Technical Appendix
PMB/comScore Congruent Fusion

The Congruent Fusion project was based on the desire to bring together PMB readership and comScore Internet access data. Congruent Fusion was executed on the PMB 2011 Fall dataset and the custom-built comScore average monthly Internet user dataset covering June, July and August 2011. Demographically, data fusion was restricted in both files to past-4-week Internet users 18 years of age or older. The PMB file comprised 21,038 respondents, and comScore file comprised 38,945 panelists covering 6,800 websites.

The following variables were used as hard control variables for fusion:

Region	Atlantic / Quebec / Ontario / Prairies / BC
Gender Within Region	Male / Female
Age Within Gender	18–24 / 25–34 / 35–54 / 55+

As a result, each data source was partitioned into 40 cells defined by these control variables. Ultimately, fusion would take place at the cell level, that is, cell one of PMB would be fused to cell one of comScore and so on.

Exhibit 1 details and compares the comScore and PMB Internet user profiles with each projected to its own universe estimate of Internet users.

Exhibit 1

	Stats Canada 18+ (2011 Fall)		ComScore Profile (Quarter ending Aug 2011) Average Month Internet Users 18+				PMB 2011 Fall			
							All 18+		Past month Internet Users 18+	
	V%	(000)	Actual	V%	Weighted	V%	(000)	V%	(000)	V%
TOTAL		26,958	38,945	100.0	20,479,186	100.0	26,958	100.0	20,722	100.0
Region										
Atlantic	7.0	1,900	3,140	8.1	1,406,532	6.9	1,900	7.0	1,464	7.1
Quebec	23.5	6,345	6,638	17.0	4,954,867	24.2	6,345	23.5	4,574	22.1
Ontario	38.6	10,418	17,474	44.9	7,937,356	38.8	10,418	38.6	8,066	38.9
Prairies	17.2	4,646	6,772	17.4	3,563,557	17.4	4,646	17.2	3,638	17.6
BC	13.5	3,649	4,921	12.6	2,616,874	12.8	3,649	13.5	2,979	14.4
Gender										
Female	50.9	13,709	16,622	42.7	10,261,678	50.1	13,709	50.9	10,341	49.9
Male	49.1	13,249	22,323	57.3	10,217,508	49.9	13,249	49.1	10,381	50.1
Age										
18 - 24	12.1	3,275	14,272	36.6	2,269,524	11.1	3,275	12.1	3,145	15.2
25 - 34	17.2	4,631	10,568	27.1	4,560,350	22.3	4,631	17.2	4,315	20.8
35 - 44	17.7	4,772	6,500	16.7	4,621,190	22.6	4,772	17.7	4,194	20.2
45 - 54	19.7	5,316	4,369	11.2	4,251,136	20.8	5,316	19.7	4,232	20.4
55 - 64	15.7	4,244	2,114	5.4	3,066,024	15.0	4,244	15.7	3,084	14.9
65+	17.5	4,720	1,122	2.9	1,710,963	8.4	4,720	17.5	1,752	8.5
Household Income										
Under $15,000	5.7	1,548	467	1.2	612,691	3.0	1,548	5.7	882	4.3
$15,000-$24,999	8.2	2,224	1,414	3.6	1,545,385	7.5	2,224	8.2	1,215	5.9
$25,000-$39,999	13.4	3,614	3,808	9.8	2,250,343	11.0	3,614	13.4	2,223	10.7
$40,000-$59,999	18.2	4,913	13,065	33.5	4,054,398	19.8	4,913	18.2	3,493	16.9
$60,000-$74,999	12.9	3,467	11,613	29.8	2,778,621	13.6	3,467	12.9	2,855	13.8
$75,000-$99,999	15.7	4,239	5,751	14.8	4,010,767	19.6	4,239	15.7	3,683	17.8
$100,000+	25.8	6,952	2,827	7.3	5,226,980	25.5	6,952	25.8	6,372	30.7
Household Size										
1 Person	13.6	3,676	4,190	10.8	3,355,572	16.4	3,676	13.6	2,263	11.1
2	33.3	8,966	13,126	33.7	6,956,957	34.0	8,966	33.3	6,396	31.2
3	19.8	5,338	13,299	34.1	4,441,524	21.7	5,338	19.8	4,357	21.3
4	19.4	5,230	4,633	11.9	3,398,069	16.6	5,230	19.4	4,494	21.9
5 or more	13.9	3,749	3,697	9.5	2,327,065	11.4	3,749	13.9	2,971	14.5
Household with Children										
No	65.2	17,569	20,866	53.6	14,574,476	71.2	17,569	65.2	12,400	59.8
Yes	34.8	9,388	18,079	46.4	5,904,710	28.8	9,388	34.8	8,321	40.2

Exhibit 2 details the counts of the 40 cells as well as highlighting any discrepancies between the two independent estimates of Internet population projections in each case.

Exhibit 2

							Jun-Jul-Aug 2011			
			PMB 18+ Gen Pop				ComScore Internet			
			f	g	h	i	L	m	m-i	h-m
			Actual	Weighted	Rounded	P4W Internet	Actual	Weighted	Internet Pop. Delta	PMB Overage
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Atlantic	Male	18 to 24	36	108.4991	108,500	106,163	621	81,207	-24956	27293
		25 to 34	47	135.1990	135,204	117,253	439	120,961	3708	14243
		35 to 54	157	341.0638	341,069	275,610	402	246,135	-29475	94934
		55 +	285	332.8317	332,849	189,909	132	126,237	-63672	206612
	Female	18 to 24	45	105.7992	105,801	105,801	514	95,127	-10674	10674
		25 to 34	59	142.8989	142,898	141,376	403	141,282	-94	1616
		35 to 54	234	337.7423	337,752	314,524	474	319,043	4519	18709
		55 +	400	396.4528	396,485	213,434	155	276,504	63070	119981
Quebec	Male	18 to 24	256	358.7969	358,816	350,137	1456	268,526	-81611	90290
		25 to 34	359	548.9969	549,009	507,912	1095	582,649	74737	-33640
		35 to 54	1175	1184.0439	1,184,113	931,150	1030	1,031,649	100499	152464
		55 +	1110	1025.3419	1,025,379	512,816	352	444,102	-68714	581277
	Female	18 to 24	225	343.2978	343,311	330,094	955	329,752	-342	13559
		25 to 34	452	525.9962	526,009	473,782	699	714,413	240631	-188404
		35 to 54	1248	1108.7985	1,108,859	903,789	831	1,093,085	189296	15774
		55 +	1492	1249.6868	1,249,790	564,953	220	490,704	-74249	759086
Ontario	Male	18 to 24	329	657.9957	658,013	642,086	3715	396,375	-245711	497936
		25 to 34	463	873.5942	873,617	825,406	2667	765,747	-59659	536590
		35 to 54	1312	1956.6631	1,956,721	1,663,463	2861	1,934,573	271110	1430476
		55 +	1302	1594.4133	1,594,449	889,970	841	1,024,976	135006	1277332
	Female	18 to 24	278	629.2951	629,309	602,865	2659	386,850	-216015	242459
		25 to 34	560	897.9938	898,016	847,880	1904	716,308	-131572	181708
		35 to 54	1467	1976.7556	1,976,834	1,684,281	2237	1,726,895	42614	249939
		55 +	1575	1830.7201	1,830,795	910,714	590	986,105	75391	844690
Prairies	Male	18 to 24	131	328.9980	329,005	314,186	1455	223,251	-90935	105754
		25 to 34	224	469.4977	469,507	439,014	1143	454,541	15527	14966
		35 to 54	532	892.9122	892,938	746,866	951	822,447	75581	70491
		55 +	544	646.8784	646,905	381,409	285	353,588	-27821	293317
	Female	18 to 24	135	303.6973	303,709	266,455	1074	189,087	-77368	114622
		25 to 34	258	432.7978	432,804	407,699	839	421,865	14166	10939
		35 to 54	572	838.8014	838,829	712,687	842	703,317	-9370	135512
		55 +	634	731.9892	732,015	369,346	183	395,449	26103	336566
BC	Male	18 to 24	127	228.3985	228,402	223,857	1093	160,077	-63780	68325
		25 to 34	171	300.7976	300,811	283,942	805	337,027	53085	-36216
		35 to 54	501	633.0600	633,089	582,755	686	526,245	-56510	106844
		55 +	656	631.0315	631,060	397,285	294	317,117	-80168	313943
	Female	18 to 24	127	210.4987	210,505	203,792	730	139,278	-64514	71227
		25 to 34	188	303.3980	303,411	270,367	574	305,580	35213	-2169
		35 to 54	651	679.2242	679,251	610,725	555	469,143	-141582	210108
		55 +	721	662.7666	662,795	406,575	184	362,190	-44385	300605
			21038	26957.6237	26,958,634	20,722,328	38945	20,479,407		

A TNS proprietary program called Congruent Fusion was used to fuse the two datasets. Rather than retaining currency values on only one dataset which is the result of using traditional fusion models, Congruent Fusion is designed to maintain the currency values of both datasets.

As revealed in Exhibits 1 and 2, the two data sources projected to slightly different estimates of Internet users. The *Congruent Fusion Model* incorporates constrained fusion and requires the universe weighted estimates to be identical at the cell level. As such, prior to execution, the Congruent Fusion platform incorporates TNS Imputation technology. The Imputation model essentially imputes the Internet user values from one file to the other creating an exact match before fusion. In this case the PMB estimates were imputed to match the comScore estimates; the data were then fused preserving the weighted total of the parent source, cell by cell.

In most cases the data were independently fused within each of the 40 control cells. However, there were several cases where the comScore estimates projected to a larger Internet user population than estimated by PMB. Imputation cannot resolve such discrepancies, that is, it cannot create Internet users when there is a shortage in the projected population. To overcome this problem, each affected cell has to be merged with the adjacent cell along the age dimension. Consequently, the following merged cells were created before implementation:

Quebec Males aged 18–24 and 25–34
Quebec Females aged 25–34, 35–54 and 55+
BC Males aged 18–24 and 25–34
BC Females aged 18–24 and 25–34

In addition to the three hard control variables, the fusion algorithm also matched donors and recipients on what are called soft control variables as follows:

Household Income	**<** $15,000
	$15,000 – $24,999
	$25,000 – $39,999
	$40,000 – $59,999
	$60,000 – $74,999
	$75,000 – $99,999
	> $100,000+
House Size	1 Person 2 / 3 / 4 or more
Households with Children	Yes / No
Age (Merged Cells Only)	18–24 / 25–34 / 35–54 / 55+

Within the fusion program, donors and recipients were screened on the soft control variables, with penalty scores computed for each donor-recipient pair. The household Income variable was given the highest weight of importance in the scoring. A perfect match on all the soft control variables implies zero penalties. Iteratively the fusion program searches for the solution that delivers the lowest overall penalty for the entire cell.

The finished fused database comprises 59,897 respondent records. In order to keep the file size at a manageable level, websites with less than 50,000 unique visitors were excluded. As a result, 6,800 unique websites are included in the final dataset.

The actual and weighted counts by demographic variables are provided in the attached tables.

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