VIACOM SOCIAL PLATFORM PRICING MODEL

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1. ABSTRACT

PROJECT GOAL

- Optimize ad costs charged to Viacom partner advertisers using demographic data

PROJECT OBSTACLES

- Limited domain knowledge of advertising can lead to unreliable interpretations of the results.

- Limited in data given since extra information is confidential and difficult to obtain.

- Viacom has limited availability for this project.

- Individual projects are limited by domain knowledge and interpretations of individuals,
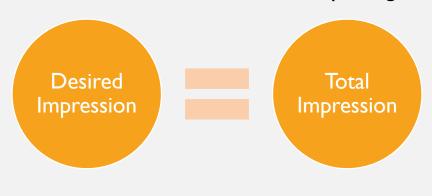
2. PRICING MODEL

ASSUMPTIONS

- A contract only use one page and one page only contains one contract

- Gender and age are the only 2 factors to determine CPM

- The impression is only organic reach and company not run Facebook ads

- CPM is the only factor affecting the choice of a customer

- The page level in the future will behave the same as the past

CALCULATE CPM: FACTORS AFFECT CPM

- Total impressions (T): Most important factor determining the feasibility of the contract

- Desired impressions (D): Varies among different customer profiles, determining the added value

- Time of contract (Time): determine the urgency of a contract.

CALCULATE CPM: DIFFERENCE BETWEEN CALCULATION OF CPM OF FACEBOOK AND VIACOM

Facebook: Use auction pricing

Desired Impression = Total Impression

Viacom: Use contracted pricing

Additional Impression + Desired Impression
• What advertisers need
= Total Impression
• What Viacom can provide

CALCULATE CPM: MAGNITUDE OF A PAGE

- Assume that Viacom has M pages and N customers

- The magnitude of page i to customer j is defined as the combination of total impressions and desired impressions of page i for customer j

- Specifically,

$$Magnitude_{ij} = Total\ Impression_i + \alpha \times Desired\ Impression_{ij}$$

$\forall i \in \{1: M\}$ and $\forall j \in \{1: N\}$

where α ranges from 0 to 10

- The higher α, the more weight is put on the Desired Impression.

- α = 0, Magnitude only consists of Total Impression

CALCULATE CPM: BASE MAGNITUDE

- The base magnitude is the magnitude of the page which is chosen to meet the minimum requirement of Total impression

- The Base magnitude for a customer j is defined as:

- $Base\ Magnitude_j = Magnitude_{Ij}$,

  - Where $|Total\ Impression_I - Required\ Total\ Impression| \geq$ $|Total\ Impression_i - Required\ Total\ Impression|$

    $\forall i \in \{1:M\}$

CALCULATE CPM: TIME OF CONTRACT

- The time of contract reflects the urgency of that contract.

- For a specified impressions, the shorter time results in higher CPM because Viacom needs to put more resources to meet the same requirement.

CALCULATE CPM

- The pages that do not meet base magnitude will have a base CPM of $25

- The pages that exceed the base magnitude will have added value, therefore will be compensated for additional magnitude.

CALCULATE CPM

- CPM of page i to customer j is defined as:

- $CPM_{ij} =$

$$\begin{cases} 25 \ \forall Magnitude_{ij} < Base\ Magnitude_j \\ 25 + 25 \times \beta \times \frac{Magnitude_{ij}}{Base\ Magnitude_j} \times \frac{1}{Time\ of\ contract_j} \forall Magnitude_{ij} \geq Base\ Magnitude_j \end{cases}$$

- Whereas, β ranges from 0 to 1.

- $\beta = 0$, CPM will be 25 for all pages, meaning that there will be no effects of demographic targeting in pricing.

- The higher β, the higher the CPM will be for. However, the β should be appropriately tuned to make sure that the CPM rate is acceptable.

- β only change the CPM but not affect the rank of different pages

APPLY CPM WITH AN EXAMPLE: PROBLEM

- A lingerie company A wants to promote their products on one Viacom Facebook page. Its requirement is to reach 30 million total impressions in 3 months starting from January. What should be the suitable CPM for each page with this customer?

APPLY CPM WITH AN EXAMPLE: TACKLE

- Step 1: Find out the desired demographic for this customer. Since its product serve for female of all ages, it is justified that company A want to target on Female age 13 – 65+

- Step 2: Input the metric, impression required, starting date and ending date using the default value of $\alpha = 1$ and $\beta = 1$

APPLY CPM WITH AN EXAMPLE: RESULT

Sheet 3

hID	Total Impression	Desired Impression	Magnitude ≡	Base Magnitude	Days of contract	CPM
-1379668826	1,132,250,898	688,532,722	1,820,783,620	52,038,315	91	35
-243913656	1,219,389,294	597,546,495	1,816,935,789	52,038,315	91	35
562697744	603,943,556	378,197,272	982,140,828	52,038,315	91	30
1937545411	415,128,119	267,535,926	682,664,045	52,038,315	91	29
-1011603482	371,620,671	224,452,406	596,073,077	52,038,315	91	28
-1123759962	231,109,670	189,859,341	420,969,011	52,038,315	91	27
-904154831	197,200,352	182,662,628	379,862,980	52,038,315	91	27
-1958438828	283,395,870	67,691,872	351,087,742	52,038,315	91	27
1497808268	215,829,303	108,930,897	324,760,200	52,038,315	91	27
632571698	204,740,679	71,211,298	275,951,977	52,038,315	91	26
2113154542	175,018,041	89,108,635	264,126,676	52,038,315	91	26
1186742240	191,809,112	68,447,371	260,256,483	52,038,315	91	26
1244572994	175,000,161	69,372,670	244,372,831	52,038,315	91	26
-2050455356	143,335,605	91,925,627	235,261,232	52,038,315	91	26
-96898710	121,797,296	113,327,888	235,125,184	52,038,315	91	26
237055665	156,252,919	68,719,908	224,972,827	52,038,315	91	26
-1843835650	126,649,027	88,497,538	215,146,565	52,038,315	91	26
-1531304817	134,665,275	77,840,477	212,505,752	52,038,315	91	26
-2111977094	124,603,214	87,279,016	211,882,230	52,038,315	91	26
-1293571655	119,492,271	66,387,922	185,880,193	52,038,315	91	26
-549502059	136,305,275	47,662,025	183,967,300	52,038,315	91	26
1258648285	151,139,278	23,340,535	174,479,813	52,038,315	91	26
-53452065	98,060,624	61,005,874	159,066,498	52,038,315	91	26
-1874613969	90,388,340	64,935,879	155,324,219	52,038,315	91	26
808795975	87,048,457	66,640,526	153,688,983	52,038,315	91	26
-821100101	96,899,854	53,184,612	150,084,466	52,038,315	91	26
1702062842	80,718,837	63,653,299	144,372,136	52,038,315	91	26
1550552148	81,572,125	49,175,285	130,747,410	52,038,315	91	26
-1609616911	80,586,720	48,312,733	128,899,453	52,038,315	91	26
1536012378	71,114,171	45,093,083	116,207,254	52,038,315	91	26
1720551795	68,304,836	40,387,457	108,692,293	52,038,315	91	26
-726455439	57,189,595	34,695,815	91,885,410	52,038,315	91	25
-1010097270	51,820,119	36,399,804	88,219,923	52,038,315	91	25

CPM ranges from 25 to 35

Metric

- [ ] (All)
- [x] F.13-17
- [x] F.18-24
- [x] F.25-34
- [x] F.35-44
- [x] F.45-54
- [x] F.55-64
- [x] F.65+
- [ ] M.13-17
- [ ] M.18-24
- [ ] M.25-34
- [ ] M.35-44
- [ ] M.45-54

Impression required

30,000,000

Alpha

1

Beta

1

Starting date

1/5/2017

Ending date

4/6/2017

APPLY CPM WITH AN EXAMPLE: RESULT

- From the result tables, it can be seen that the CPM ranges from $25 to $35

- The magnitude is the factors affecting the rank of different pages. For example, page -904154831 has higher CPM than page -1958438828 This is because although the former has lower total impression, it also has higher desired impression. Therefore, the magnitude will be higher and accordingly the higher CPM

APPLY CPM WITH AN EXAMPLE: CHANGING ALPHA

Sheet 3

hID	Total Impression	Desired Impression	Magnitude F	Base Magnitude	Days of contract	CPM
-243913656	1,219,389,294	597,546,495	1,637,671,841	45,452,318	91	35
-1379668826	1,132,250,898	688,532,722	1,614,223,803	45,452,318	91	35
562697744	603,943,556	378,197,272	868,681,646	45,452,318	91	30
1937545411	415,128,119	267,535,926	602,403,267	45,452,318	91	29
-1011603482	371,620,671	224,452,406	528,737,355	45,452,318	91	28
-1123759962	231,109,670	189,859,341	364,011,209	45,452,318	91	27
-1958438828	283,395,870	67,691,872	330,780,180	45,452,318	91	27
-904154831	197,200,352	182,662,628	325,064,192	45,452,318	91	27
1497808268	215,829,303	108,930,897	292,080,931	45,452,318	91	27
632571698	204,740,679	71,211,298	254,588,588	45,452,318	91	27
1186742240	191,809,112	68,447,371	239,722,272	45,452,318	91	26
2113154542	175,018,041	89,108,635	237,394,086	45,452,318	91	26
1244572994	175,000,161	69,372,670	223,561,030	45,452,318	91	26
-2050455356	143,335,605	91,925,627	207,683,544	45,452,318	91	26
237055665	156,252,919	68,719,908	204,356,855	45,452,318	91	26
-96898710	121,797,296	113,327,888	201,126,818	45,452,318	91	26
-1531304817	134,665,275	77,840,477	189,153,609	45,452,318	91	26
-1843835650	126,649,027	88,497,538	188,597,304	45,452,318	91	26
-2111977094	124,603,214	87,279,016	185,698,525	45,452,318	91	26
-549502059	136,305,275	47,662,025	169,668,693	45,452,318	91	26
1258648285	151,139,278	23,340,535	167,477,653	45,452,318	91	26
-1293571655	119,492,271	66,387,922	165,963,816	45,452,318	91	26
-53452065	98,060,624	61,005,874	140,764,736	45,452,318	91	26
-1874613969	90,388,340	64,935,879	135,843,455	45,452,318	91	26
-821100101	96,899,854	53,184,612	134,129,082	45,452,318	91	26
808795975	87,048,457	66,640,526	133,696,825	45,452,318	91	26
1702062842	80,718,837	63,653,299	125,276,146	45,452,318	91	26
1550552148	81,572,125	49,175,285	115,994,825	45,452,318	91	26
-1609616911	80,586,720	48,312,733	114,405,633	45,452,318	91	26
1536012378	71,114,171	45,093,083	102,679,329	45,452,318	91	26
1720551795	68,304,836	40,387,457	96,576,056	45,452,318	91	26
-726455439	57,189,595	34,695,815	81,476,666	45,452,318	91	25
-1010097270	51,820,119	36,399,804	77,299,982	45,452,318	91	25

Metric

- [ ] (All)
- [x] F.13-17
- [x] F.18-24
- [x] F.25-34
- [x] F.35-44
- [x] F.45-54
- [x] F.55-64
- [x] F.65+
- [ ] M.13-17
- [ ] M.18-24
- [ ] M.25-34
- [ ] M.35-44
- [ ] M.45-54

Impression required
30.000.000

Alpha
0.7

Beta
1

Starting date
1/5/2017

Ending date
4/6/2017

APPLY CPM WITH AN EXAMPLE: CHANGING ALPHA

- As can be seen, when parameter alpha changes from 1 to 0.7, rank of two previously indicated pages has changed. This is due to the fact that weight on desired impression has been declined. Page -904154831 will no longer has the advantage of desired impression

APPLY CPM WITH AN EXAMPLE: CHANGING BETA

Sheet 3

hID	Total Impression	Desired Impression	Magnitude F	Base Magnitude	Days of contract	CPM
-1379668826	1,132,250,898	688,532,722	1,820,783,620	52,038,315	91	30
-243913656	1,219,389,294	597,546,495	1,816,935,789	52,038,315	91	30
562697744	603,943,556	378,197,272	982,140,828	52,038,315	91	28
1937545411	415,128,119	267,535,926	682,664,045	52,038,315	91	27
-1011603482	371,620,671	224,452,406	596,073,077	52,038,315	91	27
-1123759962	231,109,670	189,859,341	420,969,011	52,038,315	91	26
-904154831	197,200,352	182,662,628	379,862,980	52,038,315	91	26
-1958438828	283,395,870	67,691,872	351,087,742	52,038,315	91	26
1497808268	215,829,303	108,930,897	324,760,200	52,038,315	91	26
632571698	204,740,679	71,211,298	275,951,977	52,038,315	91	26
2113154542	175,018,041	89,108,635	264,126,676	52,038,315	91	26
1186742240	191,809,112	68,447,371	260,256,483	52,038,315	91	26
1244572994	175,000,161	69,372,670	244,372,831	52,038,315	91	26
-2050455356	143,335,605	91,925,627	235,261,232	52,038,315	91	26
-96898710	121,797,296	113,327,888	235,125,184	52,038,315	91	26
237055665	156,252,919	68,719,908	224,972,827	52,038,315	91	26
-1843835650	126,649,027	88,497,538	215,146,565	52,038,315	91	26
-1531304817	134,665,275	77,840,477	212,505,752	52,038,315	91	26
-2111977094	124,603,214	87,279,016	211,882,230	52,038,315	91	26
-1293571655	119,492,271	66,387,922	185,880,193	52,038,315	91	25
-549502059	136,305,275	47,662,025	183,967,300	52,038,315	91	25
1258648285	151,139,278	23,340,535	174,479,813	52,038,315	91	25
-53452065	98,060,624	61,005,874	159,066,498	52,038,315	91	25
-1874613969	90,388,340	64,935,879	155,324,219	52,038,315	91	25
808795975	87,048,457	66,640,526	153,688,983	52,038,315	91	25
-821100101	96,899,854	53,184,612	150,084,466	52,038,315	91	25
1702062842	80,718,837	63,653,299	144,372,136	52,038,315	91	25
1550552148	81,572,125	49,175,285	130,747,410	52,038,315	91	25
-1609616911	80,586,720	48,312,733	128,899,453	52,038,315	91	25
1536012378	71,114,171	45,093,083	116,207,254	52,038,315	91	25
1720551795	68,304,836	40,387,457	108,692,293	52,038,315	91	25
-726455439	57,189,595	34,695,815	91,885,410	52,038,315	91	25
-1010097270	51,820,119	36,399,804	88,219,923	52,038,315	91	25

Metric

- [ ] (All)
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- [x] F.55-64
- [x] F.65+
- [ ] M.13-17
- [ ] M.18-24
- [ ] M.25-34
- [ ] M.35-44
- [ ] M.45-54

Impression required

30,000.000

Alpha

1

Beta

0.5

Starting date

1/5/2017

Ending date

4/6/2017

APPLY CPM WITH AN EXAMPLE: CHANGING BETA

- Changing Beta from 1 to 0.7 narrow down the ranges of CPM from 25-35 to 25-30. However, the rank of different is unaltered.

3. CONCLUSION

DRAWBACK OF THE MODEL

- Not take into account the demand of the advertising, therefore, CPM is solely determined by the supply capability of Viacom.

- Just pay attention to a portion of available demographic: age and gender

- The model performs well only for a small amount of customers

- Not factor in the usability of Facebook ads

- The constraint of the 1:1 connection between customers and pages are unrealistic

- The future performance may not be the same as the past

FUTURE DEVELOPMENT OF THE MODEL

- Utilize all demographic available to give customers a wider range of choice.

- Have another option for customer to choose desired impression, not total impression

- Better allocate the limited impressions along the chose pages and between different customers

- Using more data from many years to predict the demographic in the future.

CONCLUSION

- The model mentioned in presentation is the most primitive way to price an advertising contract using demographic data.

- By using this model, Viacom can understand how different pages perform for each different customers and how Viacom can take advantage of the model