Поведінка споживача та бажання платити в умовах реального ринкового експерименту

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В даній роботі ми демонструємо експеримент, який досліджує поведінку споживача та його бажання платити згідно опції ціна-кількість в умовах реального ринку. Більше того, ми оцінюємо основні методи в експериментах з онлайновою ціною, такі як поділ користувачів на контрольну та експериментальну групи, визнання та підвищення.

Даний експеримент проводиться у формі А/В-Тесту на порталі інтернет-спільноти, де клієнти можуть придбати привілейоване членство. Таке членство дозволяє користувачам спілкуватись один з одним і термін його дії обмежений.

В даному тесті клієнти поділені на контрольну та експериментальну групу. Контрольна група має доступ до привілейованого членства з опцією ціна-кількість 36 Євро за 90 днів. Члени експериментальної групи можуть обирати між опціями 36 Євро за 90 днів (варіант 1) та 15 Євро за 30 днів (варіант 2).

Хоч клієнти в експериментальній групі і могли задовольнити свої потреби краще, кількість покупок істотно не зросла. Лише 28 % користувачів в експериментальній групі обрали варіант 1. Це зрівнює співвідношення членів, які зазначили термін 90 днів чи більше. В результаті об'єми в експериментальній групі знизились приблизно до 60 % об'ємів контрольної групи. Малюнки 3 та 4 показують відношення об'єму та обраних варіантів.

Ми наводимо важливі підказки щодо проведення тесту. Також порівнюються недоліки та переваги конкретних методів.

Виявилось, що послідовне розподілення є легким методом для введення, хоч і має певні недоліки порівняно з іншими методами, особливо у випадку розділення членів та застосування підвищення. Слід визнати, що використання всіх методів супроводжуються труднощами у впровадженні та виконанні.

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Consumer behavior and willingness to pay in a real market experiment

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In this paper we present an A/B-Test where we scrutinize the consumer behavior and the willingness to pay of customers in a real online community portal. The customers of the treatment group could choose between two price-quantity options. The control group however could only choose one price-quantity-combination. It turned out that a higher number of variations does not necessarily lead to a higher sales volume. It was interesting to see that consumers decided for the option with the higher per unit price if the total amount is lower than the price of the 'bulk pack'. Beside the economic results we gained essential experience in the conduct of real market online experiments. Particular the assignment and the recognition are crucial in order to perform a valid experiment. We found out that a sequential assignment and the incorporation of registered users yields the best results.

Keywords – A/B-Test, consumer behavior, experiment, price, real market, online, consumer choice.

I. Introduction

Not only for economists pricing and consumer behavior is an interesting field of research. Also for business companies this is a fruitful area to spend time and resources. To gather information about consumers behavior and their willingness to pay real market experiments are powerful means. Since online business is a thriving market we decided to conduct an online experiment in corporation with an industrial partner. Only a few publications are made about real market online experiments, particularly price experiments seemed to be underrepresented.

The experiment was designed as an A/B-Test. In Section II we describe important issues when planning, implementing and conducting an online price experiment. We also introduce the object of investigation and explain our practical solutions to the above mentioned problems regarding

In Section III the economic results of the experiment are presented and put into contrast to theoretical findings. Section IV gives an outlook to further investigations.

II. Method

In our experiment we investigated the consumer behavior of members of an online community platform such as dating portals and portals for child care (Au Pairs). The name and the exact field are on request of our industrial partner not to mention in this paper. The above mentioned portals have in common that users of different user groups (e.g. Au Pairs and host families) can get in touch through the portal. For that purpose they create an account at no charge. In order to get in touch with each other at least one member needs to be a 'premium member'. To get the premium membership you have to

pay a certain amount. The period of each premium membership is limited.

The investigation was implemented as an A/B Test. This kind of tests is mainly used for design-tests in in online marketing experiments. In an A/B-Test visitors of a website are assigned either to a treatment group or to the control group. To the members of the treatment group a different design or offering is displayed than to the members of the control group. The comparison of the results (e.g. turnover, time spent on a certain page or number of registrations) shows which of the tested variants is advantageous. The results of an A/B-test are easy to interpret and robust against time driven changes in consumer behavior because time-dependent effects like holidays, weather or macro-economic changes affect both groups. In our case to the control group a premium membership period of 90 days for 36 Euro was displayed. The treatment group could choose between two options. First a premium membership period of 30 days for 15 Euro (option 1) and second a premium membership of 90 days for 36 Euro (option 2).

The participants were real customers and had not been informed about the experiment. While conducting online A/B-Tests various factors need to be considered. The following sections provide an insight which challenges needs to be met in online real market experiments.

a. User Assignment

For the interpretation of the experiment results it is crucial that the assignment of the users to the control and treatment group is random. Various approaches are available.

Pseudo random generator based assignment

Pseudo random generators are an easy to implement way to assign users to control and treatment group. However with small numbers of participants the difference in group size can be considerable. In a pre-test we recognized that the assignment quality is too poor for our purpose. Fig. 1 shows the deviation of control and treatment group sizes as a function of the numbers of participants which needs to be assigned.
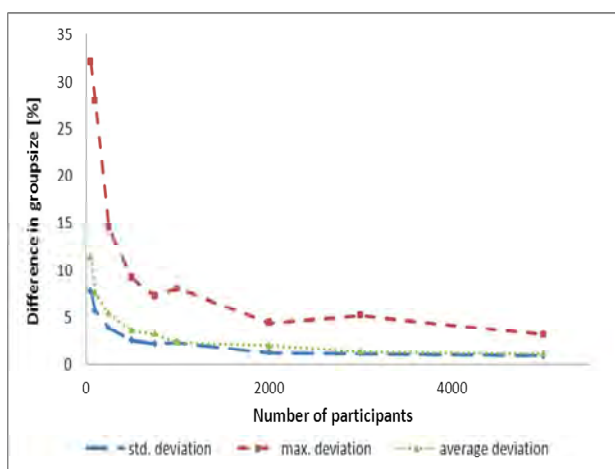

Figure 1: Results of the pseudo random test

Property based assignment

Property based assignment can be a means of choice if no other approach is realizable. As a property you can choose for example the browser type. However the property based assignment can be a source of errors or biases in the experiment. Particular if the user behavior is correlated to the selection property. With the property based assignment the size of control and treatment group depends on the distribution of the property. Hence ramp up, see section II.c, is not possible. However due to its dependency on user-characteristics it mitigates the problem of recognition.

Hash value based assignment

For the purpose of user assignment you can also use a hash value. The hash value is based upon the experiment id and in user individual number. In order to assign the user to a particular group one first converts the hash value into a number and defines a number as threshold. If the derived number is below this threshold the user is assigned to the control group otherwise to the treatment group [1]. However the quality of this method depends considerably on the applied hash function. In our test the results were not convincing. Another problem is the determination of the threshold because the scope of the hash value is unknown in many cases.

Sequential assignment

Another alternative of assignment is the sequential assignment. Users are assigned to control or treatment group in accordance to the determined proportion of the group. If the control group for example is smaller than the treatment group the next users will be assigned to the control group until the group sizes equal. In case of randomly appearing users the assignment to the groups is randomly also. The advantage of this method is that one can reach a preferred ratio of control and user group even if the number of participants is small. In our experiment we used the sequential assignment.

b. Recognition

Closely linked to the assignment is the recognition of users. The recognition is crucial if one wants to display the same variant (in our case the same price-quantity ratio) over all sessions of a user.

Cookies

The most common technique of recognition is cookies. These small text files contain a unique string with which can identify the browser can be identified. However this solution is very convenient it is not reliable. Users can deny cookies at all or delete them at the end of each session. The result is that users may encounter both variants. Thus the results of the experiment would be deteriorated. Another problem is that a user can work from more than one computer. In this case a cookie would not be able recognize the very person as well.

Finger print

In order to avoid the problem of rejection or detachment of cookies one can apply a finger print based

recognition. A finger-print is a combination of computer properties like operating system, installed plug-ins and browser version [2]. The fingerprint, like the cookie, also identifies only the computer and not the user itself. The downside of this technique is that the properties of a computer change over time which makes the long term recognition difficult. And since it only identifies the computer we face the same problems like with cookies.

Registered users

In some cases users need to register in order to use a service. In that case it is easy to recognize users over many sessions also if they use different computers. Since the portal made it necessary for the users to register we applied this recognition technique. However this approach is not save a 100%. We recognized that some users created more than one account which gives them the opportunity to see both variants. The ratio of double accounts to all accounts had been up to 9%.

A combination of cookies, finger print and registration can improve the quality of assignment and recognition notably. The implementation however is difficult.

c. Ramp up

This means is often described as an important and helpful at the beginning of an A/B-Test. Ramp up means to gradually increase the numbers of users which are assigned to the treatment group until you reach the aspired ratio [3]. This is to identify problems or poor results of the experiment in a very early stage without to affect many users. Although this method is helpful when testing technical matters one must not forget that significant conclusions can only be drawn when the numbers of treatment users is high enough. Ramp up itself also can be a source of errors. Particular it the assignment is conducted sequential adjustments need to be made.

d. Termination of the experiment

When implementing the A/B test one must already plan how to deal with the customers after the experiment has terminated because the conditions for the customers are likely to change. We faced the problem to guarantee the purchased period of premium membership if following periods offered differ from the option a member has chosen during the test.

Another problem might be customers who registered only a short time before the termination of the experiment. If they recognize a change in conditions only a short time after their registration they may become unsatisfied. There are two options how to deal with that problem. The first is to make no difference between new customers and customers who are a member for a longer time already. This is technically the easiest way however it may cause dissatisfaction with the new customers. The second option is to keep the conditions constant for a minimum period for every user who joined the experiment. Whereas members, who register after the termination of the experiment only can see the new conditions. This however is technically ambitious.

e. Detachment of user profiles

Online Portals usually provide a possibility for users to detach their profile. The detachment may affect various fields of the experiment (e.g. assignment and interpretation of the results). It depends on the scope of the detached data. If beside basic claims data also experiment data are detached the interpretation will be affected. But also a sequential assignment of the users to control and treatment group may fail in this case, because the size of both groups is affected by the detachment.

But even if the experiment data remain, the interpretation will not be that meaningful since basic claims data are missing.

f. Tracking visitors behavior

Online experiments provide a wide range of possibilities to track visitor's behavior. It can be tracked within one session or over time across many sessions. Data of interest can be the number of users who visited a certain page, the time a visitor spent there and which features of this page a visitor use.

The time and effort of the tracking is compared to offline businesses considerable lower however the implementation is still time consuming and technical demanding. When tracking privacy regulations should be obeyed.

Many tracking methods however need Java Script to be activated, but since the website had to be useable without Java Script these tracking methods where not applied in this experiment.

III. Theoretical background and Results

The theoretical basis of this Experiment is that a contractor can gain additional turnover if he is able to convince his customers to buy a bulk pack instead of a unit pack. Fig. 1 shows the demand function and the average demand function of a single customer. It is easy to see that if the contractor demands a price $\hat{p}$ he can sell a quantity of $\overline{q}$ if he offers only unit items. Customers gain a consumer surplus of the area under the demand function and $\hat{p}$ .If the contractor however offers a bulk pack of the size of $\overline{q}$ for a unit price of $\overline{p}$ he can gain a higher turnover. In this case the consumer however loses all it consumer surplus. So an additional option which comprises a smaller number of units may lead to a less profitable result for the contractor.
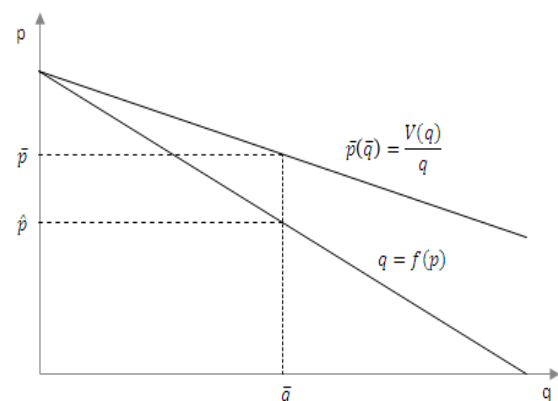

Figure 2: Optimal price per unit for bulk package and single package [4]

By request of our industry partner absolute values are not to be displayed here. The ratio of purchases in the control and treatment group is illustrated in Fig. 1. The turnovers are illustrated in Fig. 2.
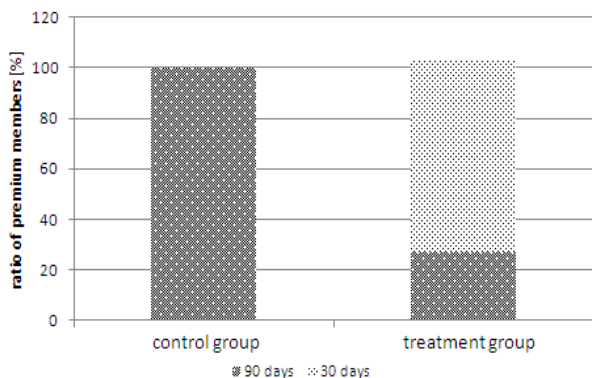

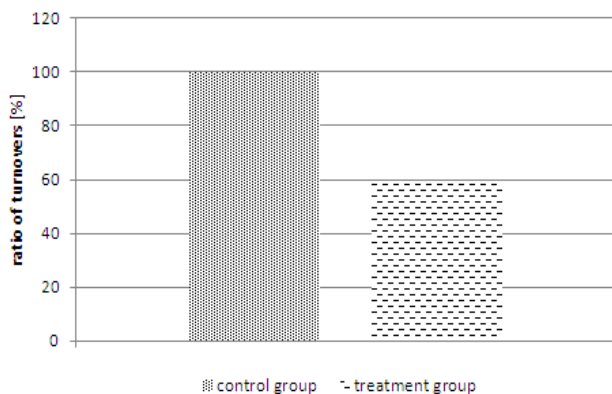Figure 3: Ratio of purchases in control and treatment group

Figure 4: Ratio of turnovers in control and treatment group

The figures show that there is no significant difference in purchases between control and treatment group. Thus it is not surprising that the turnover generated in the control group is 44.44% higher than the turnover of the treatment group.

This result shows that the estimated consumer surplus of option 2 is lower than the estimated consumer surplus of option 1. The basic claims data provide an insight into the decisions of the customers. When creating an account the users have to state when they are looking for somebody they want to get in touch with. For example at which month an Au Pair or a contractor is could start to work.

These data shows that the vast majority has a short advance (this is the time between registration and first date when the co contractor shall commence its work). The ratio of users who had an advance below three month was 71.14%. This is approximately the same ratio (28.2%) of users who opted for a short term premium membership. This indicates that the bulk pack is not considered as advantageous, as long as it is more expensive in total as the unit package. Even if the unit price is considerable lower.

An important issue of market experiments is that the environmentally conditions cannot be influenced. In order to exclude major impacts from a changed behavior of competitors we automatically tracked key data of our most important competitor and of the number of queries of relevant key words in Google. Fig. 5 shows that between the numbers of users of our competitor and the number of users of our portal the correlation is sufficient. Considered these data there was no evidence that the competitors behavior changed vitally.
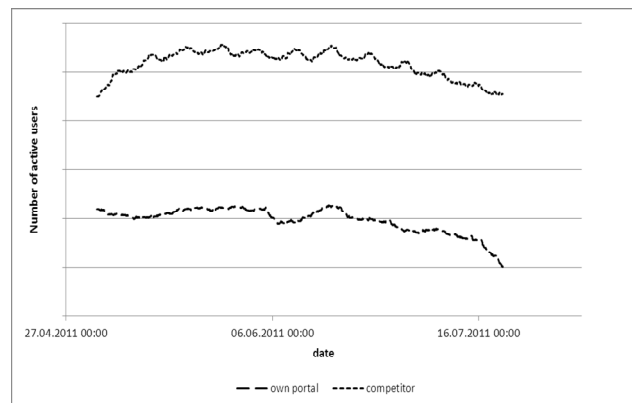

Figure 5: Comparison of the number of members of the competitor and our portal

IV. Conclusion

This experiment provided important insights into the behavior of members of this online community portal. However further investigations are necessary to find the optimal price-quantity-bundle in order to maximize the turnover. A possible next step can be to adjust the price according to the basic claims data a member provides. This is a further step to individual prices which are seen as an effective means to increase profit.

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