IEIE Transactions on Smart Processing and Computing, vol. 5, no. 4, August 2016
http://dx.doi.org/10.5573/IEIESPC.2016.5.4.283

Optimizing Content Duration for Mobile Ads

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Received June 19, 2016; Revised July 13, 2016; Accepted July 15, 2016; Published August 30, 2016

** Short Paper*

***Abstract*:** Optimizing the number of ad clicks is a large-scale learning problem that is central to the multi-billion–dollar mobile advertising industry. There are currently several optimization methods being used, including ad mediation and ad positioning. Recently, researchers have recommended using ad refresh interval as a new method for optimizing mobile advertising. This paper applies that new method to optimize content duration for mobile ads. The result achieved from this optimization study could further increase revenue for mobile advertisers and publishers. This research has high applicability for the growing mobile advertising industry. It also lays out a solid background for future research in this promising area.

***Keywords*:** Mobile ads, Optimization, Advertising, Measurement, Clicks, Ad duration, Ad format, Ad content, Content duration

1. Introduction

Mobile advertising has recently become one of the most effective marketing channels for business. In 2015, US$30 billion was spent on mobile advertising. For the year 2016, the global mobile advertising market is expected to hit two significant milestones: surpassing US$100 billion in spending, and accounting for more than 50% of all digital ad expenditures for the first time.

Today, more companies than ever are selling their products and services via mobile phones. As a result, there is a growing number of new mobile ad networks, including Facebook Audience Network, Google AdMob, and Twitter MoPub.

There are three formats in mobile ads: images, videos, and composites. A composite ad is one that contains multiple images plus video, as shown in Fig. 1.

The problem today is how to compare, on a large scale, the number of ad clicks among these ad formats. The results from this study will help maximize the number of ad clicks and increase mobile advertising revenue accordingly.

Recent publications [1, 2] recommended a new metric, clicks per hour (CPH) to measure ad click performance, taking into account ad duration.

This paper (1) uses that CPH metric to measure the ad click performance among the three different ad formats: images, videos, and composites; (2) compares and recommends the best format to use for a particular ad duration; and (3) compares and recommends the optimal duration for a particular ad format.

The methodology and experimental setup are presented in the next section. Then, measurement results are shown, followed by an examination of the findings and their applicability. The end of the paper discusses the research limitations, and offers some directions for future research.

2. Methodology

2.1 Data

The intention here is to carry out research on big and complex data. The first thing to do is access as many mobile users as possible. The next task is to ensure that the data are unbiased and representative in all possible aspects, including age and gender.

As with previous experiments, the data for this study met all of those requirements. The data were collected extensively over a long period of time, with more than

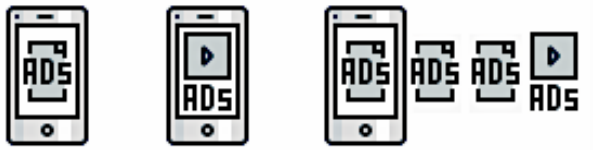

Fig. 1. Image, Video, and Composite Ads.

Table 1. Data.

Quantity	Value
Number of Mobile Users	600,000
Number of Spoken Languages	30+
Number of Countries	200+
Average Number of Impressions Per Day	30,000
Average Number of New Users Per Day	7,000
Average Number of Active Users Per Day	25,000
Average Number of Screens Per Session Per Day	3,4
Average Duration Per Session	3:00

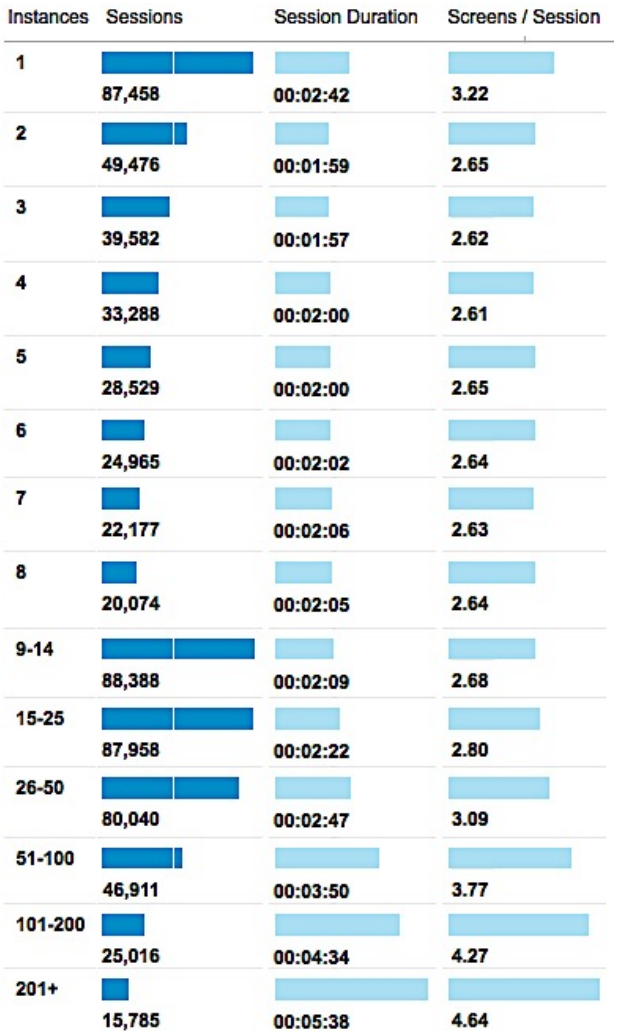

Fig. 2. Session Durations.

600,000 mobile users involved and an average of 30,000 ad impressions per day. Google Analytics was used to monitor and check all aspects of the data.

Table 1 gives a quantitative view of the data.

Preparing to test ads with long durations, quality apps and games with user engagement times of about three minutes per session were used. That allowed deploying ads as long as 120 seconds. Fig. 2 shows more details.

These apps and games also have users in almost every country around the world, with all major spoken languages included for consideration. Some users had both phones

Fig. 3. Interest Categories.

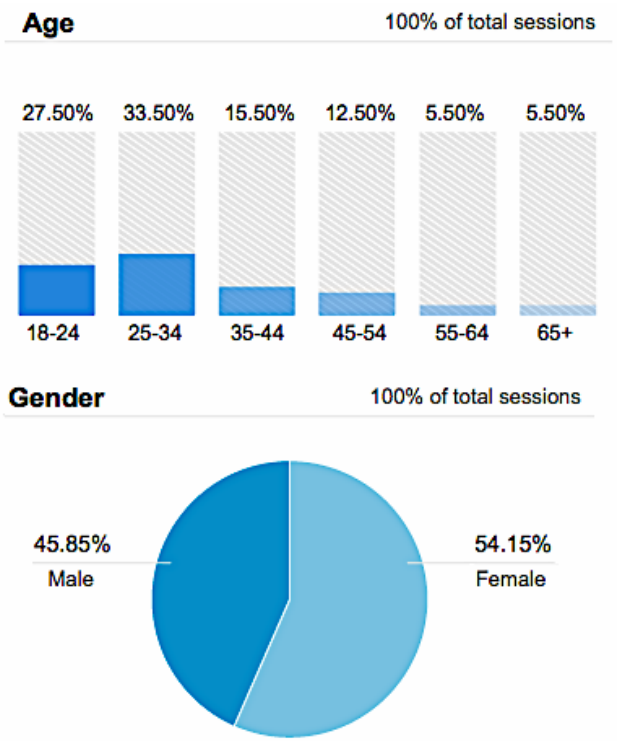

Fig. 4. Age and Gender Demographics.

and tablets, with a diverse range of screen sizes.

New users accounted for about one-quarter of all active users, meaning the data include both first-time and returning users. Each user interacted with more than three screens per session. This guaranteed more than just one user interface during any user session.

Also checked was that users had a diverse range of interests, including sports, computers, travelling, and so on. Fig. 3 shows more details.

Now, look at the age and gender demographics in the data.

Fig. 4 shows that about 60% of the mobile users were younger than 35, with most of them between 25 and 34 years old. As for gender, more than 50% were female.

Then, audience demographics were compared with those from the App Annie Audience Intelligence Report [6], indicating similarity in the percentages and their distribution.

The ad classifications are listed in Fig. 5. Categories

Fig. 5. Ad Categories.

include Arts and Entertainment, Jobs and Education, Sports and Fitness, Computer and Consumer Electronics, and many more. That ensured that all users were equally served with the target ads.

With all those checks carefully in place, it was certain that the data were unbiased, representative, diverse in all possible aspects, and ready for measurement.

2.2 Measurement

Previous studies recommended a new metric called clicks per hour (CPH), with a formula as follows:

$$Clicks\ Per\ Hour\left(CPH\right) = \frac{Number\ of\ Clicks * 3600}{Number\ of\ Impressions\ x\ Impression\ Duration}$$

Table 2. Image Ad CPH.

Duration	Impressions	Clicks	CPH
3	24,637	209	10.18
5	14,447	246	12.26
6	12,376	270	13.09
7.5	9,639	250	12.45
10	6,983	215	11.10
15	5,549	212	9.17
30	4,519	180	4.78
60	3,902	160	2.46
90	2,143	90	1.68
120	1,163	50	1.29
180	706	30	0.85

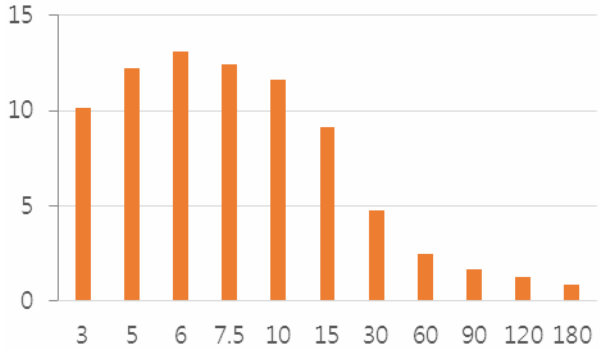

Fig. 6. Single Image Ads vs. CPH.

Clicks per hour is the average number of clicks in one hour over the whole range of all users and over the whole range of all displayed ads.

Information about the number of impressions and their durations provided the total duration for all ad impressions. Combined with the number of clicks, it is possible to find out the average number of clicks per second. Because the impression duration is in seconds, multiply that result by 3600 to get the average number of clicks per hour. A higher CPH indicates a better result.

Right now, on all the ad networks, including Google AdMob and Facebook Audience Network, there is no metric helping to measure the effectiveness of ad duration. This is the first time a metric like that has been suggested.

3. Results

There are three types of mobile ad content: images, videos, and composites. The measurement results are presented separately.

3.1 Image Ads

Table 2 shows the CPH for image ads calculated from the daily average, the daily average number of clicks, and the ad durations.

Fig. 6 shows the above table as a graph for CPH versus ad duration.

Table 2 and Fig. 6 show that the number of ad clicks at

Table 3. Video Ads CPH.

Duration	Impressions	Clicks	CPH
3	35,426	209	7.08
5	25,765	310	8.66
6	19,654	322	9.83
7.5	17,564	373	10.19
10	14,320	450	11.31
15	10,865	532	9.61
30	4,519	532	8.03
60	3,902	360	5.40
90	2,143	90	2.88
120	1,163	50	1.58
180	706	30	0.85

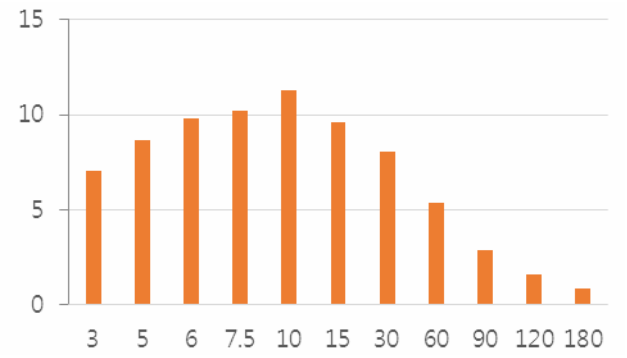

Fig. 7. Video Ads CPH Graph.

Table 4. Composite Ads.

Duration	Impressions	Clicks	CPH
3	36,453	143	4.71
5	27,654	214	5.57
6	22,109	254	6.89
7.5	19,154	303	7.59
10	15,876	394	8.93
15	9,875	414	10.06
30	4,519	323	8.58
60	3,902	303	4.66
90	2,143	145	2.71
120	1,163	50	1.29
180	706	30	0.85

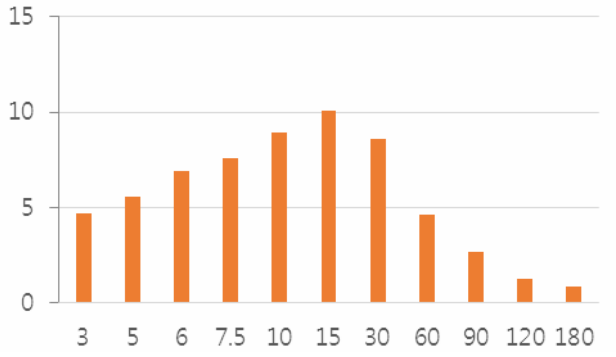

Fig. 8. Composite Ad CPH.

a duration of six seconds is the highest. In fact, it is 174% higher than for ads 30 seconds long, and 29% higher than for ads of three seconds.

That said, note that for ad durations ranging between five seconds and 7.5 seconds, the CPH values are very much the same. This result matches with that presented in a previous study. It also matches with one eye-tracking study [5], which was for single links, where a display time of six seconds was long enough for users to decide and take action.

3.2 Video Ads

For video ads, the results are presented in Table 3.

Table 3 includes information about the number of impressions and the number of clicks, together with CPH values.

Similarly, a graph can be drawn for CPH versus ad duration, as seen in Fig. 7.

Here, for video ads, the CPH graph is different from the one in Fig. 6, indicating the highest CPH result is for a duration of 10 seconds instead of six seconds. In fact, at 10 seconds, the CPH is 18% higher than at 15 seconds, 60% higher than three seconds, and 60% higher than at the normal 30 seconds.

Noticeably, CPH for durations longer than 10 seconds were higher than in the other scenario. There is clearly a shift to the right in this graph.

That could be due to the fact that video ads normally get more engagement from users. And without a close button on the screen, like image ads, the users cannot close it as early, but will stay and become interested in the playback until the end, instead. That explains the difference between these two graphs.

3.3 Composite Ads

For composite ads, the results are presented in Table 4.

Fig. 8 shows a graph for CPH versus ad duration for composites.

Table 4 and Fig. 8 show that the number of ad clicks at a duration of 15 seconds is the highest. In fact, it is 113% higher than at three seconds, and 17% higher than 30 seconds.

This graph shifts a little bit more to the right, indicating that for this ad format, users need an even longer engagement time.

The shape of this graph also indicates that composite ads up to 60 seconds are not needed. They are unnecessary and inefficient.

4. Comparison

Now, all results are presented in one table, showing a combined view of image, video, and composite ad CPH versus ad durations.

This summary can help both app publishers and mobile

Table 5. CPH Summary.

Content Format	Duration	CPH
Image	6	13.09
Image	7.5	12.45
Image	5	12.26
Video	10	11.31
Image	10	11.1
Video	7.5	10.19
Image	3	10.18
Composite	15	10.06
Video	6	9.83
Video	15	9.61
Image	15	9.17
Composite	10	8.93
Video	5	8.66
Composite	30	8.58
Video	30	8.03
Composite	7.5	7.59
Video	3	7.08
Composite	6	6.89
Composite	5	5.57
Video	60	5.40
Image	30	4.78
Composite	3	4.71
Composite	60	4.66
Video	90	2.88
Composite	90	2.71
Image	60	2.46
Image	90	1.68
Video	120	1.58
Image	120	1.29
Composite	120	1.29

advertisers select the best ad content format and ad duration in order to get the highest number of ad clicks.

As previously noted, it also helps publishers estimate their ad sales based on the amount of time their apps are used on a daily, monthly, and yearly basis. For example, an app that has a base of 30,000 daily users with an average session duration of three minutes, can expect 4,500 clicks per day. That information provides an estimate of revenue, which is useful for business planning.

Fig. 9 provides a combined graph of CPH.

Comparing the performance among these three types of ads, notice that CPH for image ads is higher when the ad duration is shorter than 10 seconds. However, at durations longer than 10 seconds, image ads are not as good as video and composite ads. Especially at 30 seconds, the composite ads are the best.

That proves that each ad type has its own range and its own advantage.

There is a misunderstanding that image ads should not be used owing to a low click-through rate (CTR) at the

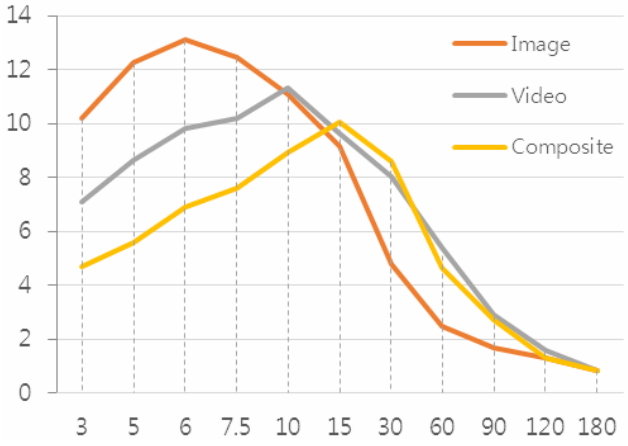

Fig. 9. Combined CPH.

normal duration of 30 seconds. However, these results show that even when an ad type has a lower CTR at a particular duration, the number of clicks at other durations is still high, even the highest over the full range.

The reason image ads perform well could be due to the fact that they are normally short and concise. They are refreshed periodically and, by the end of the day, will deliver more impressions.

The graph also shows that for ad durations longer than 60 seconds, image, video, and composite ads have the same chance of being clicked, given that they are displayed for the same amount of time.

All the significant results presented here can only be obtained thanks to the new CPH metric. CPH helps provide a clearer view of a problem that seems to be a mystery, with some misunderstandings. It also provides a mathematical tool to address other issues, which are discussed in the next section.

In summary, this study achieved the following findings.

- For image ads, the optimal ad duration is six seconds. For video ads, the optimal ad duration is 10 seconds. And for composite ads, the optimal ad duration is 15 seconds. At those lengths of time, the average number of clicks in one hour is the highest.
- As for content length, create image ads at lengths between five and 10 seconds; create video ads at lengths between 7.5 and 15 seconds, and composite ads at lengths between 10 and 30 seconds. Those proved to be long enough for users to be impressed and to take action.
- For ads shorter than 10 seconds, images give a much better click performance. In the range between 10 and 15 seconds, use video ads. Composite ads work best in a range between 15 and 30 seconds. For typical ad networks, which allow only ad durations longer than 30 seconds, use composite ads for the best ad click performance.

5. Discussions

Image ads have proven to be the ads with the highest CPH. If the time can be utilized, these are the type of ads

recommended. A method of utilizing mobile time can be found in the mentioned publications.

As previously stated, a higher CPH does not directly imply higher revenue, because a shorter ad duration could lead to a lower fill rate on some networks. So, a combination of several mobile ad networks is recommended to guarantee filling the ad request.

This research is not for newspapers, TV, and other non-clicked ads. Some ads are displayed solely for branding and offline purchases. Those are not considered in this study.

It is also desirable to find a new way to apply this method to other types of advertising, for example, web advertising. It is kind of a traditional business but is currently facing a lot of challenges [3, 4]. Once again, CPH is the right tool to address current issues.

Native ad format is becoming more and more popular these days [7]. Composite ads work well in that format, because they can be displayed inside the content, for example, in a scroll view. In those cases, the time will not be limited. And as stated earlier, if the time is not limited, composite ads are the best choice because they provide better click performance overall.

6. Conclusion

Mobile advertising is a fast-growing business. Optimizing mobile advertising by itself is a new subject area. These are some of the first attempts at digging into this promising area.

This study applied a new metric to measure and compare mobile advertising performance, taking into account ad duration and the ad content.

From a large-scale measurement, recommendations are to use an ad duration of six seconds for image ads, 10 seconds for video ads, and 15 seconds for composite ads.

For full-screen ads, the recommendation is to utilize time, and use image ads wherever appropriate. For the native format with a longer duration range, use composite ads.

With its high applicability, the result achieved from this optimization research could further increase revenue for mobile publishers and advertisers by bringing the right ads with the right amount of time to the right mobile end users.

References

[1] Vinh Truong, “Optimizing Mobile Advertising Using Ad Refresh Interval”, IEIE Signal, Processing and Computing Journal pp 117, Article (CrossRef Link)

[2] Vinh Truong, “Optimizing Mobile Advertising Using Ad Refresh Interval (Preliminary)”, Proceedings of the International Conference on Electronics, Information and Communications, 2016, pp 74-77, Article (CrossRef Link)

[3] H. Brendan McMahan, et al, “Ad Click Prediction: a View From the Trenches” Proceedings of the 19th ACM SIGKDD international conference on knowledge discovery and data mining, ACM New York, pp. 1222-1230, 2013. Article (CrossRef Link)

[4] D. Brian et al, “Evaluating and optimizing online advertising: Forget the clicks, but there are good proxies” NYU Working Paper , October 2012. Article (CrossRef Link)

[5] D. Soussan et al, “SERPs and Ads on Mobile Devices: An Eye Tracking Study for Generation Y” in HCI International (HCII) conference, July 2013. Article (CrossRef Link)

[6] AppAnnie Audience Intelligence Report, 2015. Article (CrossRef Link)

[7] Sebastian, Michael, The Year in Native Ads, 2014. Article (CrossRef Link)

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