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# Influence factors on the value of realibility estimators in marketing research

## - Summary -

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## *Introduction*

This paper presents an analysis of the influence factors on the value of one of the most used estimators of the research reliability in marketing field, Cronbach's Alpha estimator. In the literature this estimator often use features in determining the level of reliability in marketing research is considered to be independent of the external factors, its value beeing influenced only by internal factors of the instrument, pertaining to its construction. The thesis presents a series of cases in which the same instrument obtain different values for Alpha estimator applied to different groups of respondents. These results indicate an influence of external factors on the value of the estimator.

The thesis includes a special program created in GAUSS language, based on Bootstrap technique, with which you can perform tests and comparisons between different values of the estimator, obtained for different samples. This program simulates a distribution of Alpha estimator, based on wich tests may be applied.

The conclusions of this study indicate an influence, sometimes very strong, of external factors on the value of reliability estimators and suggest the need for a rigorous reliability and validity of instruments approach, especially for investigations on a very diverse population.

Key words: Cronbach’s Alpha, reliability estimators, internal consistency, reliability, validity, Bootstrap.

The thesis contents are as follows:

### *Research premises*

Research tools are those that provide ways for science to advance. The safer they are and better adapted to their purpose the more the data we will collect will help us in developing reliable conclusions, reflecting accurately the reality, phenomena, actions, intentions, perceptions, or any other aspect researchers pursue to clarify.

To provide useful data, research tools must simultaneously fulfill two conditions: to be valid and reliable. Reliability means that an instrument measure a phenomenon with consistency. Better said, reliability means that for more measurements of the same phenomenon the tool should provide the same result. This does not mean however that the result is also correct. Validity, on the other hand, involves a measurement accuracy, that an instrument really measure what it says it measures.

To be valid, however, a tool must be reliable first. To measure this reliability there have been developed over the years a number of methods, each with its peculiarities. In marketing research, the most widely used reliability estimator is Cronbach's Alpha, an indicator developed by Cronbach since 1951.

Alpha estimator has been and continues to be, maybe because of its excessive use, the subject of extensive analysis and debate.

The factor that pushed me towards this research was the curiosity. Assisting at one presentation of a colleague I noticed that there are differences between the values of Alpha for the same instrument. Or, Alpha is an estimator based on the calculation of correlation and whose value depends theoretical only on internal factors, related to the construction of the instrument.

The next step was to search for studies in this direction, of influence factors on the value of Alpha not related to instrument construction and noticed that this has been very little studied and not clear. I went ahead and asked the opinion of some people more informed than me in the field about the possibility of such influences and we concluded that these influences are due covariance, more precisely, there are many external factors influencing the relationship between the tool’s elements. That is what this research seeks to identify, those external factors influencing the relationship between the tool’s elements and therefore wich affect the value of the reliability estimator.

### *The purpose and the objectives of the research*

The thesis has a multidisciplinary character, as to achieve goals and objectives there are necessary knowledge from marketing, statistics and econometrics fields.

The work was done from the view of a marketing researcher who wants to know and master the external factors influencing the accuracy of the instruments used in research.

Research is divided into three parts: one theoretical analysis, analysis accompanied by a pilot study and empirical research.

***The overall goal*** of doctoral research is*: Finding external factors that manifest influence on relations between the elements of the instrument and indirectly on the value of Cronbach's Alpha estimator and grouping them into categories according to the characteristics of the instruments.*

The **general objectives** of the research are derived from its purpose and are the following:

- Discovery of external factors that manifest indirectly influence the value of Cronbach Alpha;
- Determine, if possible the intensity and direction of the influences;
- Identify possible links between the characteristics of the instruments and the nature of the external factors influencing the value of Alpha;
- Testing the differences of Alpha values caused by the external factors analyzed.

### *Final conclusions of the research*

The theoretical analysis of this thesis provides an overview of the domain of the validity and reliability of research instruments in science in general and marketing in particular. The field mentioned above is very important for any scientist but is, paradoxically, very confusing and controversial. In the theoretical section I made a classification and an ordering of roots and key concepts that make up the field.

Also in this section I presented a number of limitations in using Cronbach Alpha estimator. To overcome some of these at the end of the theoretical section I suggested a technique used in econometrics, namely the bootstrap.

I have created, along with PhD. Ruben Seiberlich at the University of Konstanz, Germany, a GAUSS program code that lets you create simulated distribution of the estimator Alpha, from the base sample wich is considered representative. This distribution with the standard error allows us to apply tests and compare different values of the estimator.

Studying literature and relevant articles in the field led to a first outline of the research hypotheses. For formulating final hypotheses a pilot study followed, after which were added a number of variables.

The pilot study was conducted on a sample of 300 people and consisted of an analysis of the differences that have arisen between different categories of individuals on a number of external variables.

The quantitative research consisted of a questionnaire-based survey. 3 tools were used, applied to a total population of 900 individuals, as follows: 300 individuals instrument A, 300 individuals instrument B and 300 individuals instrument C.

Data analysis was done using SPSS and program designed in GAUSS by the Phd., based on Bootstrap technique.

The quantitative research began from the general objectives mentioned above.

Thus, the first objective has been achieved since tehre were discovered a number of 9 external factors that have significant influence on the value of Cronbach Alpha estimator. The differences were tested using the GAUSS program created one of the scales used in research and proved to be statistically significant.

The intensity of the influences differs from a scale to another and the direction of these influences differs also.

Regarding the links between instrument's characteristics and the nature of the factors influencing the value of the estimator, the study was inconclusive.

The differences between Alpha values caused by external factors were, as mentioned above, statisticaly tested for one particular scale - *ease of use*. The Gauss program was created only for 3 items scales and this is why I only tested that scale. Other scales studied were composed of 4, 10, 18 and 32-items. Writing a program adapted to a greater number of items is a future direction of the research.

The quantitative research tested a total of 9 hypotheses based on external factors obtained through documentary study and pilot study.

With eight confirmed and one partially confirmed hypotheses, the research draws a warning on the use of scales and hence on the use of research tools on varied populations. Furthermore, the chapter on factors analysis results we can see that the tools that are more

likely to present problems in some segments of the population caused by one of the analyzed factors are those that have a lower value estimator . In these cases variations within sample groups determined by factors of influence are larger and more often significant, sometimes there are classes for which the instrument is very poorly adapted or inappropriate

In conclusion, the thesis has experienced a difficult road, from a research curiosity and an idea that seemed at one point not to bring much in sight and reach the end where it succeed (the researcher hopes) to arouse the reader's curiosity, informed or uninformed, to take a database and test (at least at a starting level) if there are no categories of respondents, due to the factors identified in this research or other factors, which to question the scale used. The alarm is mainly drawn for the tools that get a value of the reliability estimators around the inferior limit, but are not excluded scales with very high values of reliability estimators.

### *Researcher's contributions*

A first contribution that the researcher brings to marketing field, especially in the Romania, is the theoretical analysis that presents an overview of the concepts of validity and reliability of research instruments. The theme is briefly and incomplete treated in romanian marketing literature and the present study may be useful to many researchers both by its content and by bibliographic references it provides.

Another important contribution is the alarm that the study drags on research work with a reliability level at the limit of acceptability and on the need to adapt the instruments according to the specific of the population studied.

Another important contribution is the software designed by the Phd. student in GAUSS language, based on Bootstrap technique, creating a program that allows simulated distribution of estimator Alpha Cronbach and the application of tests for comparisons between different values of the estimators. To apply this program we should keep in mind that we assume that the sample we use is representative, without this assumption would not support the conclusions.

Last but not the least important contribution that the researcher brings to the field is the opening of a new research field, research of instruments reliability and of the need to adapt them according to the composition of the population studied, by a series of demographic and psychographic variables.

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