Analyzing traffic source impact on returning visitors ratio in information provider website

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Abstract. Web site performance, especially returning visitor is an important metric for an information provider web site. Since high returning visitor is a good indication of a web site’s visitor loyalty, it is important to find a way to improve this metric. This research investigated if there is any difference on returning visitor metric among three web traffic sources namely direct, referral and search. Monthly returning visitor and total visitor from each source is retrieved from Google Analytics tools and then calculated to measure returning visitor ratio. The period of data observation is from July 2012 to June 2015 resulting in a total of 108 samples. These data then analyzed using One-Way Analysis of Variance (ANOVA) to address our research question. The results showed that different traffic source has significantly different returning visitor ratio especially between referral traffic source and the other two traffic sources. On the other hand, this research did not find any significant difference between returning visitor ratio from direct and search traffic sources. The owner of the web site can focus to multiply referral links from other relevant sites.

1. Introduction

The Internet has grown enormously during the last decade with an estimated around 3 Billion users around the globe in 2014 [1] and brings various services along with it. The most popular service that runs through The Internet infrastructure is World Wide Web or web [2]. Due to its popularity, web site becomes an important factor in e-commerce. Although company can use many channels to get in touch with their customers, like e-mail and social media, but in the end it is important for any company to point their campaign to their web site. Web site also becomes a place where transaction usually happens.

Since high returning visitor is a good indication of a web site’s visitor loyalty, it is important to find a way to improve this metric. Visitors of a web site come from different sources and can be categorized into three major source called Direct, Referral and Search [3][4][5]. Direct visitors are visitor who type web site address directly in a browser’s address bar. Referral visitors come from other web site where provide a link to destination web site. Search visitors are those who find out the web site from search engine search result based on specific keyword.
Previous study showed that visitors come from different sources have different characteristic due to the nature of how they come to a website. Different traffic sources could lead to different Page views [4] or duration [5] characteristic. This research investigated if there is any difference on returning visitor metric among three web traffic sources namely direct, referral and search. Even though [3] has done the similar research, but this study will use different approach by using new metric called returning visitors ratio instead of returning visitor amount and use ANOVA instead of linear regression. Unlike previous study by [3], the metric and analysis method in this research compare each traffic source and will reveal if there is any returning visitor’s ratio characteristic difference between them.

An information provider website named prothelon.com will be used as data source in this study. This website provide tutorial about website development and rely on affiliation as its revenue source. Its monthly visitors are ranged between 30,000 to 40,000 visitors and dominated by search engine traffic source.

This study aimed to answer the following research questions:
1. How is returning visitor ratio characteristic based on traffic source?
2. Are there differences in returning visitor ratio based on traffic source?

The results of this study will allow site owners to determine which source of visitor’s traffic that will improve its returning visitor. This information can be used to decide strategies to increase that traffic source.

2. Literature Review
2.1 Returning Visitors
E-commerce is the use of the internet specifically the web, for business transactions [2]. E-commerce transaction accomplished through digital transactions between buyer and seller. Website is important in an e-commerce system [2]. Website has many goals based on organization’s business model. Some of popular goals are encourage visitors to buy something, read information, fill out registration form, etc.

To measure website effectiveness there are some online marketing metrics that can be used such as Page views, Stickiness, Unique visitors, etc [2]. Due to the nature of internet users who wants relevant information immediately, they tend to leave a website as soon as they thought the information does not match what they are looking for. Some of the visitors will stay for a while in a website if they think it’s worth their attention. Some of these visitors will come back to the same website if they need more information. These returning visitors are important because it indicate visitors loyalty to a website. The more loyal visitors usually mean more opportunity that they will act according to a website goals.

A website owner can do a lot of things to improve website performance. Some previous research already done to find out visitors characteristic based on various online marketing metrics. The result showed that different visitors groups lead to different browsing behaviour characteristic. Visitors of a website could come from various traffic source group. Usually they are grouped into three different sources namely direct traffic, referral traffic and search traffic. [3][4][5] showed that some traffic source groups has similar characteristic, but other groups could have significant differences on their browsing behaviour.

[3] has found that different traffic source will affect differently to the amount of returning visitors. The study utilize linear regression to address its research questions. This study will try to use different
approach by introducing a new metric called returning visitor ratio. This metric derives from two
metrics namely the amount of returning visitors and total visitors by using this equation:

\[ R = \frac{r}{t} \quad (1) \]

Where \( R \) is returning visitor ratio, \( r \) is the amount of returning visitor and \( t \) is the amount of total
visitor.

2.2 Site Management Tools
In order to improve a website performance, we need to measure the degree of success of a website. Data to
measure the level of success and performance of a website is generally monitored and
retrieved from a software tool known as site management tools. [2] stated that the site management
tools are very important to make a website work, and to determine how well a website works. Furthermore [2] also
mentioned that site management tools could become handy when we need to
understand visitor behavior on a website, observing the customer purchases more effectively, observe
marketing campaigns, information hits and visits. Site management tools can also be implemented
using web analytics technology to obtain more complete information. With web analytics, we can
optimise websites in order to accomplish business goals and/or to improve customer satisfaction and
loyalty [6].

One of popular web analytics is Google Analytics provided by Google. Google Analytics is the most
widely used tool to measure the performance of a website. Statistical data from [7] showed that in
September 2015, Google Analytics is used by 59% of the entire internet that use site analytics in their
web page. [6] and [8] mentioned that data provided by Google Analytics metrics have adequate types
and can be used as a source of research data related to e-commerce. Some previous studies also used
Google Analytics as their source of data [3][4][5][9].

3. Methodology
This study used comparative quantitative research. This type of research tries to find out the cause for
the difference behavior or status within group [10]. Subject of this study were the returning visitor
ratio of prothelon.com website. Monthly returning visitor and total visitor from three web traffic
sources (direct, referral, and search) are retrieved from Google Analytics tools and then calculated
using equation (1) to measure returning visitor ratio. The period of data observation is from July 2012
to June 2015 resulting in a total of 108 samples.

This study compared prothelon.com website's returning visitor ratio based on three sources of traffic:
direct traffic, referrals, and search. One-way ANOVA (Analysis of Variance) test two variance under
the null hypothesis (H0) whether the two variances are equal [11]. The first variance is the variance
between groups (among groups) and the second variance is the variance in each group (within groups).
According to [12] it is called one-way ANOVA since only one independent variable involved (traffic
sources). Minimum data must be at least in interval scale, so the ratio data in this study, which level is
higher than the interval, meet the requirement.

Initial hypothesis for ANOVA is expressed as follows:

\[ H_0: \mu_1 = \mu_2 = \mu_3, \] there is no difference in the average returning visitor ratio that come from
direct, referral, or search.

\[ H_1: \text{not all } \mu_j \text{ are the same}, \] there is a difference in the average returning visitor ratio of the traffic
source that come from direct traffic, referral, or search.
where $\mu_1$ is the average returning visitor ratio of the source of direct traffic, $\mu_2$ is the average visit duration of the source of referral traffic, $\mu_3$ is the average visit duration of search traffic source, and $j = 1, 2, 3$.

Although the hypothesis initially see the difference average between groups, but the one that tested is the difference of variance between groups (among groups) and the variance within each group [11]. Variance between groups known as Sum of Square Among Groups (SSA) and the variance in each group is the Sum of Square Within Groups (SSW). When SSA value greater than SSW value, the initial hypothesis is not accepted, and consequently the alternative hypothesis is proven. In this case, the conclusion is that there are differences in the average returning visitor ratio based on direct traffic sources, referrals, or search.

4. Results and Discussion
4.1 Descriptive Analysis

In average, 17% of total visitor who come from search traffic source, 19% of total visitors from direct traffic source, and 25% of total visitors from referral visitors are returning visitors. The returning visitors ratio from referral traffic source has the biggest average of 25%.

4.2 ANOVA

The requirement to run ANOVA test is that data should be normal. All returning visitor ratio data from each group (direct, referral, and search) has passed this requirement.

|                         | Sum of Squares | df | Mean Square | F       | Sig.  |
|-------------------------|----------------|----|-------------|---------|-------|
| Between Groups          | .127           | 2  | .064        | 27.811  | .000  |
| Within Groups           | .240           | 105| .002        |         |       |
| Total                   | .367           | 107|             |         |       |

As shown in Table 1, since $p$-value = 0.000 < $\alpha$=0.05, we can conclude that there are significant differences among average returning visitor ratio coming from direct, search, and referral traffic source.

| (I) Traffic_Source (J) Traffic_Source | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval          | Lower Bound | Upper Bound |
|---------------------------------------|-----------------------|------------|------|----------------------------------|-------------|-------------|
| Direct Search                         | .015192305            | .011263893 | .372 | -015158653, .044197114          |             |             |
| Direct Referral                       | -.063956101*          | .011263893 | .000 | -.90073494, -.03717726          |             |             |
| Search Direct                         | -.015192305           | .011263893 | .372 | -.04197114, .01158653           |             |             |
| Search Referral                       | -.079148406           | .011263893 | .000 | -.10592724, -.05236957          |             |             |
| Referral Direct                       | .063956101*           | .011263893 | .000 | .03717726, .09073494            |             |             |
| Referral Search                       | .079148406*           | .011263893 | .000 | .05236957, .10592724            |             |             |

*, The mean difference is significant at the 0.05 level.

Tukey analysis in Table 2 showed that there is no significant difference between average returning visitor ratio from direct and search traffic sources. On the other hand, the average returning visitor ratio from referral traffic source proven to have significant difference either with direct or search traffic sources.
4.3 Discussion
The result of this study showed that different traffic sources could lead to different average returning visitor ratio characteristic. This result consistent with previous result that showed significantly different visitor behaviour based on their traffic sources [3][4][5][9]. Returning visitor usually lead to higher stickiness. This happens because the returning visitor already consider that the web site contains useful and relevant information for them. This result support previous study [13] which found out that referral visitors lead to significantly higher stickiness measured by their visit duration.

5. Conclusions and Implications
5.1. Conclusions
The average returning visitor ratio from referral traffic source has the highest percentage of 25% compared to 17% from search traffic source and 19% from direct traffic source. The results showed that different traffic sources have significantly different returning visitor ratio especially between referral traffic source and the other two traffic sources. On the other hand, this research did not find any significant difference between returning visitor ratio from direct and search traffic sources.

5.2. Implications
The results showed that referral visitors had the highest average returning visitor ratio. The owner of the web site can focus to multiply referral links from other relevant sites.

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