

“Meta-analysis in marketing research”

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Meta-analysis in marketing research

Abstract

Meta-analysis is a method that allows us to accomplish such a work by combining the results of several studies in order to make an objective synthesis following precise stages. With the help of meta-analysis, we can quantify a global result for the entire studies taken into consideration and obtain a more precise response and a more acceptable generalization.

This paper focuses on the steps of meta-analysis on resumed data, which are used more frequently, because they can easily tend towards exhaustiveness. The synthesis work has to be standardized. It consists in four stages: studies' research, selection, data extraction and analysis. Its feasibility is linked to the existence of a sufficient number of studies that can be included in this meta-analysis. This method has been used in research since 1970 and it became irreplaceable for making recommendations. Its application field is only limited to that of existent studies.

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Introduction

The scientific information in marketing field is very complex and accessible due to the online databases and research progress. Because of the important number of scientific publications, it is necessary to carry on a synthesis work in order to get a precise answer to a research question. This work can become very complex from the point of view of information gathering and selection steps, on the one hand, and, on the other hand, from the point of view of results' interpretation and conclusions. For instance, a research expert that wants to make a synthesis focuses on research studies that he collected. However, another research expert making a synthesis analysis on the same topic can come to a partially or totally different conclusion, because he did not base his analysis on the same research studies or he made a different interpretation of the data he found.

The meta-analysis is a method that allows us to make such a research by combining the results of several research studies in order to make an objective synthesis following certain standardized steps that can be easily applied. The meta-analysis approach was pioneered several decades ago in marketing (Woodside et al., 1995; Farley et al., 1995). Laroche and Soulez (2012) present an-up to-date view of the technique.

This analysis allows us to quantify the global result for all the studies taken into consideration. It consists in a precise method of research, selection, presentation and analysis of the research studies available on a certain topic. However, in contradiction to other experts, its

results are supposed to be reproduced regardless of their author. This method is widely used for all the research areas of marketing field in order to achieve a global result from the analysis of different studies, sometimes, contradictory ones. It also allows us to make a more thorough analysis of data by increasing the number of studied cases, on the one hand, and, on the other hand, a more generalized analysis, based on results from different sources.

More and more, this technique is used in practice to help the management of innovation teams to select the right information to be used, information originated in marketing test (Grinstein, 2008; Cankurtaran et al., 2013). Some attempts are also made to guide public policy (Franke, 2001).

The principle of meta-analysis dates from the beginning of the last century, the first meta-analysis being in biomedical field (Glass, G., 1976; Hunt, M., 1997). There are several types of meta-analysis, but we can distinguish mainly meta-analysis on resumed data and individual data. The resumed data correspond to global information, for instance, under the shape of average or frequency for the elements included in the study. More often, they are obtained by reading an article presenting the results of every study. The individual data are the data of every subject, taking part in the study, being obtained by the bias of questionnaires, being used in order to gather the data from every subject of every study or from databases that resume the information. However, if the meta-analysis on individual data allows a higher degree of confidence for the final statistical analysis, it is often difficult to obtain all the databases of all the studies that we should include in a meta-analysis. This limit has to be taken into consideration when making a synthesis, which has to be as exhaustive as possible when dealing with research and selection of studies. Thus, the meta-analysis on resumed data is the most used and this is the reason why we chose to analyze this further on in this paper.

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1. Methodology

Meta-analysis became a method used to make the synthesis of the available studies and bring a global answer in accordance with the existing information. The field of analysis is only limited to that of the already existing studies. Besides the synthesis work, the interest of meta-analysis is to raise the precision of the final qualification, together with its representativeness and its generalization. And, if needed, it will allow us to remove all the doubts between previous obtained results. However, it can allow us to make complementary studies and suggest new hypothesis. The main stages of meta-analysis are: studies research, selection phase, data extraction and analysis.

1.1. Studies research phase. It has to be as exhaustive as possible. In consequence, the obtained result is essential for the publication, and the studies with a significant result have a higher chance to be published in journals with an important impact factor and international spread. Thus, it is necessary to make the most exhaustive study research on a certain topic. For that, all the information sources have to be accessed. The presentation of the results can take different shapes: scientific articles published in marketing journals or conference proceedings or a study report owned by its promoter. The main sources and the first to be consulted are represented by online databases. Because of the fact that none of the bibliographic databases is exhaustive, we have to search in several databases. The main databases in the fields of economics and management are ScienceDirect, followed by EconLit, Ebsco, Emerald, etc. However, other specialized databases can be equally consulted. Further on, the research has to be enriched by all the available means for exhaustiveness. The bibliography cited by the authors represents a source of references easily reachable for the access to other studies. Unpublished studies can also be analyzed: interviews with experts, researchers, investigators within the field, etc. Gertner (1995) gives a good example of the difficulties that can be encountered in defining the research object.

1.2. Selection and inclusion phase. The studies meant to be included in meta-analysis have to be the subject of a thorough selection at the end of the bibliographic research phase. A first pre-selection has as its main goal to eliminate the studies that have no connection to the meta-analysis problem, but which were kept because of the bibliographic research in order to be as exhaustive as possible. The purpose of this selection and inclusion phase is to retain only the work that responds to the established selection criteria defined at the

beginning. The selection criteria of the studies have to be defined before, in order to avoid that the studies are chosen depending on their results or other subjective factors, such as author name, date of apparition, etc.

We have also to keep in mind that one of the advantages of meta-analysis compared to a single study is to obtain an estimation of the global effect, beginning from a higher number of subjects. Also, with the goal of exhaustiveness, the language of the results' presentation doesn't have to be a criterion of selection, if possible. There are some cases when a study is published in several stages. It is important to trace these multiple publications in order not to over-represent several data and keep independence between the various statistics units of the meta-analysis. Their identification can be made by: name of authors, article acronym, number of subjects, country of origin, year of publication, etc.

However, the selection of the studies by two persons is compulsory for several reasons: errors of inattention, which are inevitable because of the demanding task; the high number of studies; information lack in publications. A double reading can allow the discussion of these points. The differences obtained after this double reading can be, then, solved in order to gain a common point of view.

1.3. Data extraction. The following phase of data extraction has to be done together with the selection phase, while the articles are read. The same pre-established extraction paper has to be used by two meta-analysts who make the data selection and extraction.

The elements that should be gathered in this pre-established paper are mainly dependent of the meta-analysis field. However, they have to fulfill the following information in way to keep their informative content (Abernethy and Franke, 1996):

- ◆ the study characteristics (methodology, sample, characteristics of sample, etc.);
- ◆ the necessary data for the estimation of the global effect (average of the effect, frequency of success, etc.).

The data extraction phase can imply the need to directly contact the authors of the articles if there are some misunderstandings of several parts of the article such as: the data are not written in the publication or the data that can be found in the article appear only transposed into graphics, thus, difficult to be extracted. If we cannot make a complete extraction caused by the access to the information, the article cannot be included in the meta-analysis.

2. Results and discussions

Between the first phase of research and the final phase of extraction, the number of studies retained for analysis decreases drastically.

In our example, the research problem consists in determining the connection between mobile telecommunications services quality and customer satisfaction. Some previous work explored the systematic review in the telecommunication (Gerpott and Thomas, 2014; Yang et al., 2013) or

new technology diffusion, like mobile phone (Van den Bulte, 2000).

The online databases represent the main sources of bibliographic research. Thus, we analyzed scientific articles within the field of our topic published in the existing journals of econometric evidence, from the following databases: ScienceDirect, Ebsco and Emerald. Finally, we choose 24 empirical studies for our meta-analysis of the econometric evidence in mobile telecommunications services marketing in our attempt to analyze the effects.

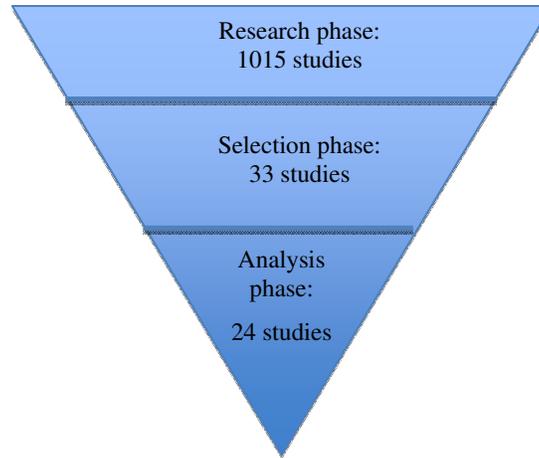


Fig. 1. Number of studies for each phase

Sources: ScienceDirect, Ebsco, Emerald.

The research articles have a higher chance to be published if their results are statistically significant. That's why the literature may not reflect the reality, but it can give a more optimistic view to it. This situation justifies the exhaustive research. Lodish et al. (1995) show how to operationalize the reviewing of all the study and that this often needs a large group of researchers.

A graphic can be used to represent the distribution of standardized studies' effects depending on their number or standard deviation. Sultan and Farley (1996) propose some interpretation techniques of the results obtained.

2.1. Standardized effect. The effect that we look to quantify and/or compare in meta-analysis can be either a quantitative or qualitative variable. The effect can be defined as the parameter that we want to estimate. The method of qualification and analysis will depend on the variable type (Bland, C.J. et al., 1995). If the meta-analysis on qualitative variables is more common and the most consensual, it is always possible to design the meta-analysis beginning from quantitative variables such as: averages and standard deviation collection within several articles taken into consideration.

For every study, it is necessary to have an estimation of the studied effects, which represent the parameters of interest. The estimation method has to be the same for each study. The principle is based on weighting the gross effect of every study by the opposite of the variance of every study (Eisend, 2015).

Standardized effect =

$$= d_i = \frac{\text{the effect of the study I}}{\text{observed variance within the study I}} \quad (1)$$

2.2. Global effect. The global effect (D) corresponds to the average of the standardized effects (d_i) of every analysis, weighted by the opposite of their variance (w_i). This weighting allows for the studies, whose results had a weak variance, to have an important contribution to the common result, opposite to the studies with high variance results. The variance also reflects the precision and it depends on the number of persons included in the study. The studies on a large sample have a higher influence on the global effect.

$$\text{Global effect} = D = \frac{\sum w_i * d_i}{\sum w_i} \quad (2)$$

2.3. Test. The global effect can be tested, for instance, beginning from a null hypothesis, for which the global effect will be 0. The classical Z test beginning from the values of d_i and their variance could allow us to reject the null hypothesis and conclude for a significant effect different from 0.

2.4. Heterogeneity. The meta-analysis has as its main goal to quantify the common effect for all the studies included here. This implies a homogeneity, which means studying well the same effect. Before testing this hypothesis, we have to make a homogeneity test in order to verify if at least one of these studies is not different from the whole. In case the test is significant, which implies the existence of heterogeneity, we should make a joint analysis of all these studies in order to discover where the studies are responsible of this heterogeneity. For this, the heterogeneity test is repeated by extracting one or more studies till we obtain a non-significant test. Once we identified one or more studies, we have to find the characteristics that are different: sample, measurement method, etc., which could explain the heterogeneity.

The statistical test used to measure the heterogeneity is the Q test of Cochran, for whom the principle is the same of a Chi2 test at k-I degree of freedom, where k represents the number of studies.

$$Q = \frac{\sum w_i * (d_i)^2 - (\sum w_i * d_i)^2}{\sum w_i} , \quad (3)$$

d_i represents the standardized effect of every study;

W_i represents the weight of the standardized effect (the opposite of the variance) in the global estimation.

In case of significant heterogeneity, it is possible to follow meta-analysis either by excluding the studies that are a source of heterogeneity or by using a random model, which will take into consideration the variability between the studies, opposite to the fix model. The consequence will be the enlargement of the confidence interval of the global effect estimation.

2.5. Complementary analysis. It is possible to make subgroups analysis by choosing the studies on

the parameters of interest such as: the year of the studies, the methodologies used, etc. The meta-analysis also allows us to indirectly compare two elements that were never compared directly, but each one of them was compared to other third elements. These types of comparisons that can be multiplied have to be interpreted with precaution (see Edeling and Fischer (2016) for some example concerning firm performances).

2.6. Results presentation. The results presentation stage of meta-analysis is also standardized. There are two important phases that have to be respected: the descriptive presentation of the studies included in meta-analysis and the graphical representation of the standardized effects of every study and the global effect. There is some specialized software that can be used in order to make the final representation together with the previous stages.

Conclusion

The main limit of meta-analysis is its dependence on the number of studies that can be analyzed, which has to be large enough in order to make the statistical tests. Another important limit is linked to the level of proof. Compared to an isolated study, the meta-analysis allows us to obtain a better level of proof by reducing the random error by a superior information quantity. The level of proof of meta-analysis depends on the introduced studies. However, meta-analysis cannot be reduced only to experimental studies, it can also include observations (Eisend (2009) gives humorous examples about this).

Several new phenomena are explored already using this technique, for example, word-of-mouth on Internet quickly became an important research topic (de Matos and Rossi, 2008; Rosario et al., 2016; Ya et al., 2015). This shows that the number of studies produced when a topic is "hot" in the Internet age necessitates the use of meta-analysis.

Nevertheless, because the principle of meta-analysis is not so complex, it is sometimes considered simple and rapid, but, in practice, it needs around a year of work. It is advisable to begin this type of work in collaboration with an experimented meta-analyst.

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