

Processes of Creating Infographics for Data Visualization

Mateusz Szoltysik
University of Economics in Katowice
Katowice, Poland

mateusz.szoltysik@ue.katowice.pl

Abstract

This paper presents a brief overview of infographics, together with study which was originated to discover what motivates people to design infographics and what are the components of the creative process. Section 2 outlines the experiment. Section 3 presents obtained results. Section 4 presents conclusions and future directions in studies of processes in designing infographics, outlines the important problem for further research.

Keywords: infographics, design, data visualization, processes, education.

1. Introduction

Nowadays the popularity of infographics (figure 1) is increasing, it is more and more common to present content in a visual way. Even though it might seem like that, infographics are not a new idea. The concept of data visualization in the form of maps or illustrations has been known for centuries [10].

Information graphics, commonly called “infographics”, are used to communicate complex data in a captivating way. In general, infographics can be described as a compilation of one or more visualizations that have been modified in order to present a specific data and highlight the significant points [2,3].

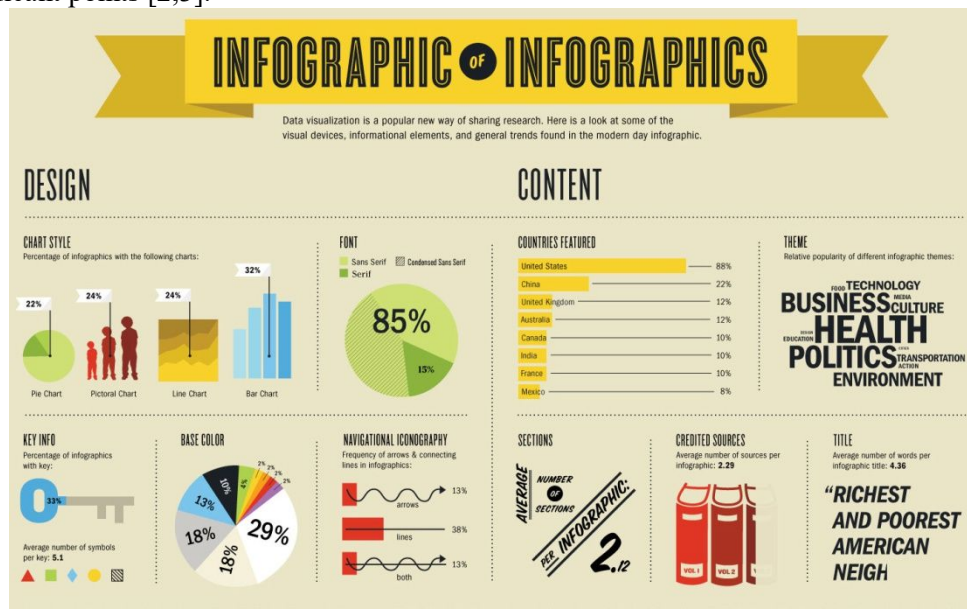


Fig. 1. The attempt to explain what an infographics are by example of one of them [4].

Through infographics readers get an overview of a topic due to data and other available information. Infographics are one of the most effective means of telling stories about the data, which are captured by the reader through principles of graphic design [7].

Infographics can be a powerful visual approach to transmitting information and supporting conceptual, theoretical understanding because people “see with their brains” [12].

Due to infographics people easily remember the content because of presentation of large amount of data in a visual form [19]. It’s a type of image that combines data with design, thus helping individuals and organizations communicate their message [16].

Information graphics or infographics are graphic visual representations of information, data or knowledge. These graphics present complex information quickly and clearly [11]. The infographic is part of data visualization [17]. Data visualization includes signs, photos, maps, graphics and charts, it presents complex data [15].

Six types of visual representations that help to communicate content to the reader defined by Nancy Duarte are [5]:

- 1) flow (e.g., linear, circular, divergent/convergent, multidirectional);
- 2) structure (e.g., matrices, trees, layers);
- 3) cluster (e.g., overlapping, closure, enclosed, linked);
- 4) radiate (e.g., from a point, with a core, without a core);
- 5) pictorial (e.g., process, reveal, direction, location, influence);
- 6) display (e.g., comparison, trend, distribution).

These types of visual representations can help efficiently, precisely, and clearly transfer abstract ideas, complex and compact content that would otherwise require a long narrative. Notably when they are used together as building elements for communication. As Duarte stated, “Rather than oversimplifying the complexities... (the use of these types of visual representations) can often incorporate multiple parameters, telling a richer story of cause and effect (or any other relationship) than data points alone” [5].

The foundation and core of infographics are composed of three important parts. Those are Visual, Content and Knowledge [14]. Visual representations of data, information, and/or knowledge are presented by elements on figure 2:

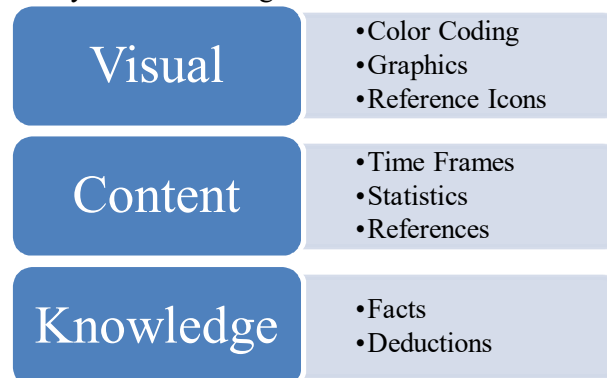


Fig. 2. Three core parts of infographics [14].

In opinion of Dave Gray and Juan Velasco infographic is a visual explanation thanks to which the reader is able to understand, find or do something more easily; it also integrates words and pictures in a dynamic, easy to remember way. Gray and Velasco claim that it stands alone, is universally understandable and self-explanatory, as well as it reveals information that was invisible or submerged [6].

Visuals are powerful tools for learning, they help to improve memory and recall. A set of abilities that enables an individual to effectively find, interpret, evaluate, use, and create images and visual media is referred as visual literacy [1]. They are necessary to understand and analyze the contextual, cultural, ethical, aesthetic, intellectual, and technical components involved in the production and use of visual materials by the recipient [1].

But infographics can also be a threat. As mentioned in earlier Huff’s studies [8] about usage of charts to inform or misinform readers, those aspects are also actual nowadays, in the new tools of data presentation. The choice of ranges on graphs can have huge impact on interpretation, as well as proportion of Y-axis to X-axis also can distort the data. Huff has stated,

that bar charts and pictorial graphs should have areas proportional to values - to make comparisons only in one dimension.

2. The Purpose of the Study

The study was originated to discover what motivates people to design infographics and what are the components of the creative process. Those components are very important and their understanding in the future will help to unify the entire process of data visualization by example of infographics.

This study involved first and second year students that study at the Faculty of Informatics and Communication at the University of Economics in Katowice. The four groups of students were examined and every laboratory group was split into smaller teams (figure 3).



Fig. 3. Groups of students working at their tasks.

Each study-team obtained a several sheets of paper, pencils, colorful marker pens and one from four prepared sets of statistical data, titled Topic 1, Topic 2 etc.

The data sets are referring to the year 2015 and describe issues mentioned below:

- the Silesian Police summary from 2015 [9],
- the summary concerning level of knowledge of foreign languages in Poland [20],
- the summary concerning people digitally excluded in Poland [18],
- the summary concerning level of reading books in Poland [13].

Each of the student teams has the same task: to create a draft of infographic from obtained different statistic data and to describe the entire process. In this case they had to fill up the simple question form and answer six questions:

- 1) Describe the entire process which guided you to create infographic. Indicate its most important points.
- 2) What influenced the choice of colors used in your project. Do you consider this aspect important?
- 3) Do you consider that type of information presentation (i.e. infographic) is more readable for its recipients?
- 4) Did you make drawings in your project? If yes, justify and describe the specific position of its placement in the project. If not, justify and describe why didn't you consider a drawing usage in the project.
- 5) What's the title of your project? If any? Do you consider this element important? Justify your answer.
- 6) Do you think that the subject of obtained data and the data itself have had an impact on the difficulty level of your project preparation? Justify your answer.

3. The Obtained Results

This section contains the overview of obtained results. Each aspect of the study is discussed separately. Due to limitation of the study to Polish-speaking groups only, all the key parts of infographics were translated in the forms of blue rectangles.

The Elements of the Process

In the analysis of the first aspect concerning the participants' designing processes, 7 from 12 teams have reported the most important elements of their thinking, discussion, preparation and creating process in the form of points.

One of the groups rated every point of their preparation process with the percentage values of its priority degree, giving to each the equivalent value of 25%:

- Grouping the information,
- Selecting the most important information,
- Selecting the most appropriate graphics corresponding to the given data,
- A graphical layout (simplicity).

Another team pointed three factors: transparency, readability, intuitiveness, which in their opinion are the most important in the process of infographics creation. The first impression regarding the analyzed data was also significant for that team and led them through their concept changing for obtaining more clarity and readability.

Simplicity, a short time of interaction with the data by the reader and aesthetics of the project itself were relevant factors for another group.

Other group have tried to use a simple iconography because these are clear symbols, easy to understand and associate with the facts. Pictograms were joined by statistical data with some brief descriptions. Ease of interpretation and possibility of translation infographics into foreign languages was important. That potential translation process couldn't affect the form of project and understanding of its data.

Another team identified three stages of their process:

- Analysis of the data, reading it together in the group,
- "Brainstorm" on graphic conceptions and choosing the best one collectively,
- Implementation in form of sketch by the person assigned at the beginning.

In this approach each member had to introduce its own idea, widely discussed by the other team members. The sketch has evolved to the final version of colored project design. Assignment of responsibilities was an important stage in the creating processes.

An important factor for one team was the level of topic importance: whether it is worth to discuss it. They had to choose the information to present a leitmotiv of their project in the form of a recognizable sign.

The Significance of Color

An another purpose of the study to consider was the level of color significance used in infographics and its meaning for participants of study. Each team participating in the study should indicate, what influenced the choice of colors used in their project and whether they consider this issue to be important.

For most of study groups this issue has a significant position in process of infographics design. The colors are relevant, they have cultural background, derived from the evolution of human existence. For example the green color is often associated with something positive, and red with something negative.

All participants decision was to choose more aggressive colors to indicate negative objects. They have referred to the origins of colors as main factor in their selection, giving as an example the red color again. In their opinion, it has a negative significance because that color is widely associated with blood.

Yet another team pointed a subliminal message as an element inseparably connected with color code. That groups' opinion is that the authors of infographics are responsible for reception of their work. They can influence the audience perception of projects. With black and white

drawings each person can understand them on their own way. With color we can decide on the perspective of interpretation for our audience and dictate an intentional interpretation to them. Another team chose bright colors for the titles in order to simultaneously intrigue, attract and absorb a potential recipient. In their opinion, the colors used in the infographics are relevant, because it unintentionally affects the way of receiving information by the viewer. For example, properly used color will bring up the feeling of peace and inner-balance.

Two groups have indicated that the correlation color-topic is extremely important. Both groups have used bright, eye-catching colors related to the topic of statistical data. For example, the colors that in their opinion were associated with road sign indicating frequent accidents (figure 4). Participants referred to attracting recipients attention about this sign and for highlight the significance and message in infographics.

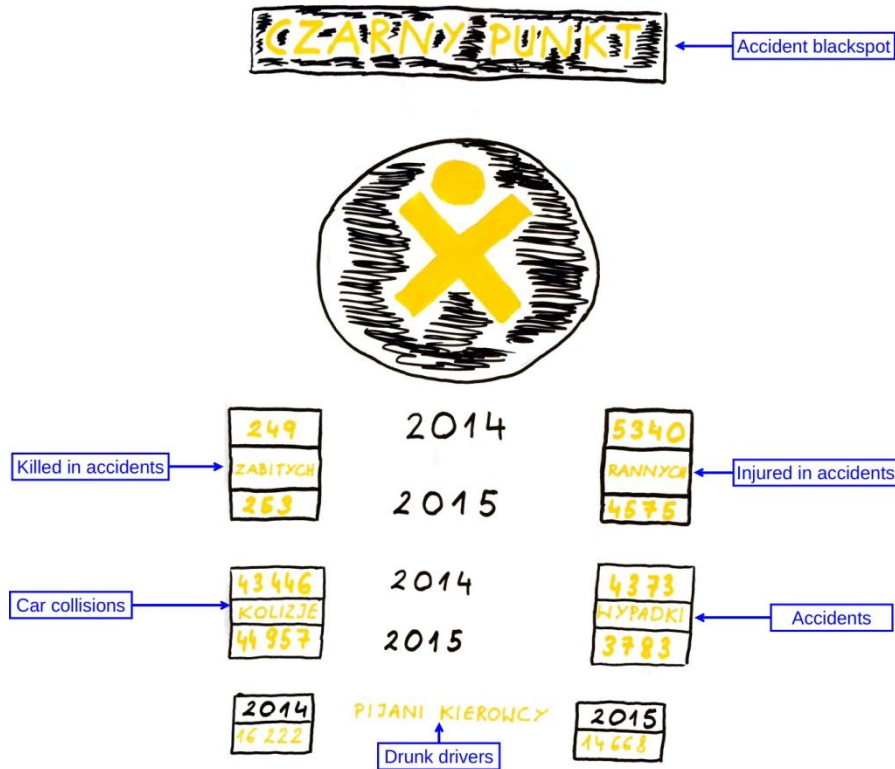


Fig. 4. Road sign indicating frequent accidents as an infographic main theme.

The Readability of Message

In the next step of this study, the participants needed to determine whether that type of communication of information through infographics is in their opinion more readable for message recipients?

All the participants have agreed with the legibility of infographics as a data medium.

One group has stated: "Yes, because it is a faster and easier method to information absorption and only the most important information are extracted. That contrasts with the long tables filled with data, which overwhelm the users."

Another team has considered that: "The infographics are a lot more legible than plain text, because people process the images quicker than only-text data. That affects the level of better understanding of presented subject."

Yet another team has agreed with that statement: "By the use of many graphics, illustrations and the content comparisons contained in the infographics, they are much clearer and transparent for interpretation than in case of the text data only."

Next group has stated: "Definitely yes, as indicated by the different studies, only 20% of messages are communicated via words, and as many as 80% via the images and gestures.

However, most people processes the data by the visual type of learning and that method is easier to communicate the messages for them."

One group has considered, that: "Pictures and pictograms are easier to read than text, because the text data are perceived as more time-consuming. The infographics form of presentation is conducive to the rapid flow of information, however it is more suitable for the people, who are better adopted for such type of data, i.e. young people or people familiar with the Internet. Older people prefer to pay attention to the long texts, they are able to focus on what they know, in contrast with younger people."

Another team has agreed, that this way of presenting information is both more interesting and easier to assimilate. Many people may feel the desire to absorb the presented information, even despite the fact, that at the first glance data presented in the form of infographics are not from a field related with area of their interest.

Another group has considered, that original artwork attracts more attention and it allows a better understanding of the provided information, because in most cases people's perception is guided by sight and visual objects.

Members of another team have suggested, that dry facts described in a documents, either in the form of tables or descriptions, lead the recipient to get lost in what he or she is reading. In most cases it doesn't offer such benefits and effects that should be. Meanwhile, data represented by the graphics are easier to understand, assimilate and image.

Other team has decided, that visual aspect of infographics is important and has agreed with discussed hypothesis. They referred to usage of colors, which attract the reader's attention, the design and layout of infographics itself, e.g. pie charts.

The Significance of Drawings

Another purpose of the study to consider was importance of drawings in projects of infographics. The participants of study were supposed to indicate if the position of drawings in design of infographics is important or irrelevant, as well as show if the graphics itself as a data source are irrelevant.

All participants have agreed with importance of drawings in data presentation.

One group has used drawings, because of the connotation that is connected with every graphic symbol. Other team used drawings to show difference between statistical representatives of presented subject, in this case each group of knowledge of languages (figure 5).

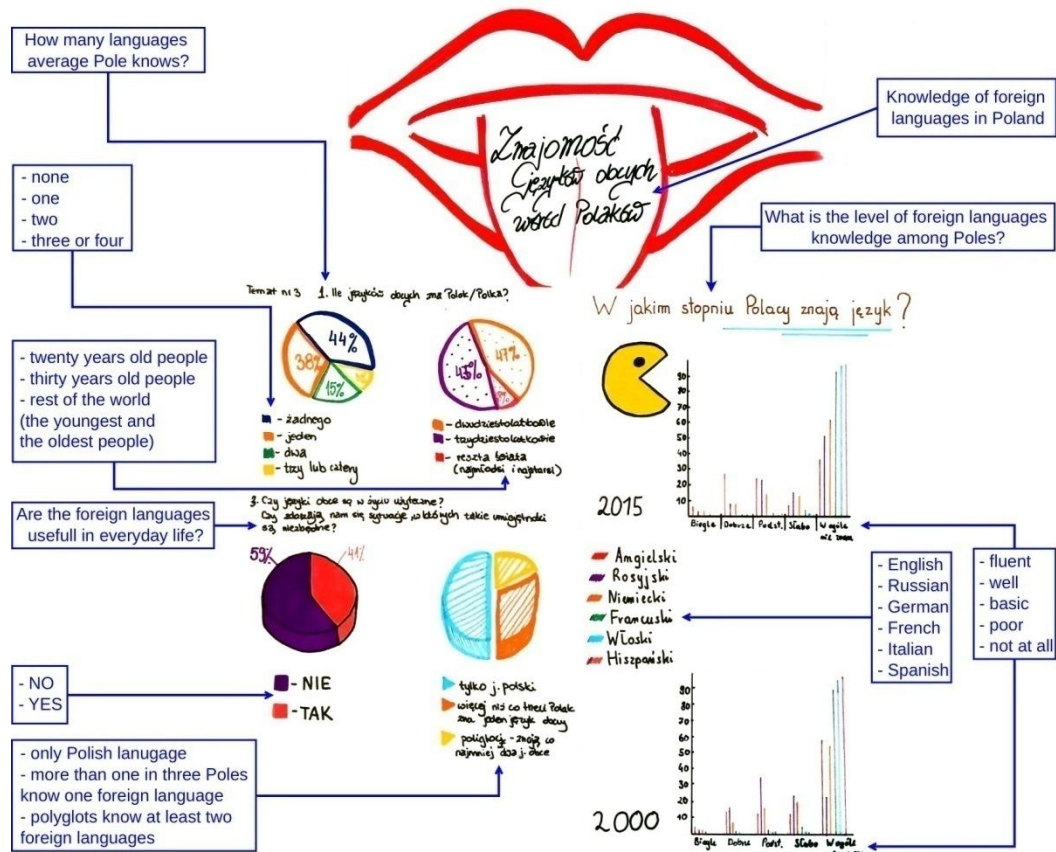


Fig. 5. The project about foreign languages created by one of the teams.

Another group used drawings to reduce time of reading the data and shorten the time of infographics assimilation.

Yet another team has suggested, that usage of drawings increases the readability level and attracts attention to the communicated message, because of that they used many drawings in their project, as it can be seen on figure 6.

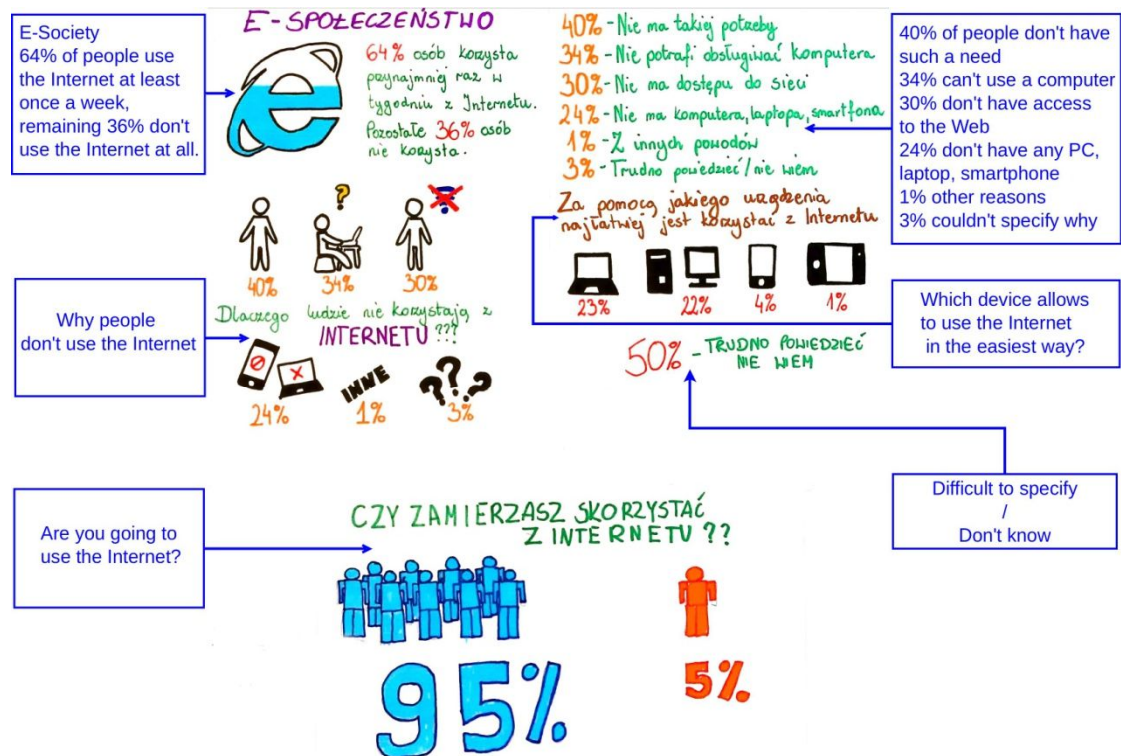


Fig. 6. Drawings in infographics attracts attention to the communicated message.

They also considered that infographics with drawings are received by viewers with greater pleasure in contrast to text data. That allows to increase user engagement to the presented data.

The usage of images allows to add variety to the form of communication. Data becomes more attractive for the customers and viewers pay more attention to the data.

They used drawings to visualize almost every important statistical or percentage values and added some variety to the projects. That approach allows to reproduce the assigned values in an interesting and comfortable way without usage of the standard data tables. Any similarities to the presented data topic were supposed to strengthen the connotation of infographics and attract the viewers. In this form the data are very structured and legible.

The Significance of Title

In the next step of this study, participants were supposed to consider the importance of the title in infographics designs.

All participants have indicated the title as a requirement, because a person automatically interprets certain information in a certain way. Nevertheless not all the teams (figure 7) have included this element in their projects.

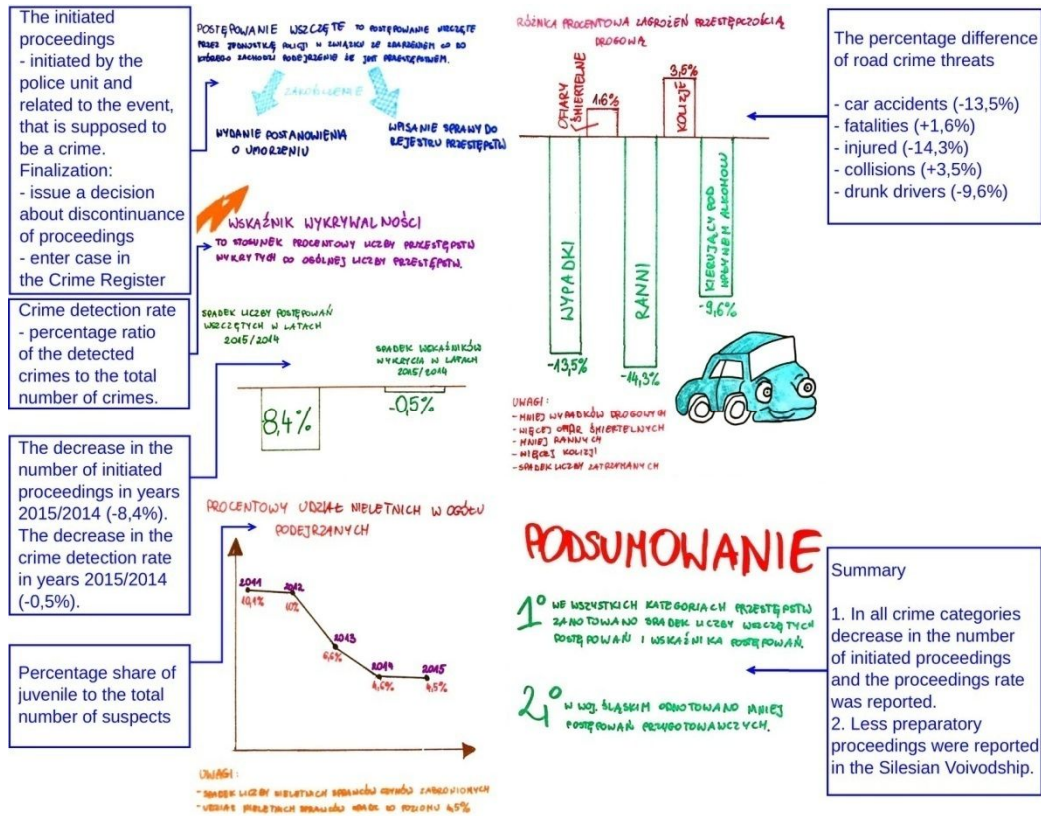


Fig. 7. Infographic without a visible title can confuse recipients.

Other teams (figure 8) have used title in a creative way that will catch the attention of younger readers.

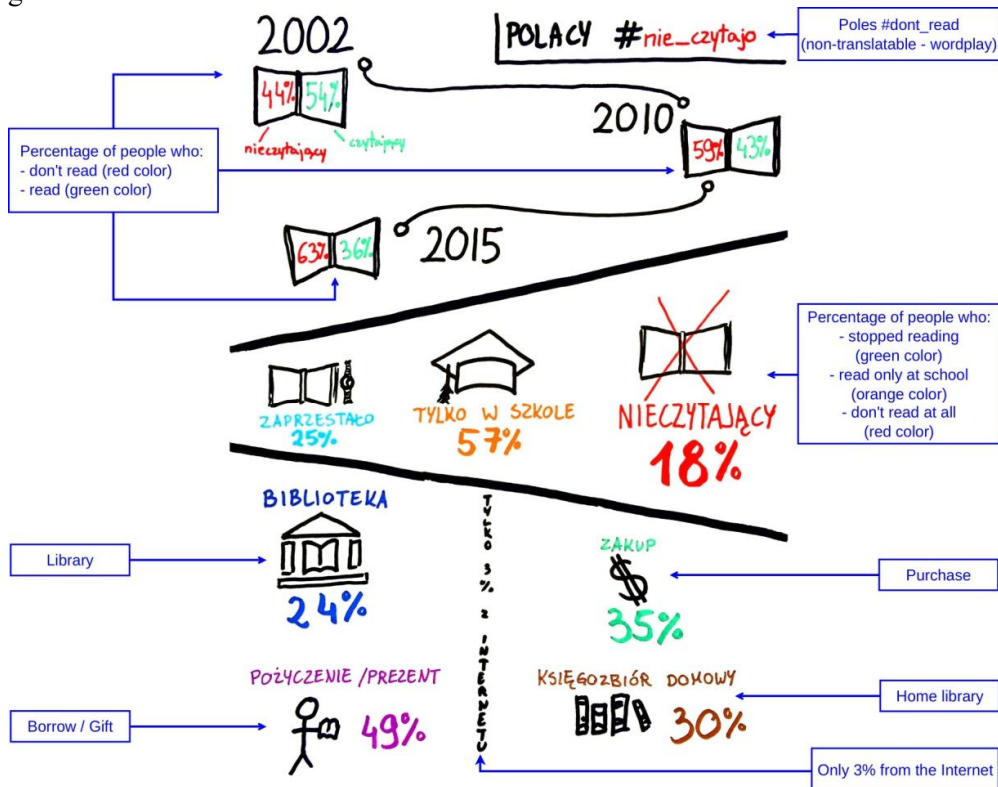


Fig. 8. Infographic title as a hash tag element.

They gave example of mouse usage in that scenario: when user would hover the mouse cursor over the one of the statistical data, an another list of information would appear, and then it vanishes when user would move the mouse in another direction.

Other team has considered, that this is definitely matter of much significance. In their opinion the obtained topic can't be presented in a light and pleasant way. The project should emphasize the importance of the topic, its relevance and seriousness.

Yet another team has also suggested, that obtained topic gave them a wide room for maneuver. The frames of their subject were very extensive and they could develop it with many different approaches.

A significant role was marked by the level of obtained text: data written in simple and intelligible language were easier to process by participants of study. E.g. one group of participants suggested, that the type and amount of their data were too detailed, what has increased level of difficulty in their project.

Infographics as a form of data presentation categorically affects the difficulty of preparation. It requires many additional steps in creating process. First we need to analyze all the data and then present them in interesting graphic form.

Participants, who were not earlier familiar with subject of data discussed by them, have had greater difficulty in the preparation of projects.

An another factor, which had directly influenced the difficulty level was style of composition, that had to be kept in the entire project and should correspond with the presented data.

4. Conclusion and Future Directions

After analysis we can identify the essential elements of the data transformation process from statistic data into visual data, presented by elements on figure 10.

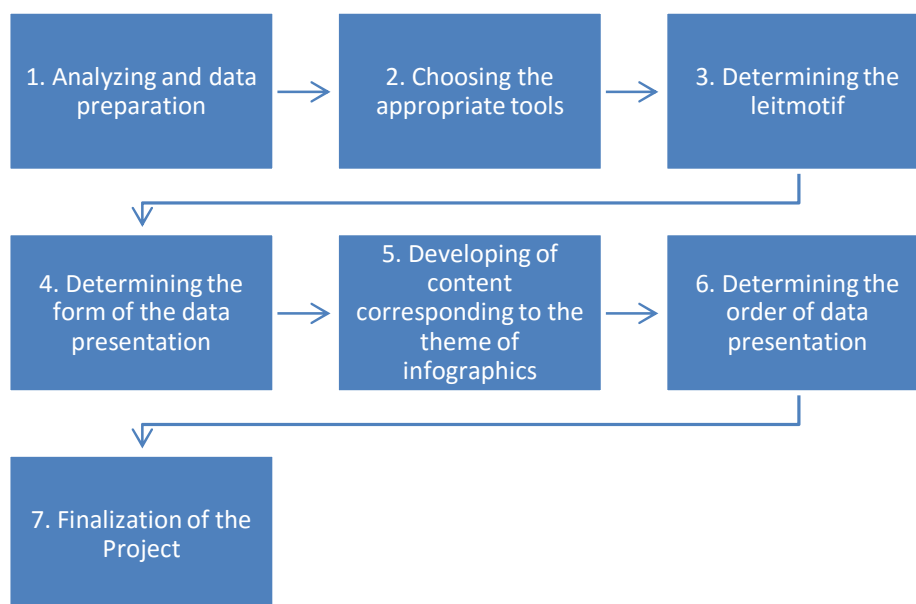


Fig. 10. The steps of participants' creating process.

Every group had pointed out that creating a good and readable infographic is a main target. We can indicate the clarity factor as significant. Selection of data, content (drawings and sketches), colors, which are responsible for the character and intensity of the process, appeared in all responses. Without earlier analysis of obtained data, they couldn't begin any operations: firstly they had to make a choice what information are worth to present.

The colors are meant to emphasize the importance of provided information. Selection of colors was often dictated by the aesthetic reasons. Colors affect the perception of the presented

data. They affect the emotions and focus of recipient. The participating teams wanted to present the data in more readable form for the recipients. In aspect of color importance, the simplicity and readability are pointed again as significant issue in process of infographics creation. These elements are necessary for unambiguous interpretation of visual data by the audience.

The main factor that appears in all statements in favor of infographics as a medium for a readable presentation of the data is a fact, that data presented with this method can be easily memorized by the recipients.

In the era of Big Data the use of infographics as a main visualization tool to present data obtained through Big Data processes could be an another interesting direction to further research. Apart from the usage of infographics in education discussed in this paper, the adoption of informational and educational aspects of infographics as an element assisting decision support systems could also be verified. For example in the area of visual analytics for making smarter decisions faster.

An important aspect for future studies is why people didn't refer and cite the sources of obtained and presented data. Infographics as an element of data visualization must be reliable. Examining the reasons why the participants have often omitted this fundamental element in infographics, can help us creating infographics as more certain data sources. In the age of information, one of the most popular statements is: "don't believe in everything you read on The Internet".

Easy access to data resources, the availability of various types of data and the possibility for every person to be an author and creator, can be an tremendous progress for us, but also a threat. Understanding why people don't pay attention to citing the original sources will help to develop an effective approach in the education process and to stressing and increasing the level of significance of this element. Especially when everyone can share anything.

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