Experimental Design of Baby Food Advertisement in Social Media

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Abstract

Social media is one of the channels in modern marketing methods. One of the challenges of promotion on social media is ensuring that social media advertise it effectively. The Instagram and Facebook account @foodformybaby is one of the businesses that use social media as a marketing channel. It offers catering and ala carte with various types of organic food (homemade) for babies aged 6-12 months. The marketing strategy must be determined to meet the needs of consumers. This study aims to determine the effect of different channels, times, and days of ad serving on the number of impressions and actions. The method to be used in this research is the analysis of variance (ANOVA) for 2x3 factorial designs. The research variables tested were the number of impressions and the number of actions. While the independent variables in this study are social media channels, time of ad serving, and day of ad serving. The analysis shows that there is a significant effect of social media channels, ad serving time, and day of ad serving on the number of impressions and number of actions. The recommendations given are illustrated in the form of ads designs.

Keywords
Experiment Design, Factorial Design, Social Media, Advertising, And Baby Food.

1 Introduction

Social media is a channel of the rapid development of information and communication in modern marketing methods. In social media, people meet not in real physical but the information exchange. So that even though the users cannot meet directly, they interact by visual or audio in social media. According to Kotler and Keller (2012), social media is meant for consumers to share information in the form of text, images, audio, or video with one another, with companies, and vice versa. There are 150 million social media users in Indonesia according to research from the media company We Are Social in collaboration with Hootsuite. Facebook is the most popular social media application by Indonesians with a percentage of 81%, followed by Instagram, the second most popular social media in Indonesia with 80%. While Twitter, Linked In, and Snapchat rank third, fourth, and fifth, with the percentage of 52%, 33%, and 26% respectively (Pertiwi 2019).

One of the challenges faced by promotion on social media is ensuring that social media advertising serves its purpose effectively. Although measuring the effectiveness of promotions on social media is difficult, the extent to which advertisements on social media produce intended benefits can be measured by examining interactions (example the number of "Likes" or "Share") among social media users to assess their perceptions of these advertisements (Burg 2013)

Instagram and Facebook are photo-sharing applications that have strength in the visual field. The advantages of Instagram and Facebook as marketing tools, they can convey messages from a brand through photos, images, or videos. Marketing with social media creates opportunities for greater brand recognition, which means there is a consumer attitude towards the brand of the product being advertised so that consumers are also expected to have special attention to using or buying products advertised on social media Instagram, and Facebook. This marketing activity is also used by one of the baby food catering businesses that have joined Instagram since October 2015 under the name @foodformybaby.

The Food for My Baby business activity, located in Semarang, offers catering and ala carte with various types of organic (homemade) food for babies aged 6-12 months. Some of the foods offered by Food for My Baby (FMB) are

filter porridge, oatmeal, rice / non-rice team, and others. The target markets are young women and adults, especially in Semarang and Jakarta. Since joining Instagram and Facebook, FMB has always been actively introducing its business by uploading photos, videos to advertise its products. The number of photos that have been uploaded on Instagram is more than 183 posts with 4,876 followers until 2020. FMB has also joined Facebook since October 2015 and has 878 followers and 868 likes.

The advantages of using Instagram and Facebook ads are increase branding, a means to target users more specifically (jobs, financial status, habits, interests, etc.), increase profits and sales potential, and can direct prospective visitors to advertiser websites easily and quickly. By placing advertisements, FMB can also develop word-of-mouth communication with users. According to Sernovitz (2009), word-of-mouth is communication that produces good conversation. Someone will ask others about the quality of an item or service before they decide to buy it, therefore word-of-mouth can influence someone's decision to make a purchase. Advertising on Instagram and Facebook can be done in various options, the time of display, how long the ad will run, and the amount of budget that advertisers want to spend. So, in this case, the researchers chose Facebook and Instagram channels as experimental media.

Coelho et al. (2016) in their study stated that post content can have an impact on the Facebook and Instagram social media metrics: likes and comments. Post content can have an impact on online engagement represented by likes and comments (Luarn et al. 2015) Factors that influence the popularity of a post can be known from the number of impressions and actions in the form of likes, comments, and others (Kontsevaia and Berger 2017; Luarn et al. 2015). The impact of post content or in this study advertising content can be seen from the number of Facebook and Instagram users who see ads that are displayed at least once (number of impressions), as well as consumer responses represented by likes, comments, etc. (number of actions). The more number of users who see the ad and the number of actions show that the ad content has succeeded in paving the way for many new users, so the content will be more easily shared and open up opportunities for a brand to be more popular and known (Zarzycki 2018).
Based on FMB advertising data in August, November, and March which aired at the same time (for about 1 month) on Facebook and Instagram, it was found that the results of the number of impressions and actions decreased by 54% and 63% (of November to March). Compared to similar service accounts, the number of followers from the Instagram FMB account is quite small, for example, kitchenbundazami accounts with 7,061 followers, bebinutri_indonesia accounts with 5,144 followers, mpasi.babyspark account with 25 thousand followers, and pureeland account with 177 thousand followers. Marketing strategies will always change over time, so it is necessary to do an advertising experiment using a different strategy than is usually applied.

Previous research conducted by Kontsevaia and Berger (2017) examined the effect of six factors that influence upload success on social media with two success variables (number of impressions and number of actions). The six factors include day to post (day of post), time to upload (time of day of post), presence/absence of images (presence of an image), presence/absence of hashtag (presence of a hashtag), word length (length of the message), and the channel used (specific channel used). However, there is still no specific research that examines the impact of advertising/post content regulation such as day and post time on healthy food products.

Based on this, the author will research to test whether there is an influence of successful advertising content in reaching users and actions using three variables namely social media channels, time, and day of delivery. The method that will be used in this research is a 2x3 factorial design. Factorial experiment design is the right method used in this study because it can be used to determine the effect of interactions between channel factors, time, and day of ad serving on Facebook and Instagram social media in influencing the number of impressions and actions. In addition, factorial experimental design can also determine the effect of each factor on the observed variables. Thus, in factorial experiments, researchers want to study the effect of some independent variables on the dependent variable individually or simultaneously. The research objective is to find out the different channels, times, and days of ad serving to the number of user reach and actions based on the results of experiments, as well as design ad designs for Facebook and Instagram accounts to provide recommendations on FMB.

2. Literature Review

2.1 Social Media

According to Carr and Hayes (2015), social media is an internet-based media that allows users the opportunity to interact and present themselves, either instantaneously or delayed with a wide audience or not. Social media is now widely used by businesspeople to facilitate sales promotion. The purpose of using social media is (Gunnelius 2013):
1) Build relationships with consumers
2) Increase brand awareness
3) Publicity
4) Promotion
5) Market research

2.2 The Best Posting Time on Facebook and Instagram

Potential marketers need to learn when the right and effective time to post (upload) images, videos, or others on this social media. To achieve this, here some recommendations can be used as a starting point (Rebecca 2016):

- Quick Sprout: Thursday and Friday, at 1 pm to get the most shares, and at 3 pm to get the most clicks. "The fewer people who are working, then they are accessing Facebook."
- Optimizely: Monday to Thursday, between 6 - 8 pm.
- Microsoft: Thursday and Friday, 1 – 3 pm.
- Hubspot: Thursday and Friday, 1 – 3 pm.

Here are some strategy recommendations on Instagram (Rebecca 2016):

- Hubspot: Any time from Monday to Thursday, except from 3 – 4 pm.
- Latergramme: Wednesday at 5 pm.
- Every working day (except weekends) between 6 – 12 pm.

2.3 Advertising

According to the definition of Morissan (2010), advertising is any form of indirect communication about an organization, product, service, or idea paid by a sponsor. The purposes of advertising according to Mahanani (2003) are to provide information, persuade, and influence, remind, provide added value, and assist. So that all elements of advertising can be delivered maximally to the reader, Kotler (2002) reveals that an effective message should ideally draw attention, maintain interest, generate a desire to try or have (desire), and lead to actions to buy (action).

2.3 Factorial Experiment

Experimental research in principle can be defined as a systematic method for building relationships that contain causal phenomena (causal-effect relationships) (Sukardi 2011). The factorial experiment is an experiment on a set of treatments consisting of all possible combinations of the level of several factors. For example, in an experiment with 4 factors A, B, C, and D each consisting of 3 levels, a level from factor A, b level from factor B, c level from factor C, and d level from factor D, then the factorial experiments a x b x c x d = 3 x 3 x 3 x 3 = 81 combined treatments were obtained.

2.4 ANOVA Factorial Design

Analysis of Variance or Analysis of Variance (ANOVA) is a technique or method used to test the variance of several average groups of data at once. In the ANOVA model, the conclusions were obtained in the form of a comparison between the average square of the treatment with the mean square error. The average square is written with F, the value of F is a measure of a significant difference in observations due to the effect of treatment. If the F value is greater than the F table with a certain degree of freedom, then a hypothesis about the difference between the effects of the treatment is accepted. Vice versa if the F value is smaller F table, then the hypothesis about the difference between the effects of treatment fruit is rejected. A list of ANOVA for a x b factorial experimental design can be seen in Table 1. as follows.

Table 1. The Analysis of Variances Table for Factorial Design Experiments an x b (Sudjana 1995)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F_0
A	a-1	SS_A	MS_A	MS_A/MS_E
B	b-1	SS_B	MS_B	MS_B/MS_E
AB	(a-1)(b-1)	SS_{AB}	MS_{AB}	MS_{AB}/MS_E
Error	ab(n-1)	SS_E	MS_E	
Total	**Abn**	**ΣY^2**		

Analysis of variance is a powerful procedure for testing the similarity of sets of averages. If the null hypothesis is rejected and a match is accepted, further tests are needed to determine the direct effect of each factor level. Fisher's test is often called the Least Significant Different (LSD) method which is a paired test conducted to compare all possible levels of treatment (Walpole and Mayers 1995).

3. Methods

In this study, researchers used a 2x3 factorial design variance analysis (ANOVA) method. The object of research is an object that is used as research or the point of interest of researchers when conducting a study. In this case, the object of research is social media users who are members of and are active in social media Facebook and Instagram. The intended respondents are respondents who have seen ads displayed by @foodformybaby on Facebook and Instagram, as well as respondents who have responded in the form of likes, comments, link clicks, and other reactions.

4. Data Collection

The process of collecting data follows the steps of designing an experimental design method. These steps consist of:

1. Introduction and statement of the problems encountered
   This is important to develop ideas on research subjects. With a clear statement of the problem, it will be able to make an important contribution to a proper understanding of the phenomenon and the final solution of the problem.
2. Determination of research objectives
   The objectives that underlie the research must be able to answer what has been stated in the formulation of the problem, namely, to find the cause and effect of the problem at hand.
3. Selection of response variables
   Response variable or dependent variable is a variable whose change depends on other variables. In this study, the dependent variable used is as follows (Kontsevaia and Berger 2017)
   (a) Number of impressions of advertisements that are served
   Impressions measure how many eyes see an ad, without taking any action on the ad.
   (b) Number of actions against the ad served
   The action shows that the user acted after seeing the ad, which in this case is in the form of clicks, likes, and comments, shares, saves, and other reactions.
4. Selection factors and factor levels
   Independent factors or variables are variables that affect the response variable. In this study the independent variables used are displayed in table 2:

Table 2. Independent Variables

Code	Factor	Level 1	Level 2
A	Channel	Facebook	Instagram
B	Ad serving time	9 -11 pm	5 – 7 pm
C	Ad serving day	Wed, Thu	Sat, Sun

5. Selection of experimental design methods
   Experiments were carried out using the design as in Table 3.

Table 3. Experiment Design

Variables	Factor		
	A	B	C
Impressions	Facebook	9 -11 pm	Wed, Thu
			Sat, Sun
	Instagram	5 – 7 pm	Wed, Thu
			Sat, Sun
Actions	Facebook	9 -11 pm	Wed, Thu
			Sat, Sun
	Instagram	5 – 7 pm	Wed, Thu
			Sat, Sun

6. Implementation of experiments
   Researchers will conduct experiments by placing advertisements on FMB pages on Instagram and Facebook for one week with three repetitions or for three weeks. The treatment that will be given can be seen in Table 5, with the implementation of ad experiments which began in September 2019 until completion.
7. Data analysis
   The research data collected in this study are primary data obtained from the results of the advertising performance of the @foodformybaby account. In addition, researchers also conducted interviews with @foodformybaby account holders.
8. Conclusions and recommendations
   After the data is analyzed, conclusions can be drawn from the results of the study.
   ANOVA test results for the number of impressions can be seen in Table 4.

Table 4. ANOVA Test Results for Number of Impressions

Source of Variation	SS	df	MS	F_0	F_1
A	18.928.608,17	1	18.928.608,17	5,306	4,494
B	28.649.720,17	1	28.649.720,17	8,031	4,494
C	16.580.112,67	1	16.580.112,67	4,648	4,494
AB	11.564.816,67	1	11.564.816,67	3,242	4,494
ABC	11.899.537	1	11.899.537	3,336	4,494
Error	57.078.649,33	16	3.567.415,58		
Total	144.701.444	23			

5. Result and Discussion

Based on the calculations listed in Table 4., the F_0 for the channel, time, and day factors is greater than F_1 (5.306 > 4.494; 8.031 > 4.494; 4.648 > 4.494), so the decision taken is to reject H_{A0}, H_{B0}, and H_{C0}. The conclusion is that the channel, ad serving time, and ad serving day variables affect the number of accounts that see the ad served. The AB

combination has an F_0 smaller than F_1 (3.242 < 4.494) which means that the interaction factor of channel and time does not significantly influence the number of accounts that see the ad served.

While AC and BC interactions have an $F_0 < 1$, so the calculation is done again by eliminating the interactions. The results of retesting change the F_0 of ABC interaction to be smaller than F_1 (3.336 < 4.494), meaning that the interaction of channel variables, ad serving time, and ad serving day does not significantly influence the number of accounts that see the ad served. ANOVA test results for the number of actions can be seen in Table 5.

Table 5. ANOVA Test Results for Number of Actions

Source of Variation	SS	df	MS	F_0	F_1
A	20,167	1	20,167	1,449	4,494
B	150	1	150	10.778	4,494
C	73,500	1	73,500	5,281	4,494
AB	2,667	1	2,667	0,192	4,494
ABC	64,833	1	64,833	4,659	4,494
Error	222,833	16	13,917		
Total	533,833	23			

Based on the calculations in Table 5., the F_0 for the time and day factor is greater than F_1 (10.778 > 4,494, 5,281 > 4,494) while the channel factor F_0 value is found to be smaller than F_1 (1,449 < 4,494), so the decision is rejected H_{B0} and H_{C0} and don't reject H_{A0}. The conclusion is the ad serving time, and ad serving day affects the number of accounts that provide significant action on the ads that are displayed, the channel also influences but is not significant. The AB interaction has an F_0 that is smaller than F_1 (0.192 < 4.494) which means that the interaction factor of channel and time does not significantly influence the number of actions.

While AC and BC interactions have $F_0 < 1$, so the calculation is done again by eliminating the interactions. The calculation results change the ABC interaction count to be greater than the F table (4.659 > 4.494), meaning that the interaction of channel variables, showtime, and day affect the number of accounts that provide action on the ads served.

In this study, the pairwise comparison test used was Fisher's Test. Fisher's test or Least Significant Different (LSD) method, is a paired test conducted to compare all possible levels of treatment (Walpole & Mayers, 1995). LSD test in this study will test four treatments namely n1, n2, n3, and n4. The four treatments include:

n1: Channel (Facebook); Time (night); Day (Wednesday, Thursday)
n2: Channel (Instagram); Time (evening); Day (Saturday, Sunday)
n3: Channel (Facebook); Time (night); Day (Wednesday, Thursday)
n4: Channel (Instagram); Time (evening); Day (Saturday, Sunday)

From the LSD test results on the number of impressions obtained at least two treatments have different effects in the experiment. Among them, the most influential is when the ads air on the Facebook channel on Wednesday & Thursday night. While other treatment interactions (n1 with n3; n1 with n4; n3 with n4) were found to have an impact on the same experiment. If the effects are the same, then it doesn't matter if you use the following combination of treatments, because the effect remains the same.

Then for the LSD test on the number of actions, there are at least two treatments that have different effects in the experiment. Among the most influential is the Instagram channel on Saturday & Sunday afternoons. While the interaction of treatment (n1 with n2; n1 with n3; n2 with n3) was found to have the same effect on the experiment. If the effects given were the same, it would not matter if using the following combination of treatments, because the effect remained the same.

Impressions in this study show how many Facebook and Instagram users have seen an ad that aired at least once. If an ad content has a broad reach, it means that the content has succeeded in paving the way for many new users, so that the content will be easier to share and attract new users to get involved (Zarzycki, 2018). To make it easier to reach new users and attract more customers, this reach value is the right measurement for FMB to see.

Actions in this study indicate that users take action after seeing the ad, which in this case is in the form of clicks, likes, and comments, shares, saves, and other reactions. The more people who do clicks, likes, and comments, shares, saves, the more ads that appear on their timeline pages. This value measurement makes it easier for FMB to communicate with existing and prospective new customers.

In addition, this communication can also develop into word-of-mouth communication for FMB customers in influencing new customers in particular. According to Sernovitz (2009), word-of-mouth is communication that results in good conversations. Someone will ask others about the quality of an item or service before they decide to buy it, therefore word-of-mouth can influence someone's decision to make a purchase.

The results of this study support previous research which has proven the influence of the channel in influencing the number of impressions. Examples such as the Kontsevaia and Berger (2017) study which found a significant relationship between channels (LinkedIn and Twitter) and the number of impressions, but this study did not show the influence of the channel on the number of actions. Research conducted by Al-Hadban et al., (2014) also shows that Facebook is one of the effective social media in marketing activities. Khan (2018) in his research revealed that Instagram is not only seen as a means to increase brand awareness and reach new customers but also as a tool to build an image for a product's brand.

The results of this study also support previous studies that have proven the influence of ad serving time in influencing the number of impressions. Examples such as the Kontsevaia and Berger (2017) study which found a significant relationship between time (Morning, Afternoon) and some impressions, but this study did not show the effect of time on the number of actions.

The ad posting time of Facebook advertising experiments for this study is slightly different from the article written by Rebecca (2016), which says according to Optimizely the right time to post on Facebook is Monday to Thursday between 6 to 8 pm, then according to Hubspot, the exact time is Thursday and Friday from 1 to 3 pm. Meanwhile, the right time for Instagram according to Hubspot is Monday through Thursday at any time except from 3 to 6 pm. Although it differs from the article written by Rebecca (2016), it turns out that the number of impressions and actions obtained from Facebook and Instagram is also quite high. This explains that not necessarily the right time for an account to upload content is the same as another account.

Finally, the results of this study also support previous studies that have proven the influence of ad serving days in influencing the number of impressions. Examples such as the Kontsevaia and Berger (2017) study which found a significant relationship between days (Morning, Afternoon) and the number of impressions, but this study did not show the influence of days on the number of actions. The day of the Facebook ad experiment for this study was slightly different from the article written by Rebecca (2016), according to Optimizely the right day to post on Facebook was Monday to Thursday between 6 to 8 pm, then according to Hubspot, the right day is Thursday and Friday from 1 to 3 pm.

Meanwhile, the right day for Instagram according to Hubspot is Monday through Thursday at any time except from 3 to 4 pm. Although it differs from the article written by Rebecca (2016), it turns out that the number of impressions and actions obtained from Facebook and Instagram is also quite high. This explains that not necessarily the right day for an account to upload content the same as another account.

6. Conclusion

The results of the study found that the use of Facebook and Instagram is the right choice for FMB in promoting its products. In addition, Facebook and Instagram can be connected in placing advertisements, so that advertisements can be displayed simultaneously or can be differentiated in posting time, days, ad text, images used, advertising budget costs, and others. In Facebook Ads, we can see all activities of our account followers, including all interactions that occur, namely the number of likes, shares, comments, clicks, saves, and other reactions. Information from Facebook Ads is used to measure the effectiveness of marketing with social media.

In addition, placing advertisements on Facebook and Instagram should include the URL tracking address as a page that can be addressed after the user clicks on the link on the ad page that is running. The words used in Facebook ads should not be too much, because this will affect the reach of new users that can be reached. As for Instagram, the number of words does not affect the range that can be achieved. From the results of experiments, the use of many words and hashtags affects reaching new users on Instagram. Secondly, ads should be displayed at different times to find out how different the characteristics of Facebook and Instagram users are. When experimenting for 3 weeks, the number of impressions and actions obtained was also quite high even though it only aired for 4 days each week. Determination of the airtime can be determined from the data in Facebook Ads, which is by looking at the time whenever the user sees the ad and responds.

Based on FMB advertising data in August, November, and March which aired at the same time (for about 1 month) on Facebook and Instagram, this ad can reach more other users starting at 4 to 10 pm. So, the recommended time that is by the characteristics of followers of the FMB account and other new users is from 4 to 10 pm.

Finally, it is better if the ad is displayed on different days to find out how the different characteristics of Facebook and Instagram users are. When experimenting for 3 weeks, the number of impressions and actions obtained was also quite high even though it only aired for 4 days each week. Ads that appear on Saturdays, Sundays reach more users and get a higher number of actions compared to ads that air on Wednesday, Thursday.

This shows that the results of Instagram ads are better when it airs on weekends (Saturday - Sunday). So that the recommendation given is FMB can apply for Facebook ads airing for 1 month on a normal day (Monday - Friday), while Instagram ads can be aired for 1 month on weekends (Saturday – Sunday).

Facebook and Instagram are the right choices for FMB in promoting its products. From the analysis, it was found that ad serving time and the day had a significant effect on the number of impressions and the number of actions. But the channel does not have a significant effect on the number of actions.

The LSD test results on the number of impressions found that the most influential treatment interaction is when the ad is displayed on the Facebook channel on Wednesday & Thursday night. For the number of actions, the most influential is when the ad is displayed on the Instagram channel on Saturdays & Sunday evenings.

The words used in Facebook ads should not be too much, while for Instagram, the number of words does not affect the reach that can be achieved. In addition, advertisements should be displayed at different times and days to find out how the different characteristics of Facebook and Instagram users. The recommended time for an FMB account is from 4 to 10 pm. The recommended day is when you want to show the next ad, FMB can apply for Facebook ads to run on a normal day (Monday - Friday), while for Instagram ads can be displayed on weekends (Saturday - Sunday).

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