2019 SAWTOOTH SOFTWARE CONFERENCE

Excel Simulator Tips & Tricks

Additional Files

https://github.com/kpfairchild/ExcelSimulator

Topics we'll cover

- Why Excel?
- Elements of an Excel Simulator
- Essential Excel Tricks
  - Array Formulas
  - Named Ranges
  - Other essentials
- Essential Calculations
- Segmentation and Weighting
- Style ConsiderationsPutting it all Together

Why Excel?

We have lots of simulator options:

- Lighthouse - Most powerful
- sawtoothsimulator.com - Most online!
- Lighthouse Excel export - Easy option, less flexible, not client ready
- Custom Excel Simulator – Fully customizable, easy to give to clients

Elements of an Excel Simulator

Raw Utilities

Utilities		Responde	Include	Red	Green	Blue	Large	Medium	Small	$1	$2	$3	None	Weight
		1	1	-3.62349	1.001738	2.621753	-2.15951	-0.81362	2.973124	3.323278	-0.57624	-2.74704	-0.66378	1
		2	1	-0.80942	-0.34355	1.152971	-4.53894	1.89831	2.640632	1.618263	-0.40939	-1.20888	1.545042	1
		3	1	-2.73823	1.059232	1.678997	-0.73896	-0.09789	0.836851	2.831797	-0.85676	-1.97504	-1.62692	1
		4	1	-1.99565	-0.56262	2.558271	-1.23016	0.403141	0.827014	0.66186	0.618527	-1.28039	-1.00349	1
		5	1	-1.46044	-0.23222	1.692657	-1.81586	-0.35355	2.169413	2.757226	-0.31874	-2.43848	1.872246	1
		6	1	-2.28387	0.052385	2.231486	-0.72782	-0.1769	0.904722	0.686105	0.621647	-1.30775	1.513226	1
		7	1	-1.45997	-0.35845	1.818422	-1.96922	-0.88731	2.856529	1.621175	-0.65916	-0.96202	1.552688	1
		8	1	-1.56939	0.413143	1.156242	-5.15151	2.155056	2.99645	1.429354	0.207433	-1.63679	0.631759	1
		9	1	-1.0332	0.214559	0.818645	-4.63485	2.195269	2.439577	1.40377	-0.09069	-1.31308	-0.56315	1
		10	1	-1.50262	-0.91921	2.421831	-2.04183	-0.36999	2.411819	4.877868	-1.9591	-2.91877	-0.21828	1

Elements of an Excel Simulator

Calculations/other hidden stuff

Design	Include?	0	1	0	0	1
1	Color	2	1	1	1	
2	Size	1	1	1	1	
3	Price	1	1	1	1	
		1	2	3	4	None
1	1	0	1	1	1	0
1	2	1	0	0	0	0
1	3	0	0	0	0	0
2	1	1	1	1	1	0
2	2	0	0	0	0	0
2	3	0	0	0	0	0
3	1	1	1	1	1	0
3	2	0	0	0	0	0
3	3	0	0	0	0	0
		0	0	0	0	1

Share of Preference Calculation					
	Product 1	Product 2	Product 3	Product 4	None
SOP	0	0.100145	0.100145	0.100145	0.699565

Labels		
	Include	
	Exclude	
	Red	1
	Green	2
	Blue	3
	Large	1
	Medium	2
	Small	3
	$1	1
	$2	2
	$3	3

Elements of an Excel Simulator

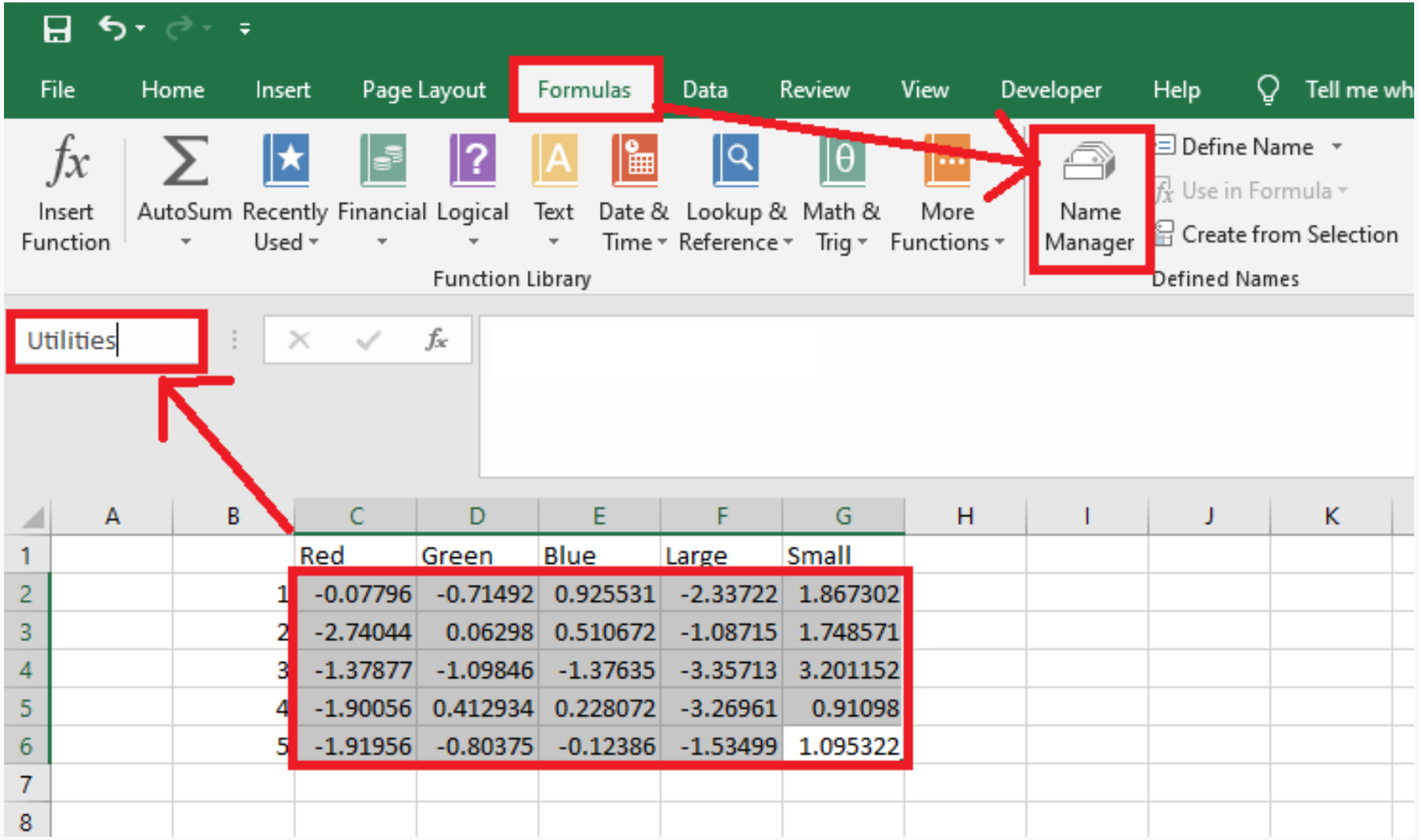
Client facing configurator and share of preference display

Simulator		Product 1	Product 2	Product 3	Product 4	None
	Include?	Exclude	Include	Exclude	Exclude	Include
	Color	Green	Red	Red	Red	
	Size	Large	Large	Large	Large	
	Price	$1	$1	$1	$1	
	SOP	0.00%	20.39%	0.00%	0.00%	79.61%

Essential Excel Tricks - Array Formulas

- Runs calculations on whole arrays of values at the same time
- Can output to multiple cells
- Can reduce the total amount of cells that need to store intermediate calculation steps (brevity/clarity tradeoff!!)
- How to:
  1. When editing a cell, press ‘Control+Shift+Enter’ (CSE) instead of ‘Enter’.
  2. F9 is your best friend to evaluate intermediate steps for difficult computations

Essential Excel Tricks - Named Ranges

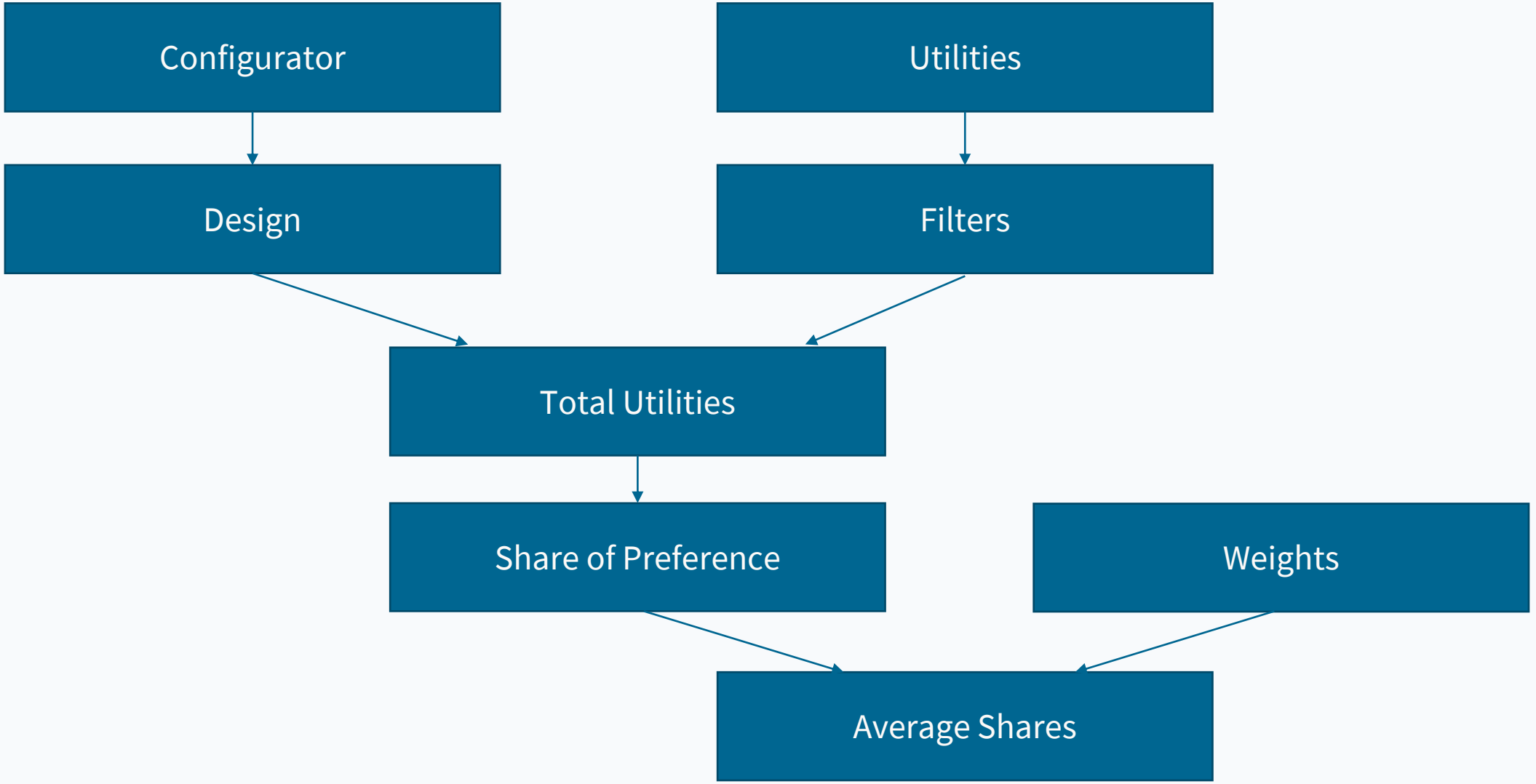


	A	B	C	D	E	F	G	H	I	J	K
1			Red	Green	Blue	Large	Small				
2		1	-0.07796	-0.71492	0.925531	-2.33722	1.867302				
3		2	-2.74044	0.06298	0.510672	-1.08715	1.748571				
4		3	-1.37877	-1.09846	-1.37635	-3.35713	3.201152				
5		4	-1.90056	0.412934	0.228072	-3.26961	0.91098				
6		5	-1.91956	-0.80375	-0.12386	-1.53499	1.095322				
7											
8											

Essential Excel Tricks - Other common formulas

- Finding stuff
  - VLOOKUP – Find a value, return another value
  - MATCH – Find a value, tell me where you found it
- Indicator logic (converting TRUE/FALSE to 1/0)
- OFFSET – Give me a cell near a cell, offset by some amount
- ROW/COLUMN – What row am I on?
- INDEX – Give me subset of another selection

Calculation Flow Chart



Essential Calculations

Total Utility Calculation:

Formula: $$U_A = Util(A) = Attr1_A + Attr2_A + \ldots + AttrK_A$$

Excel (standard): =sum(a1:e1)

Excel (array): =MMULT(Utilities,Design) or SUMPRODUCT(Utilities, Design)

Share of Preference:

Formula: $$Prob(Choice = A) = \frac{e^{U_A}}{e^{U_A} + e^{U_B} + e^{U_C}}$$

Excel (standard): =exp(a1)/(exp(a1)+exp(b1)+exp(c1)

Excel (array): =exp(a1:c1)/sum(exp(a1:c1))

Essential Calculations - Total Utility

	Red	Green	Blue	Large	Medium	Small	$1	$2	$3	None
Utilities	-3.62349	1.001738	2.621753	-2.15951	-0.81362	2.973124	3.323278	-0.57624	-2.74704	-0.66378
Include/Exclude	0	**1**	0	**1**	0	0	**1**	0	0	0
Multiply Together	0	**1.001738**	0	**-2.15951**	0	0	**3.323278**	0	0	0
Add them up	**2.165507**									

Essential Calculations – Average Share of Preference

$$SOP_A = \frac{\sum_{i=1}^{n} Prob(Choice_i = A)}{n}$$

Excel (standard): sum(A:A)/count(A:A)

Segmentation and Weighting

Segmentation – Filtering of respondents by known subgroups

Weighting – Changing respondent's relative contribution toward group average

- Use weighting when your actual population is different in a known way from your sampled population.

Segmentation and Weighting – Review Averages

Regular Average:

$$\bar{x} = \frac{x_1 + x_2 + \ldots + x_n}{n}$$

$$= \frac{\sum_{i=1}^{n} x_i}{n}$$

Segmentation and Weighting – Review Averages

Regular Average with weights shown:

$$\bar{x} = \frac{1 \cdot x_1 + 1 \cdot x_2 + \ldots + 1 \cdot x_n}{1 + 1 + \ldots + 1}$$

$$= \frac{\sum_{i=1}^{n} 1 \cdot x_i}{\sum_{i=1}^{n} 1}$$

Segmentation and Weighting – Review Averages

Weighted Average with weights shown:

$$\bar{x} = \frac{w_1 \cdot x_1 + w_2 \cdot x_2 + \ldots + w_n \cdot x_n}{w_1 + w_2 + \ldots + w_n}$$

$$= \frac{\sum_{i=1}^{n} w_i \cdot x_i}{\sum_{i=1}^{n} w_i}$$

Excel(array + named ranges): =sum(weights*values)/sum(weights)

Segmentation and Weighting – Segmentation

For building our simulators, we can just treat segmentation as a matter of setting our weights equal to zero when the segment should be excluded.

Style Considerations

Conjoint Simulator

Specialty	Experience	Sample Size
☑ N	☑ N	434
☑ E	☑ V	
	☑ R	

Attribute	[PROFILE] ☑	[PROFILE] ☑	[PROFILE] ☑	[PROFILE] ☑	[PROFILE] ☑
[ATTRIBUTE]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]
[ATTRIBUTE]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]
[ATTRIBUTE]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]
[ATTRIBUTE]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]
[ATTRIBUTE]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]
[ATTRIBUTE]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]
[ATTRIBUTE]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]
[ATTRIBUTE]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]
[ATTRIBUTE]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]
[ATTRIBUTE]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]	[DROPDOWN]
	[PROFILE]	[PROFILE]	[PROFILE]	[PROFILE]	[PROFILE]
Preference Share	0%	0%	0%	0%	0%

1. Keep it simple
2. Get it working before styling

Let’s look at an example!

QUESTIONS?

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