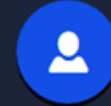


Macewan Wifi Analysis

Jimmy Prince, Alan Yong



Type any word here...



At the end of 2013, there were more mobile devices than people on earth. – SAP

5

Wifi

Life

My wifi stopped working and so did I.

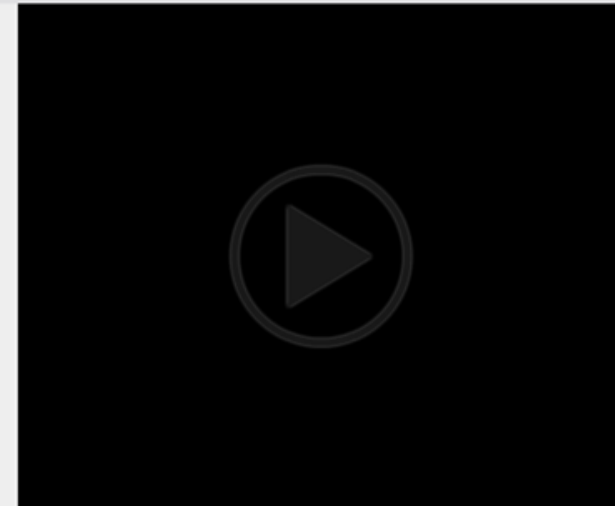
by [Bangbangzeppelin](#) July 03, 2014



75



8



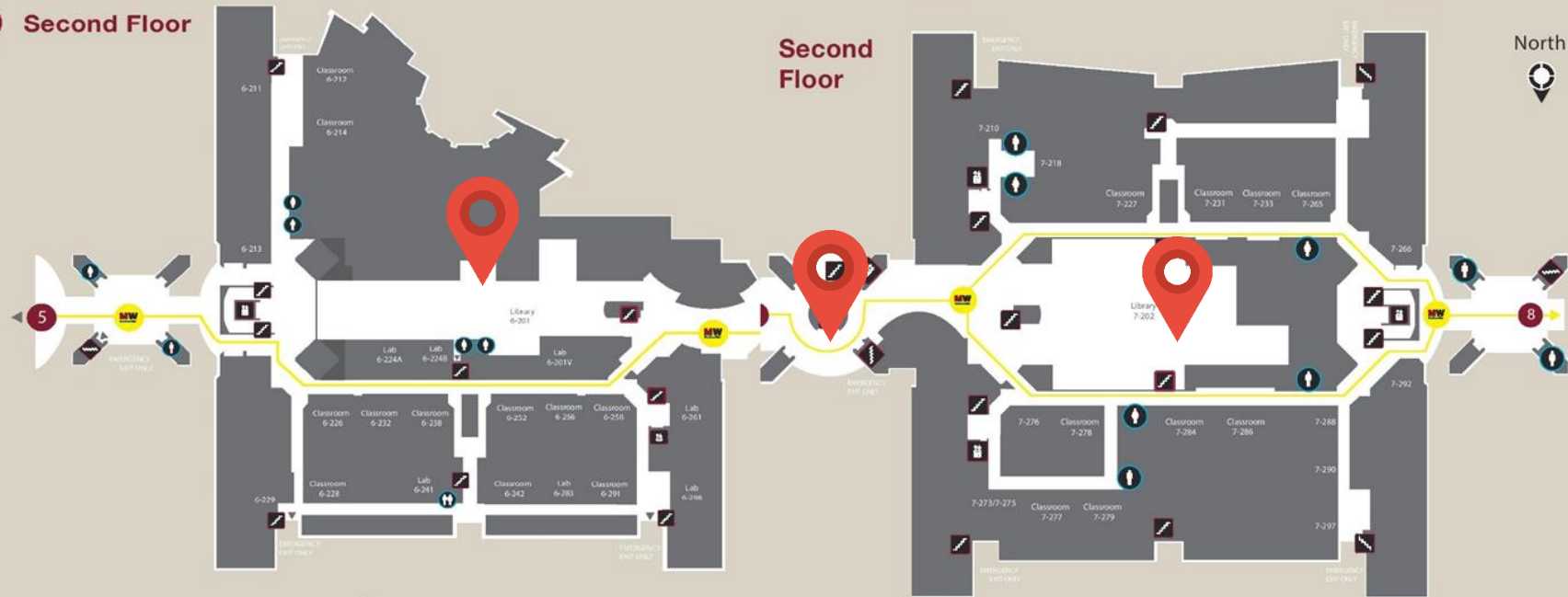
Smartphone users spend an average of 60 minutes a day. iPhone users average 90 minutes a day.

– Experian

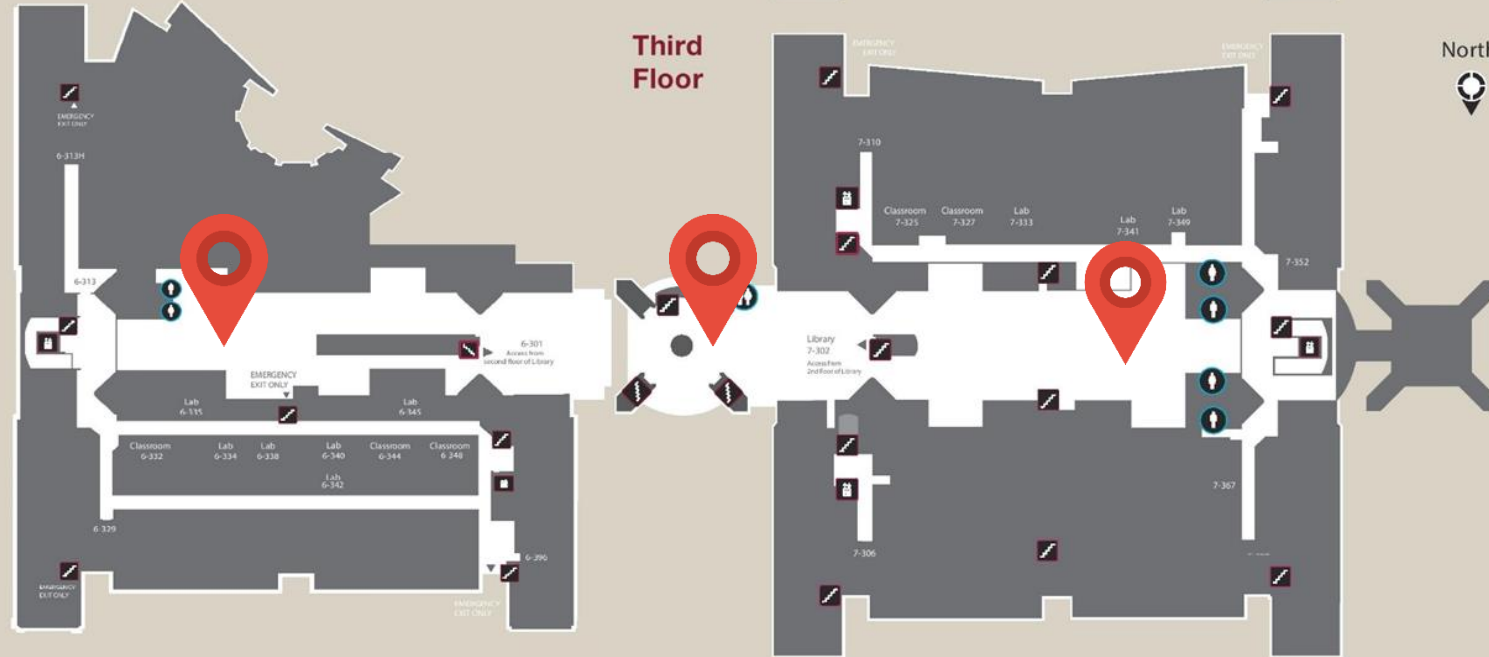


THE ACCUSED

6 Second Floor



6 Third Floor

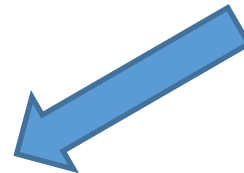


Blocks

- Time of Day (Morning, Noon, Evening)
- Day of the Week (Mon/Wed/Fri, Tues/Thurs)
- Device (Apple vs Android)
- Weeks (Nov.16 - Nov.20, Nov.23 - Nov.27)

Model Type

Blocks



$$y_{ijklm} = \mu + \tau_i + \boxed{\beta_j + \gamma_k + \alpha_l + \lambda_m} + \varepsilon_{ijklm}$$

τ_i = Location, $i = 1, 2, 3, 4, 5, 6$ (6 2nd floor, middle 2nd floor, etc.)

β_j = Time, $j = 1, 2, 3$ (Morning (10), Noon(12), Afternoon(2))

γ_k = Day of the Week, $k = 1, 2$ (Mon/Wed/Fri, Tues/Thurs)

α_l = Device/User, $l = 1, 2$ (Jimmy/Android, Alan/Apple)

λ_m = Week, $m = 1, 2$

Downloads:

Data Appropriate?

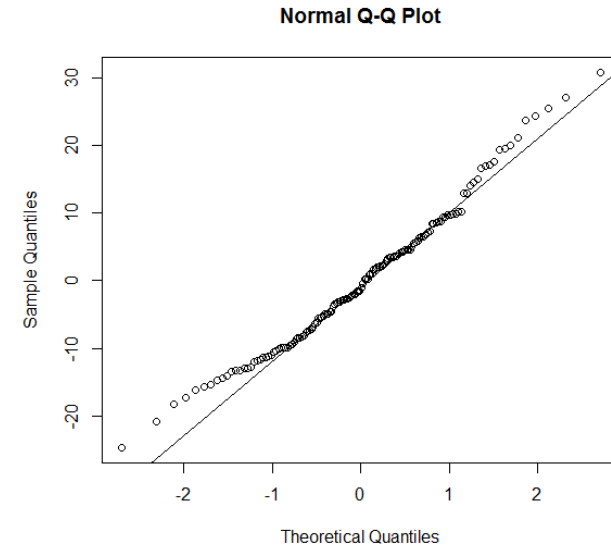
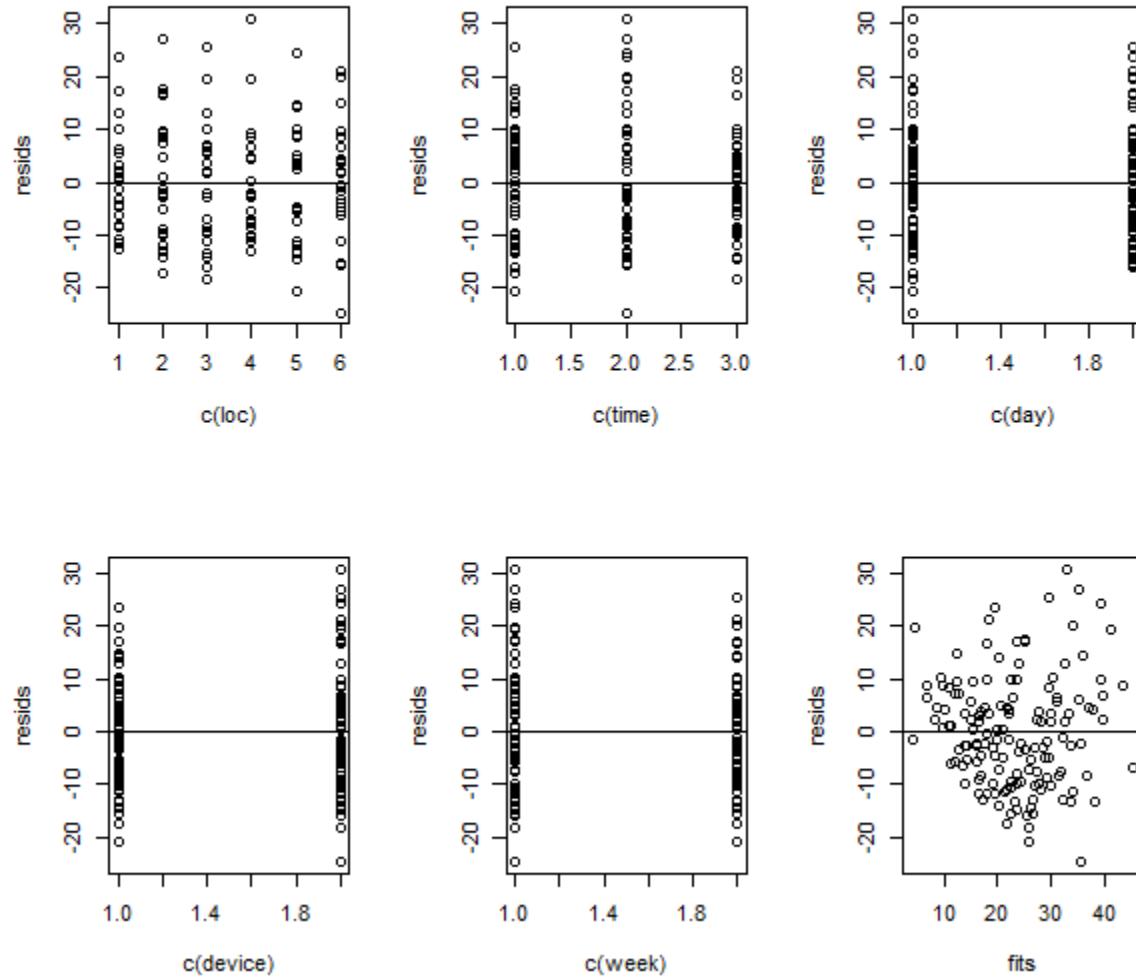
```
Levene's Test for Homogeneity of Variance (center = median)
      Df  F value  Pr(>F)
group   5    0.784  0.5629
      138
```

Additive Model - Results

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
loc	5	1461.1	292.23	2.4234	0.038746	*
time	2	6035.2	3017.60	25.0247	5.961e-10	***
day	1	1164.2	1164.20	9.6546	0.002310	**
device	1	1933.2	1933.18	16.0317	0.000103	***
week	1	631.2	631.20	5.2345	0.023721	*
Residuals	133	16037.8	120.58			

We see that all Factors and blocks are significant.

Additive Model - Residuals

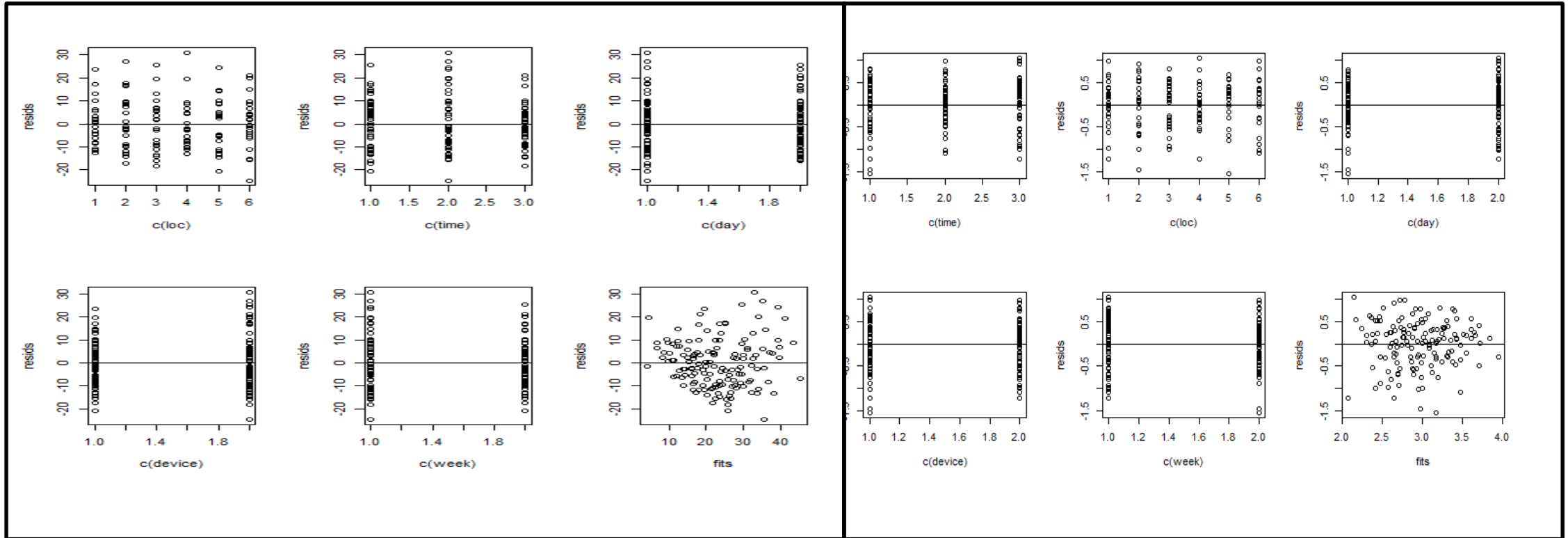


- Variances alright
- Normality not bad
- Fits have slight funnel shape

All in all, no major violations

Will a log transformation help?

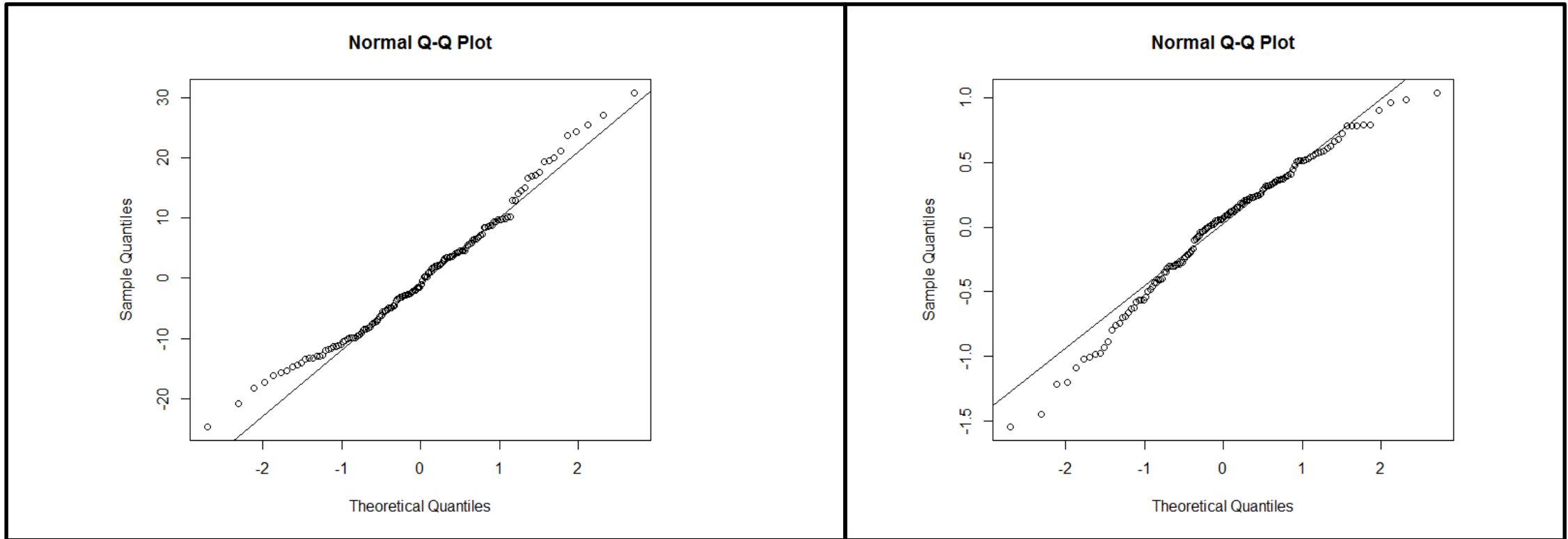
Log vs Original - Residuals



Original

Log

Log vs Original - Normality

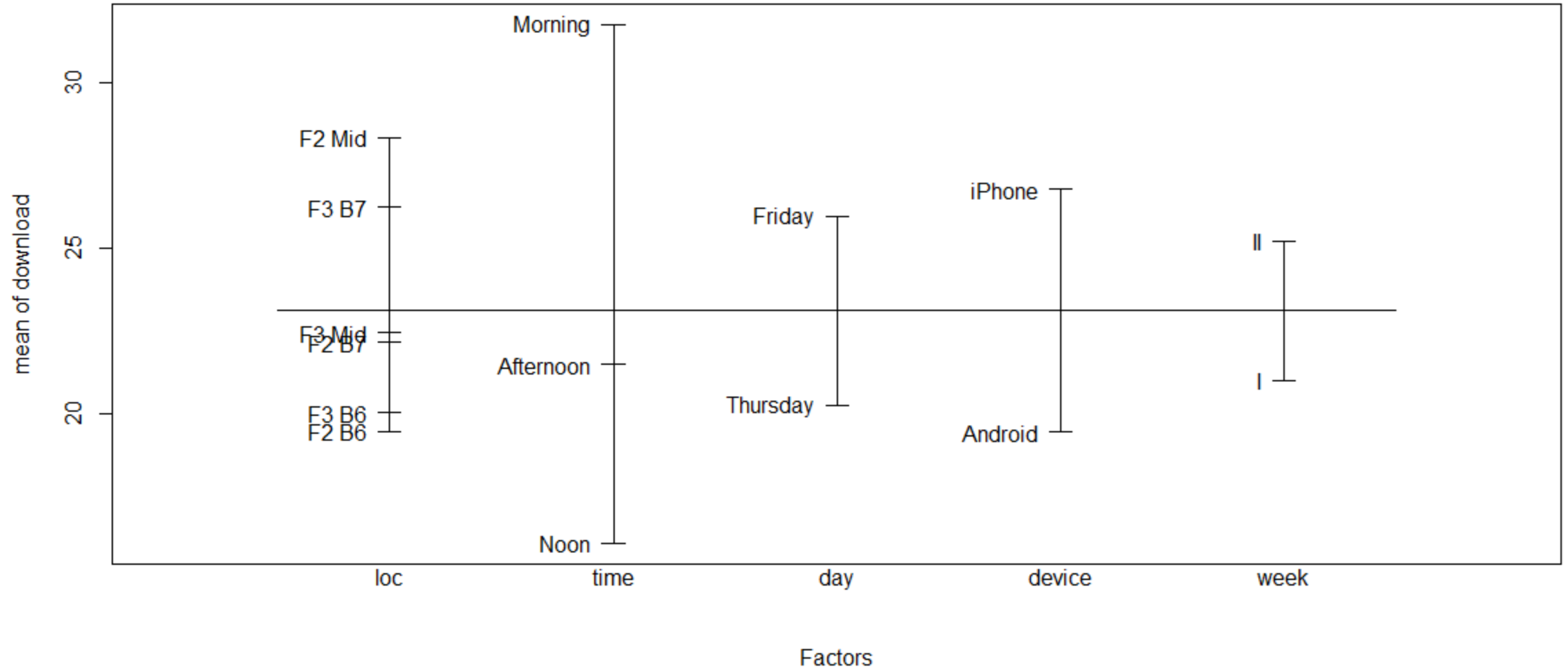


Original

Log

Not significantly better, we'll stick with original

Additive - Design Plot



Multiple Comparisons

95% Tukey-Kramer confidence intervals

	Diff	Lower	Upper	Decision	Adj. p-value
μ_{F2} B6- μ_{F2} B7	-2.665	-11.83145	6.50145	FTR H0	0.959293
μ_{F2} B6- μ_{F2} M d	-8.83729	-18.00374	0.32916	FTR H0	0.065678
μ_{F2} B7- μ_{F2} M d	-6.17229	-15.33874	2.99416	FTR H0	0.378461
μ_{F2} B6- μ_{F3} B6	-0.54146	-9.70791	8.62499	FTR H0	0.999979
μ_{F2} B7- μ_{F3} B6	2.12354	-7.04291	11.28999	FTR H0	0.984931
μ_{F2} M d- μ_{F3} B6	8.29583	-0.87061	17.46228	FTR H0	0.100289
μ_{F2} B6- μ_{F3} B7	-6.74125	-15.9077	2.4252	FTR H0	0.280094
μ_{F2} B7- μ_{F3} B7	-4.07625	-13.2427	5.0902	FTR H0	0.792247
μ_{F2} M d- μ_{F3} B7	2.09604	-7.07041	11.26249	FTR H0	0.985791
μ_{F3} B6- μ_{F3} B7	-6.19979	-15.36624	2.96666	FTR H0	0.373356
μ_{F2} B6- μ_{F3} M d	-2.96854	-12.13499	6.19791	FTR H0	0.936323
μ_{F2} B7- μ_{F3} M d	-0.30354	-9.46999	8.86291	FTR H0	0.999999
μ_{F2} M d- μ_{F3} M d	5.86875	-3.2977	15.0352	FTR H0	0.43676
μ_{F3} B6- μ_{F3} M d	-2.42708	-11.59353	6.73936	FTR H0	0.972759
μ_{F3} B7- μ_{F3} M d	3.77271	-5.39374	12.93916	FTR H0	0.84088

Multiple Comparisons – Protected LSD

95% LSD confidence intervals

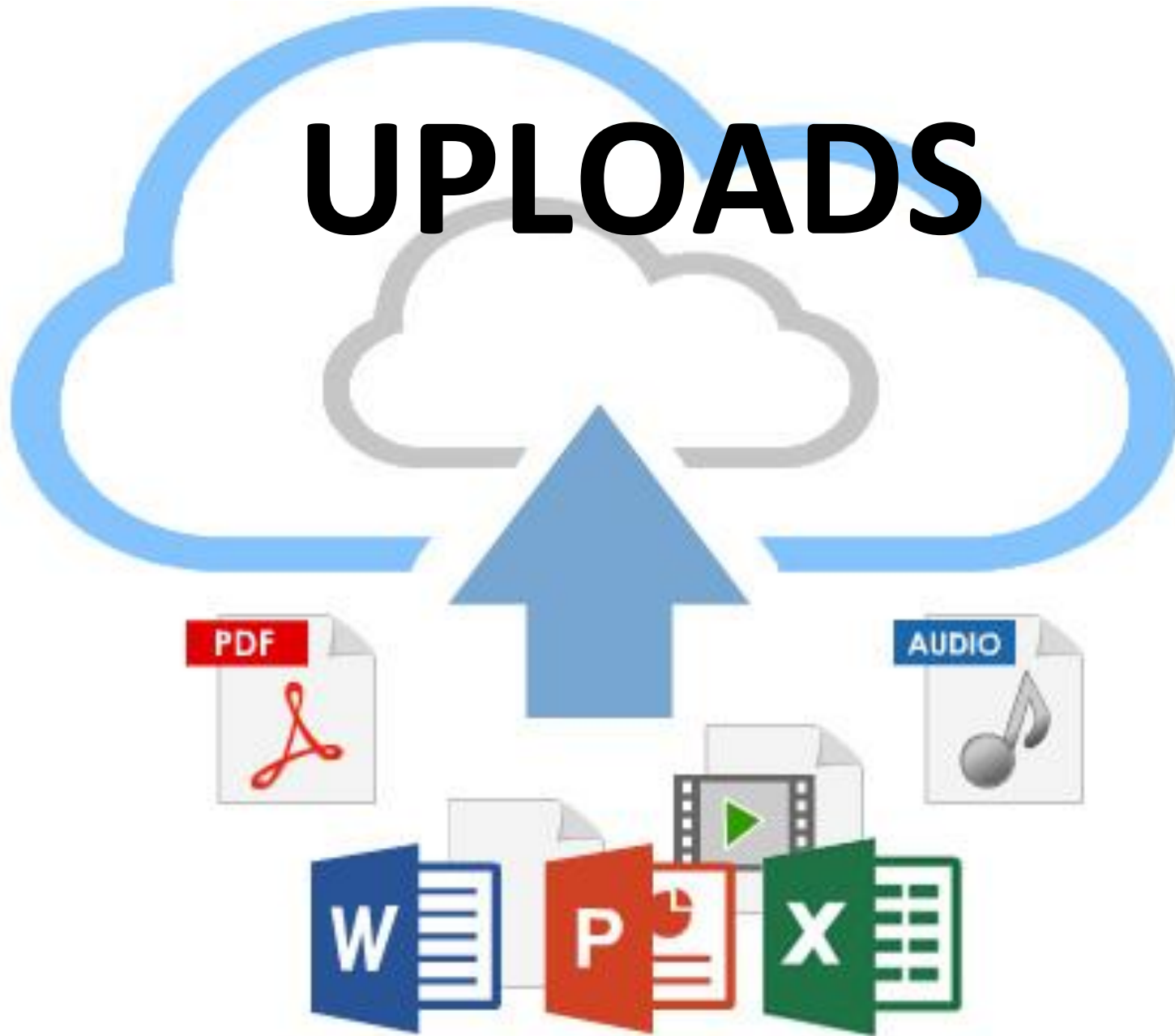
		LSD	Diff	Lower	Upper	Decision	Adj .	p-value
muF2	B6- muF2 B7	6.26996	-2.665	-8.93496	3.60496	FTR H0		0.40202
muF2	B6- muF2 M d	6.26996	-8.83729	-15.10725	-2.56733	Rej ect H0		0.00608
muF2	B7- muF2 M d	6.26996	-6.17229	-12.44225	0.09767	FTR H0		0.05362
muF2	B6- muF3 B6	6.26996	-0.54146	-6.81142	5.7285	FTR H0		0.86463
muF2	B7- muF3 B6	6.26996	2.12354	-4.14642	8.3935	FTR H0		0.50408
muF2	M d- muF3 B6	6.26996	8.29583	2.02587	14.56579	Rej ect H0		0.0099
muF2	B6- muF3 B7	6.26996	-6.74125	-13.01121	-0.47129	Rej ect H0		0.0353
muF2	B7- muF3 B7	6.26996	-4.07625	-10.34621	2.19371	FTR H0		0.20071
muF2	M d- muF3 B7	6.26996	2.09604	-4.17392	8.366	FTR H0		0.50961
muF3	B6- muF3 B7	6.26996	-6.19979	-12.46975	0.07017	FTR H0		0.05258
muF2	B6- muF3 M d	6.26996	-2.96854	-9.2385	3.30142	FTR H0		0.35073
muF2	B7- muF3 M d	6.26996	-0.30354	-6.5735	5.96642	FTR H0		0.92386
muF2	M d- muF3 M d	6.26996	5.86875	-0.40121	12.13871	FTR H0		0.06633
muF3	B6- muF3 M d	6.26996	-2.42708	-8.69704	3.84288	FTR H0		0.44523
muF3	B7- muF3 M d	6.26996	3.77271	-2.49725	10.04267	FTR H0		0.2361

Although the protected LSD results show us this, the method is not very reliable and does not correct for multiple comparisons.

Conclusions

As far as downloads go, the test we conducted does not show the six points we chose in the library are significantly different from each other.

UPLOADS



Data Appropriate?

Levene's Test for Homogeneity of Variance (center = median)

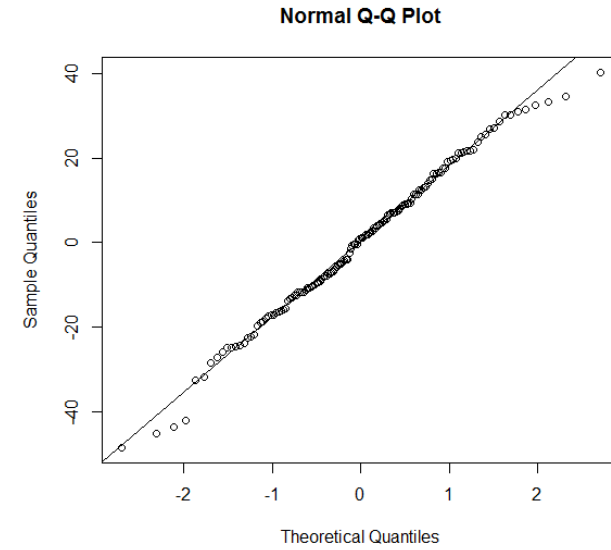
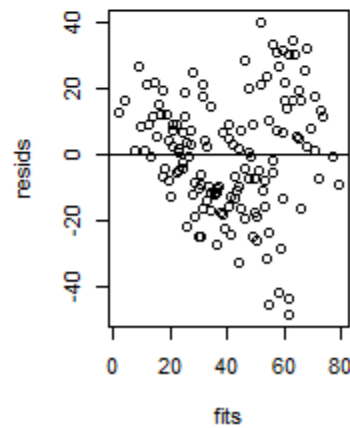
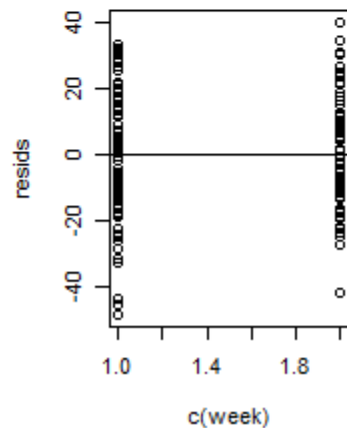
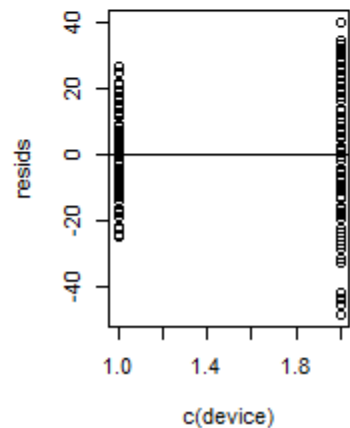
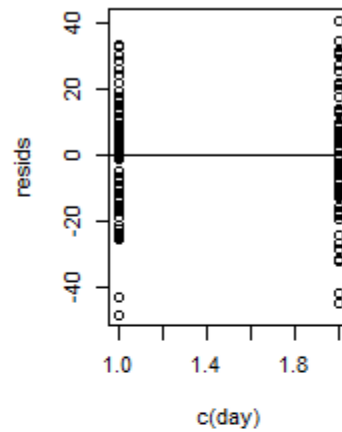
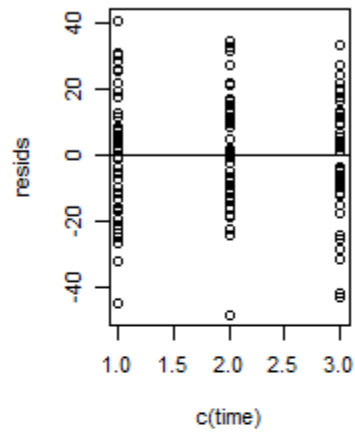
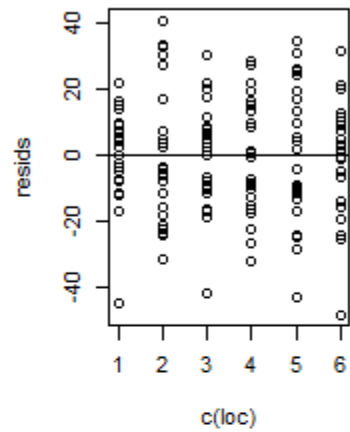
	Df	F value	Pr(>F)
group	5	2.8701	0.01694 *
	138		

Additive Model - Results

Response: upload						
	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
loc	5	10663	2132.6	6.2766	2.923e-05	***
time	2	3247	1623.3	4.7777	0.009913	**
day	1	228	228.4	0.6721	0.413785	
device	1	30234	30234.2	88.9853	< 2.2e-16	***
week	1	1980	1980.3	5.8285	0.017129	*
Residuals	133	45189	339.8			

We see that Location, time, device, and week are significant.

Additive Model - Residuals

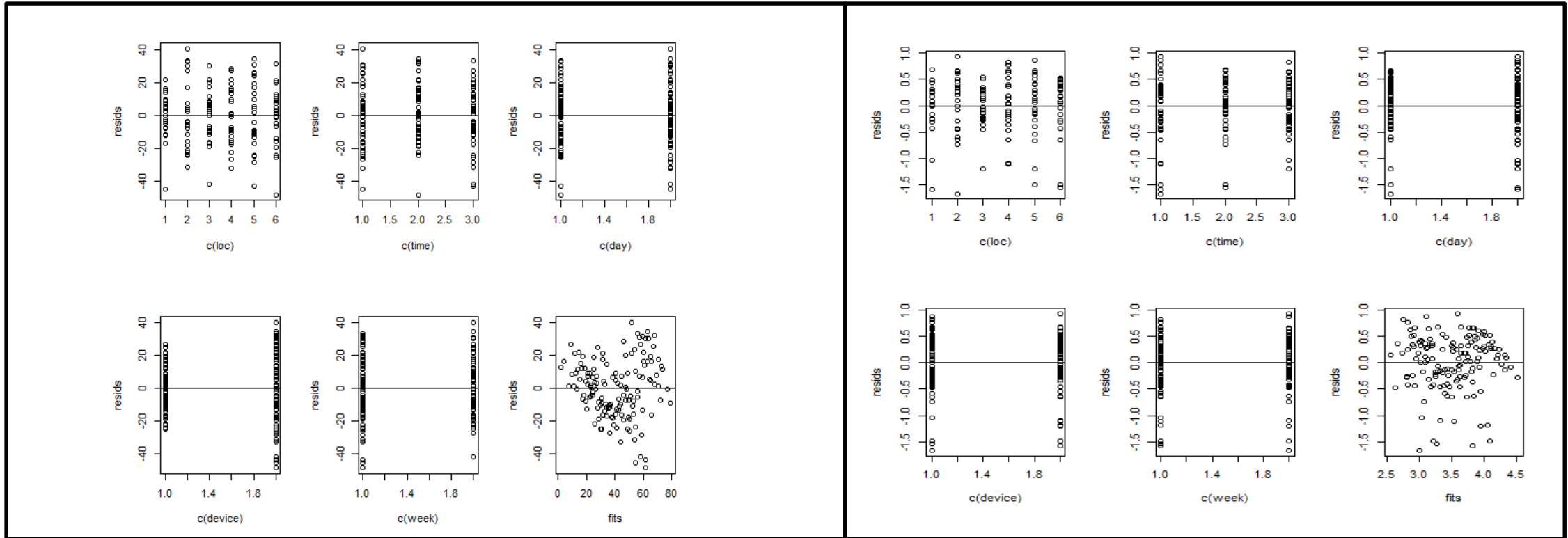


- Variances alright
- Normality great
- Fits have slight funnel shape

All in all, no major violations

Will a log transformation help?

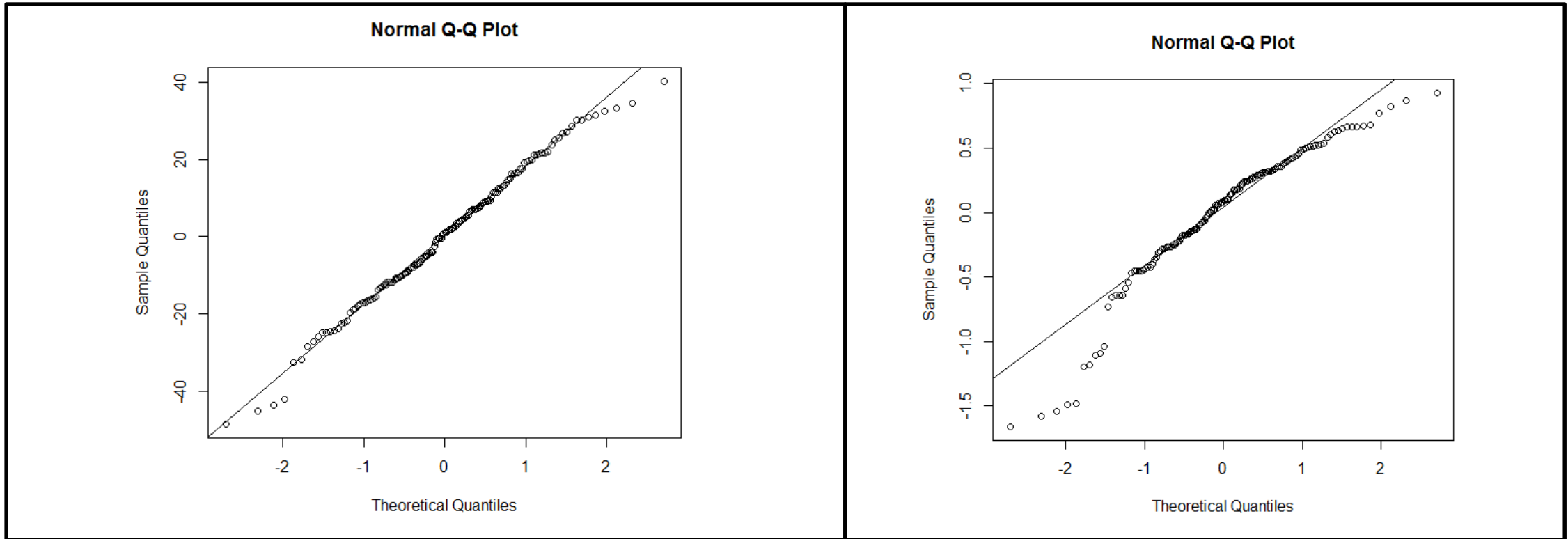
Log vs Original - Residuals



Original

Log

Log vs Original - Normality

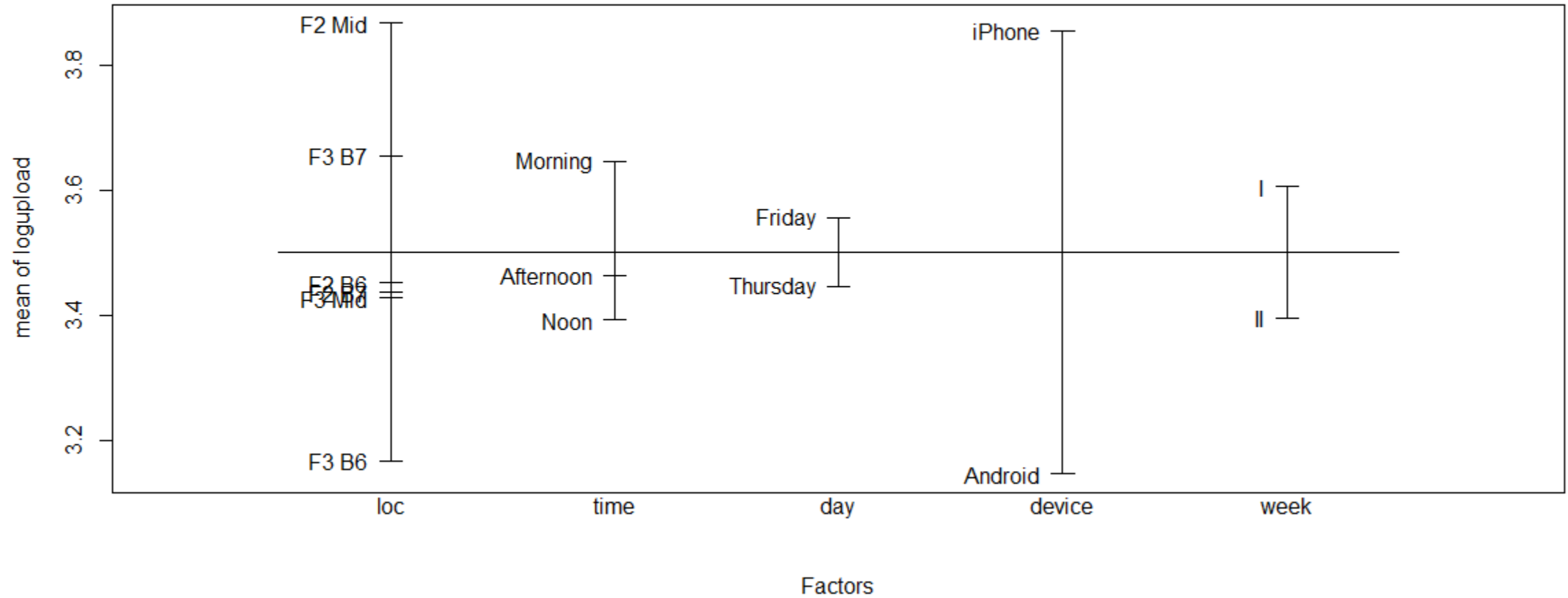


Original

Log

While fitted residuals look slightly better, normality gets wrecked. We'll stick with original

Additive - Design Plot



Multiple Comparisons

95% Tukey-Kramer confidence intervals

	Diff	Lower	Upper	Decision	Adj. p-value
muF2 B6- muF2 B7	0.01537	-0.43455	0.46529	FTR H0	0.999999
muF2 B6- muF2 M d	-0.4151	-0.86502	0.03482	FTR H0	0.088715
muF2 B7- muF2 M d	-0.43047	-0.88039	0.01945	FTR H0	0.069334
muF2 B6- muF3 B6	0.28459	-0.16533	0.73451	FTR H0	0.450778
muF2 B7- muF3 B6	0.26922	-0.1807	0.71914	FTR H0	0.514398
muF2 M d- muF3 B6	0.69969	0.24977	1.14961	Reject H0	0.000212
muF2 B6- muF3 B7	-0.20318	-0.6531	0.24674	FTR H0	0.781352
muF2 B7- muF3 B7	-0.21856	-0.66848	0.23137	FTR H0	0.724155
muF2 M d- muF3 B7	0.21192	-0.23801	0.66184	FTR H0	0.749483
muF3 B6- muF3 B7	-0.48777	-0.9377	-0.03785	Reject H0	0.025269
muF2 B6- muF3 M d	0.02339	-0.42653	0.47331	FTR H0	0.999989
muF2 B7- muF3 M d	0.00802	-0.4419	0.45794	FTR H0	1
muF2 M d- muF3 M d	0.43849	-0.01143	0.88841	FTR H0	0.060714
muF3 B6- muF3 M d	-0.2612	-0.71112	0.18872	FTR H0	0.548198
muF3 B7- muF3 M d	0.22657	-0.22335	0.6765	FTR H0	0.692505

Significant differences between:
 $\text{Mid}^2 - 6^3$
 $6^3 - 7^3$

6^3 Mid^3 7^2 6^2 7^3 Mid^2

Conclusions

- As far as uploads go, the test we conducted shows the only difference supported by the data is in between $\text{Mid}^2 - 6^3$, $6^3 - 7^3$.

THE VERDICT

Mostly not guilty

Maybe some community service

