The extent of the deception of graphs : comparison between sources of information: newspapers, television and social networks / Batel Leibowitz

Abstract

Infographics is a field that aims to transmit information with visual means. In the past, information consumers were accustomed to a certain system of information transmission where a clear separation between visual and verbal information was maintained. With the advancement of technology, the changes in information consumption habits, and especially in the wake of the Internet revolution and the emergence of social networks, there has been a great deal of development in infographics, and the integration of verbal information with visual information has become a very common way of presenting data.

As a result of the increasing awareness of visual representation of information, rules have been created to correctly visualize data. Studies that have already been done in the field of visual information show that visual information presented through various means and media channels does not necessarily rely on scientific truth, and the way it is presented can deceive the reader or viewer. The purpose of visual information is usually to convince the reader regarding a particular agenda or need for a service. The designers of diagrams presented in various channels sometimes deviate from the rules of proper presentation in order to impress the target audience. Therefore, it is important for the information consumer to develop the ability to distinguish between correct and valid data presentation and a chart that presents information in an erroneous manner.

This study examines deceptive information in graphs published in Israeli media during the election period. The problem of presenting deceptive information in the contexts of politics and election periods is a known problem in research, and is now also included in the public discourse. The problem is defined by the concept of "rational ignorance". This means that information consumers cannot invest time and effort in examining the information presented to them in these contexts. Therefore, the relevance and added value of this study are expressing

the extent to which deceptive diagrams are presented to the public on significant issues in their lives, as well as raising awareness of deceptive visualization of information.

At the beginning of the study, diagrams including a combination of verbal information and visual information were collected, all of which were presented in a visually misleading manner. The errors found included: scale distortion, incorrect graph usage (e.g. bar graph instead of pie chart), columns displayed in wrong order, etc.

The purpose of the study was to examine three things: the degree of influence of deceptive graphs, whether the graph type (bars, lines or pie) affects the degree of misrepresentation, and whether the source of the information presented in the graph (Channel 2, Ha'aretz newspaper or Facebook) influences the degree of misrepresentation.

Out of more than 17 deceptive graphs that were published in the various media channels in Israel in 2012-2016, three graphs were finally selected for this study: the Prime Minister's residence expenses graph, the Arab vote graph, and the ranking of the parties. A preliminary study (pilot) was conducted on each of these graphs, in which the deceptive visualizations had a very large effect. A correct version of each graph was also prepared. The extent of the effect of deceptive visualization is defined in this study as the gap in understanding the information between those who saw the correct graph and those who saw the graph in its deceptive form. As noted, with these three graphs the study found a significant gap between those who misunderstood the graph in its proper form, and those who misunderstood the graph in its deceptive form.

Out of the three graphs selected for this study, six questionnaires were constructed. Each questionnaire has three sections. Each section presents a different chart about which three questions are asked. The first question examined awareness and basic graph understanding. Its goal was to filter out subjects who did not have a basic ability to read / understand graphs. The second question for each graph examined the impact of the deceptive visualization. Each graph had its own multiple choice question. The question tested the understanding of the data presented in the graph. One answer was the correct answer, another was the misleading one, and two answers were irrelevant. The subjects who chose the misleading answer were those

who "fell into the trap", meaning that the graph managed to mislead them. The third question examined the reliability of the source of the information, where the subjects had to rank the reliability of the source of the information that presented the graph, between 1-5.

The questionnaires were distributed on Facebook in various groups with diverse populations, on a voluntary basis. In total, 271 respondents answered the questionnaires.

Both the statistical findings and the prevalence test were in accordance with the hypothesis of the study. The first research question was: to what extent are people misled by correct diagrams compared to incorrect ones. In order to examine whether there were differences between the interpretation of information by subjects who received a correct diagram versus an incorrect one, a chi-squared test analysis was performed. This analysis showed a significant difference between the recipients of the deceptive charts compared to those who received correct ones.

The second research question related to the relationship between the shape of the graph and the degree of misrepresentation. In chi-squared analyses performed separately with each shape, significant differences were found between pie charts and the other types of graphs. (line graph and columns). A significant difference at a lower level was found in relation to line graphs and bar graphs.

The third research question sought to examine whether the source of information presenting the chart affects the degree of misrepresentation. As mentioned, each participant received a chart from - three different sources: Ha'aretz newspaper, Facebook and Channel 2 TV. Chi-squared analysis of the impact of deceptive visualization on the interpretation of the information show that the greatest effect of deceptive visualization was found with regard to Facebook. The effect of deceptive visualization at a lower level was found in the Ha'aretz newspaper, whereas no significant difference was found between deceptive and non-deceptive visualization for Channel 2.

Another question that this study examined is the question of the reliability of the information in connection with the source of the information. The subjects were asked to evaluate how

reliable was the information presented to them. This assessment was done on a 5-point scale so that the higher the score, the higher the level of reliability. In order to examine whether there were differences between the different groups, a variance analysis was performed. In this analysis, we found a significant differences between the sources of the information.

As mentioned, the study also examined the ability of respondents to read data presented in graphs. Subjects in the different groups had to answer a relatively simple question, just to see that they were indeed capable of understanding graphs. The question did not refer to deceptive or authentic representation. In all groups, over 90% responded correctly to the question of basic understanding of a graph. It should be noted that in analyses performed in relation to the types of the various diagrams, and in relation to the sources of information, no significant differences were found between those who were misled and those who were not misled, regarding the understanding of the diagrams presented to them. In other words, their "mistake" was not because they did not know how to read data from a graph, but because of the way the information was presented on the graph.

This study seeks to contribute to critical thinking about information visualization. Information consumers are used to seeing the information presented to them as a kind of "truth", or at least to think that what is presented to them is true, and that it reflects facts. However, thinking critically we can say that not all the information, especially information presented visually, is "true". Graphs are not politics-free. Every data collection and translation into visual information is a process of abstraction, and it can always create a form of manipulation. Therefore, it is necessary to treat visual information in a critical manner, and to enable the consumer to consume the information critically.

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