

How Infographic should be evaluated?

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Abstract–With a little time and too much information to learn, Infographics were used to support as data visualization. Visual communication is communication through visual aids. Visual communication is more effective than reading and hearing information. There are so many infographics for everything; however, how can we know which one has a good or not so good design. The aim of the paper is to clarify the evaluation approach of infographic in many aspects and methods. The paper presents the definition and the uses of infographic in the introduction section. The types of infographics are mentioned with the examples. The trendy multimedia and interactive infographic are introduced. The most important part of the paper is the evaluation approach, which will be addressed with the questions and discussion for infographic developer. The recommendation for infographic designing will be concluded in the last section of the paper.

Keywords- *Infographic, Data Visualization, Information Visualization, Infographic Evaluation*

I. INTRODUCTION

Infographic is data visualizations that present complex information quickly and clearly [1]. As mentioned by Visual.ly, data visualization includes signs, photos, maps, graphics and charts, it presents complex data. The infographic is part of data visualization. The foundation of infographics is composed of three major parts. They are Visual, Content and Knowledge. Visual representations of data, information, and/or knowledge are:

- (1) Visual elements – colors, graphics, signs, icons, maps, etc.
- (2) Content elements –facts, statistics, texts, references, time frames, etc.
- (3) Knowledge –conclusion to express the stories or messages [1].

The infographic design is very significant. The designing process of infographic can help understand and implement the principles of the designs better than designing the web or documents as well. Nevertheless, graphics could fast persuade readers to disregard the article [2]. Now almost everyone is using infographics, such as companies, educators, non-profits organization, etc. The reasons why we need infographics are to communicate a message, to present large amount of information in a compressed and easy way to understand, to expose the data, to determine cause-effect relations, and to classify relationships among data, and to observe changes or trends in data [3]. The tools help integrate these three main components to form nice and well-designed infographics [2]. Importance of infographics are making information more appealing, showing valuable ideas, attention-grabbing, easier to understand, being more persuasive, memorable, easily relay information [4]. The tools help integrate these

three main components (Visual, Contents and Knowledge) to form nice and well-designed infographics. The word “infographic” according to the book of Krum [23] mentioned (based on the data from Google Insights for Search) shows that the last two years (2010-2012) the clearly growth in searching for “infographic” term has been recognized.

II. TYPES OF INFOGRAPHICS

In general, there is the accepted standard in the medium towards exploring new formats based on web mash-ups and data visualization, but not often they aim to make up a space for public debate that provides readers more than just only one platform. Arabic numerals are preferable in infographics; the heading of table should be underlined and centered above them. Human mind can recognize visual information much more successful. With today’s technology, infographics can also be transformed to animated images for the website version [5]. There are many articles and papers mentioned the types of infographics. They are the followings: Ashton [6] said that at least we had many types of infographics coming in all shapes and sizes [7]. The followings are the main types of infographics:

- The Visual Article (Figure 1)
- The Flow chart (Figure 2)
- Useful attraction (Figure 3)
- Number, The Timeline (Figure 4)
- Data Visualization(statistical based) (Figure 5)
- The Compare & Contrast (“VS: Versus”) (Figure 6)
- The Photo (Figure 7)
- How-to (process oriented) (Figure 8)
- Research Results(Figure 9)
- “Did-You-Know?” (Figure 10)



Figure 1. Example of visual story infographic¹(Titanic)



Figure 2. Example of the flow chart infographic²(How Affiliate Marketing Works)



Figure 3. Example of useful attraction infographic³(Travel Like an Athlete)



Figure 4. Example of number, the Timeline infographic⁴(Google Search Timeline)

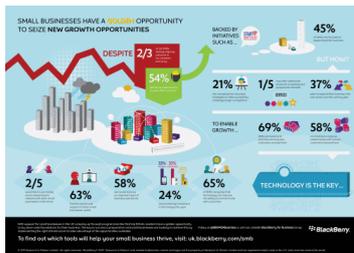


Figure 5. Example of data visualization infographic⁵(Technology is the key)

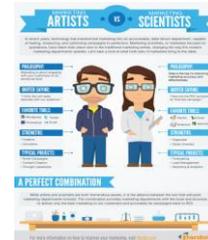


Figure 6. Example of VS infographic⁶



Figure 7. Example of the photo infographic⁷(Wedding Infographic)



Figure 8. Example of how-to (process oriented) infographic⁸(Tie Instruction)

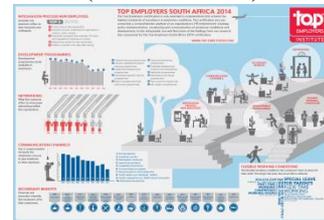


Figure 9. Example of Research Results infographic⁹(Top Employers South Africa 2014)



Figure 10. Example of "Did-You-Know?" infographic¹⁰(Winter Tyre Statistics)

¹ http://thumbnails-visually.netdna-ssl.com/titanic_521df2c4be587_w1500.png

² <http://designwebkit.com/wp-content/uploads/2011/10/Affiliate-Marketing-flowchart.jpg>

³ http://www.jaunted.com/files/6193/Travel_Like_an_Athlete_COMPLETE.jpg

⁴ http://1.bp.blogspot.com/-JMta3XWwP1M/UkSAUDID_ZI/AAAAAAAAAqs/H_JBg0HOaa8/s1600/Screen+Shot+2013-09-26+at+11.40.10+AM.png

⁵ <http://bluehatmarketing.com/wp-content/uploads/2013/02/infographics-and-data-visualisation-image1.png>

⁶ <http://www.pardot.com/wp-content/uploads/2013/01/Marketing-Scientists-vs-Marketing-Artists.png>

⁷ http://fc03.deviantart.net/fs70/i/2013/142/f/b/wedding_infographic_design_by_darkstalkerr-d66603e.jpg

⁸ <http://mlhart.files.wordpress.com/2011/02/tie.jpg>

⁹ <http://www.top-employers.com/PageFiles/6501/Top%20Employers%20South%20Africa%20Research%20Results%202013%20Infographic.png>

¹⁰ http://thumbnails-visually.netdna-ssl.com/did-you-know_50ffd4e64bf9d_w1500.jpg

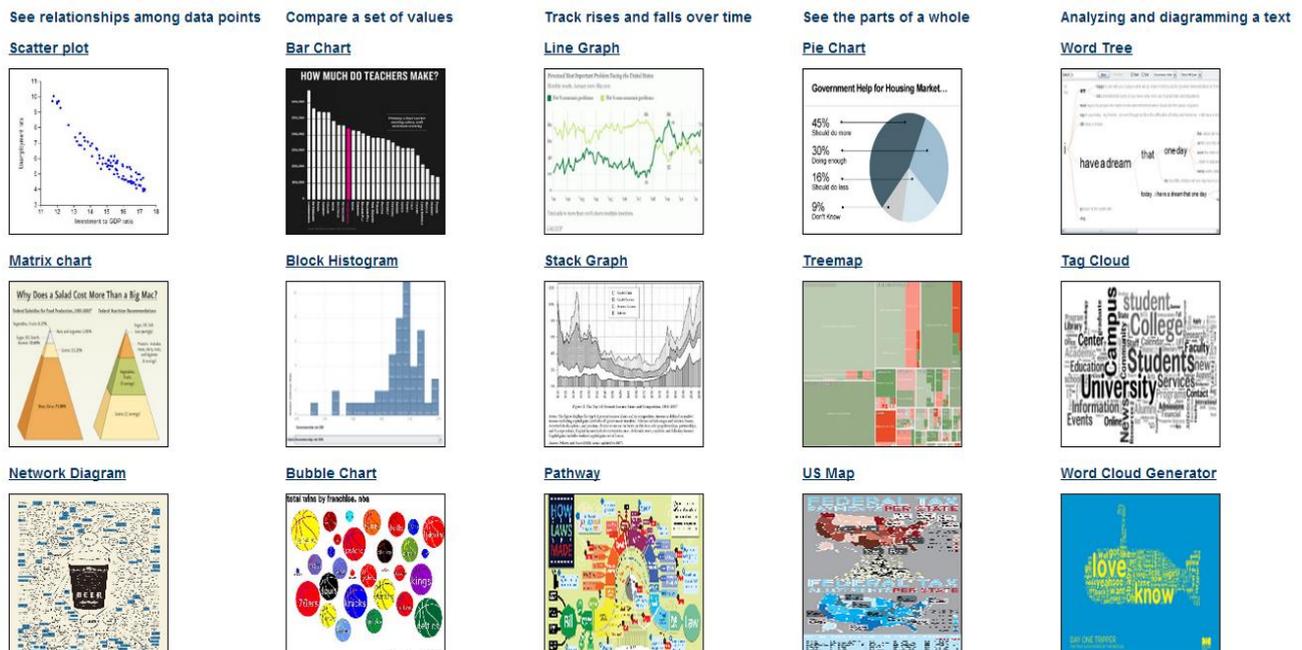


Figure 11. The way to present data in infographic [22]

To create an infographic, one needs the creativity and aesthetic. The infographic creators sometimes have to act as artists. Because the main purpose of infographic is to make people summarize information quickly in the world full of flooding information. Infographic is not made for entertaining only but it should conclude the main ideas/products/services. The infographic creators should consider the foremost structure, accuracy, reliability, depth, and functionality and then think about decoration. The infographic creators must think about whether the decoration is required at all or what type of infographic would appropriate for presenting the main idea. This is not that infographics should not be beautiful. On the other hand, if infographic has been made in order to draw readers and make them feel attracted in contents. If decoration can be the obstacle for readers to understand the main idea of the infographic, possibly the aesthetic or elegance may not be needed.

Linda [8] said in her presentation on website slideshare.com that the infographics need analyzing, evaluation, and creation. To present the huge information in a large set of data, graphs and statistical chart or geographical context to a story with a map need to be applied. These are data visualization tools. The pattern is hidden behind the complexity of tabular forms of numbers and data. The pattern became visible when a human brain can recognize it. The human brain can easily remember things in picture better than texts. The well-built and reasonable presentation of information, graphics, charts, maps and colors are what make infographics noticeable and attract the audience successfully [9]. In Figure 11, it shows the guideline of how creators create the type of graphs or

charts to present or emphasize the different situations. For example, if the creator would like to see the relationships among the data points, the suitable graph or chart type would scatter plot, matrix chart, and network diagram. Line graph, stack graph, and pathway should be used for tracking rises and falls over time. Bar chart, bubble chart, and block histogram are tools for comparing different values with correctness, and a choropleth map is a tool for distinguishing the comparative occurrence of phenomena in an area and can illustrate the piece in the whole map. Good graphics are not just displays; audience can extract information from, but devices to explore information with [10].

III INTERACTIVE, MULTIMEDIA AND VIDEO INFOGRAPHICS

Creating the graphical representation of complex datasets makes it easier to be understood; this is called data visualizations and infographics. One original infographic project is Paris Metro by Harry Beck [14]. The meaning of Harry Beck's map design in 1933 (Figure 12, 13) is widely familiar as one of the Graphic and Information Designs, and became a main persuasion to the underground maps of the world. In year 2009, Mark Ovenden wrote the book called, "Transit Maps of the World", in which he mentioned the map of Harry Beck.



Figure 12.& 13. The old maps used as the infographic.

Nowadays everything is interactive; including interactive infographics which allow the users to interact with the information. They need designers and programmers to create and allow the users to explore the information themselves. One of well-established interactive infographics has been created by news organization like CNN. For example, the CNN Ecosphere uses WebGL to create data visualization; in addition, since the social networking is very well known for everyone, the interactive infographic can help spread the infographic.

The effort for creating good interactive infographics is greatly increasing, nowadays many web-based data visualization tools are making it easier to create interactive infographics, but they still require great effort especially when multiple datasets are being compared [15]. The information can change over time and that can create the interactivities in infographics. The interesting Interactive/Video Infographics sites are as follows:

- <http://www.dipity.com/> (create an interactive online timeline)
- <http://www.tableausoftware.com/public/community> (live metric tracking)
- http://news.bbc.co.uk/2/hi/in_depth/interactives/default.stm
- <http://www.coolinfographics.com/blog/tag/video>
- <http://youtu.be/d0zION8xjBM>
- <http://vimeo.com/9602282>

More and more interactive infographics have been used widely, they are very catchy and improving user-experiences [11]. Some of the most engaging infographics are actually interactive pieces created in Flash or HTML5. More detailed information can be discovered by clicking any words or pictures. The interactivity of the feature is joined with the immediacy and interest that the topic generated combined to create a very successful piece of link attraction [12].

The multimedia infographic allows some interactivity, and the users have an ability to browse the infographic which offers a virtual connection to the content. New technologies can and do encourage designers and visual communicators. Video infographic offers another engaging format for infographics [13]. This will include imaging multiple panes of static or animated infographics with a voice over to tell a story. The impact is more. The moving images are very attractive and they prevent our

concentration to deviate [12]. The advantages of animated infographics are: The benefits of animated infographics¹¹: They are static but particularly ground-breaking and eyes catchy. They facilitate to clarify the difficult and complex idea for examples in medical and health issues. They can be plugged to the blogs and website where static infographics are submitted. In video infographic, the animated text can move towards flying in and out. It will easily receive the main message together with adding to that visuals, background music and sounds. Moreover, the font and its size are very significant. The text must be very clear to the viewers' eyes and the font has fair readability. Animated interactive infographics will happen to common by using Flash or HTML5 in websites; it makes infographics much more interesting same as video infographics.

III. CREATING INFOGRAPHICS

The first way to create an infographic is to hire a designer or agency to create it. This is to make sure that the infographic is visually independent of others and representatives of the brand. Nevertheless, it can be expensive. In the old days we could create infographic using paper, pen, pencils, makers, and rulers. Alternatively, today we use computer software to build nice infographic, which is both faster and easier and even more attractive and multicolored [16]. A different way is to find the suitable websites that offer portfolios or templates of infographic, or information on hiring designers. There are two methods in order to create the proper infographic [1].

1. Build entirely online with infographic website (such as www.visual.ly and www.ease.ly)

- Advantages: easy, quicker, graphics and creation tools provided for you, publish and share

- Disadvantages: limited data input, limited template and design choices, may not be higher for printing, maybe restricted to their website

2. Use image editing software to build infographics (MS Excel, MS PowerPoint or Publisher, Photoshop, and other open source software, such as Paint.Net, Gimp, Inscap, Photoshop Express, Pixlr, Sumopaint, Creately) and also there are many Apple and Android application (Apps) to create the infographic. Then host it online

- Advantages: more design freedom, build it high-resolution for print, use it/output it many formats, host it online easily

- Disadvantages: more work, requires a little knowledge of image editing/design principles, find sources for hosting/sharing

Nonetheless, if we need to build the infographic for specific purpose, here is the first start. Krauss suggested a very useful nine-step process to create the infographic [1] as follows:

¹¹ www.inforgraphicdesignteam.com

1. Gather your data (need numbers from more than once recourses)
2. Determine your purpose
3. Plan your infographic (outline or flow chart)
4. Start laying out your plan with software or an online tool (graphics or photos)
5. Evaluate your data
6. Find the best way in a visual representation (type of charts, and cite data properly)
7. Apply a color scheme & choose fonts
8. Step back and evaluate it, get feedback and edit
9. Caution about the copyright, cite your sources for data, and don't use any image off the web.

There are a number of tools available for creating infographics. Some are more user-friendly than others. Several sites that can be used to visualize information. An incomplete sentence Because of the ability to capture attention and convey information in a straightforward manner, infogr.ams have exploded in use and popularity. Students must be able to understand and analyze information presented in this manner. Production of infographics also demonstrates a student's expertise of advanced cognitive skills, technical skills, and familiarity with varied literacies. The widespread use of infographics arises and with emerging technologies influencing the definition and requirements of "literacy" for current and future students and teachers. They need to embrace new forms of presenting information and use it efficiently.

Things that have to be taken to consideration for the infographic are as follows:

1. What are infographic? definition, purpose, types
2. Are there any standards for infographics? Next generation science standards, ISTE standards-S National Research Council.
3. Why do we use infographics? Require analysis an interpretation, format aids comprehension, visual learners.
4. What are tools for creating the infographics? Ease.ly, Visua.ly, Infogr.am, Piktochart.
5. What goes into infographics, what to consider when using or creating?
6. How do we evaluate infographics?

IV. EVALUATING APPROACH

Anyone can create an infographic and put it on the web. Not all infographics are good or accurate; it is like when we want to validate or evaluate a website. So we should validate an infographic carefully before using it. The downside of infographic is that data can be skewed and/or have a margin of error which would make the data irrelevant. Data is constantly changing on a daily basis, so the information presented could be outdated [1]. Although data visualizations and infographics can be created improperly; putting in too much information (or not enough), using inappropriate types for the information

provided, and unsuitable charts or graphs and other failures are common. To avoid sharing some poorly designed infographics, the audience needs evaluation and checking-questions. The things that we have to consider for infographics in general are: audience, evaluation, purpose, design and bias, readability, interactivity, and social sharing. Usually in order to evaluate how well an infographic designs and creates, there are some of discussion questions [10] to guide how creator thinks and discusses as follows:

Questions about the information:

- ✓ What is useful about putting information in this format?
- ✓ What different pieces of information are included on this poster?
- ✓ What information was included in this poster that allows non-science people to understand the content?
- ✓ Write an abstract about what it is about (two or three sentences that highlights the purpose of the infographic.)
- ✓ What is the infographic about? What story is being told?
- ✓ Does it have a clear and meaningful title? What kind of headlines, intro copy, and labels could it include to make it meaningful for a broad audience?
- ✓ Does it tell a story? What are the most important or surprising points in the data?
- ✓ What do the data mean?
- ✓ Are there sources for the data? Visit the sources? Are they valid websites/sources?
- ✓ Does it tell a story? What are the most important or surprising points in the data?
- ✓ Could we go beyond what is currently presented?
- ✓ Can we provide a better context for the data?
- ✓ Are there spelling or grammar errors? (if there are errors, chances are there are errors in the data)

Questions about aesthetics of text, photo, object, and color:

- ✓ How are colors used differently in each one? Are some colors more powerful than others?
- ✓ How are objects displayed on each one? Do sizes of the objects matter in presentation the proposed information?
- ✓ How could colors, sizes, and kinds of objects be used to give the wrong impression about people away from the data?
- ✓ Can we emphasize them by some means?
- ✓ How do the words support or distract from the message?
- ✓ How are colors used differently in each one? Are some colors more powerful than others?
- ✓ What other variables should be gathered/analyzed if we want to give an accurate portrait of the topic the graphic covers?

Questions about the overall assessment:

- ✓ Make notes about what you notice and like/don't like about the infographics.
- ✓ Is it legible? Can you read it and make sense of it?
- ✓ Can you sum up the point or message in two sentences or less?
- ✓ Who is the author? Is there any credit or information to identify the author as reputable?
- ✓ Is this infographic really “functional” in the sense of facilitating basic, predictable tasks (comparing, relating variables, etc.)?

Questions about the charts or graphs types:

- ✓ Why would this be better than just showing the formulas or using just a bar graph?
- ✓ Color and graphics? Are they legible and easy to read?

Lynda.com mentioned in the tutorial video about the five attributes of great infographic, they are contrast, hierarchy, accuracy, relevance, and truth [19]. University of Mary Washington, infographics blog presented the idea of

characteristics of an effective infographic [20] in [1] show the summaries four main categories were identified: Usefulness, Legibility, Design and Aesthetics.

Usefulness: Easy to understand, Clear purpose, Reliable data (sources cited), Informative – viewer learns something.

Legibility: Easy to read, Color scheme should not hinder ability to read, Graphs/diagrams labeled appropriately, Font choice, size and color used to make legible.

Design: Graphics should reflect purpose and audience, Graphics are good quality, not distracting and consistent, Space used effectively (no excess clutter), Appropriate use contrast and color.

Aesthetics: Easy to follow, overall design facilitates understanding, Hierarchy/organization of data.

Also we can create those questions as the questionnaire or form filled. The example of infographic evaluation form is shown in Figure 14.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	children Strongly Disagree	children Disagree	children Neutral	children Agree	children Strongly Agree
Other (please specify)					
8. Which chapter/section did you enjoy most?					
<input type="radio"/>	chapter 1				
<input type="radio"/>	chapter 2				
<input type="radio"/>	chapter 3				
<input type="radio"/>	chapter 4				
<input type="radio"/>	chapter 5				
<input type="radio"/>	chapter 6				
9. Why? (multiple choices allowed)					
<input type="checkbox"/>	It was more amusing				
<input type="checkbox"/>	I preferred the information				
<input type="checkbox"/>	I preferred the way the story was visualised				
<input type="checkbox"/>	I preferred the characters				
Other (please specify)					
10. What is your opinion on the way the characters are visualised?					

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I was able to recognise the characters	<input type="radio"/> I was able to recognise the characters Strongly Disagree	<input type="radio"/> I was able to recognise the characters Disagree	<input type="radio"/> I was able to recognise the characters Neutral	<input type="radio"/> I was able to recognise the characters Agree	<input type="radio"/> I was able to recognise the characters Strongly Agree
I could relate to the characters	<input type="radio"/> I could relate to the characters Strongly Disagree	<input type="radio"/> I could relate to the characters Disagree	<input type="radio"/> I could relate to the characters Neutral	<input type="radio"/> I could relate to the characters Agree	<input type="radio"/> I could relate to the characters Strongly Agree
The characters are expressive	<input type="radio"/> The characters are expressive Strongly Disagree	<input type="radio"/> The characters are expressive Disagree	<input type="radio"/> The characters are expressive Neutral	<input type="radio"/> The characters are expressive Agree	<input type="radio"/> The characters are expressive Strongly Agree
The characters made me smile	<input type="radio"/> The characters made me smile Strongly Disagree	<input type="radio"/> The characters made me smile Disagree	<input type="radio"/> The characters made me smile Neutral	<input type="radio"/> The characters made me smile Agree	<input type="radio"/> The characters made me smile Strongly Agree
Other (please specify)					

Figure 14. The example of evaluation form¹² for Alice in wonderland infographic

¹² <http://www.surveymonkey.com/r/?sm=zFaXDdelKIWwOD5cHeTAIQ%3d%3d>

IV. CONCLUSION AND RECOMMENDATION

Infographics present information in a limited space and an artistic format. They are able to quickly pass on facts and keep the readers reading it. They give important data/information and are enjoyable to read and understand. Infographics become popular in web 2.0, because they are data in graphic illustrative form which makes it easier for readers to look at and digest [17] in [18]. Infographics show how the advertising of data and information can be ordered/arranged and offered to integrate the summarize ideas [21]. For the website, with the advanced technology, infographic can be integrated with multimedia concept by adding together the sound and motion. However, as mentioned in [16] and [12], infographics are not a substitute when we do not have real information/facts. It means that ethical issue is very important, always use the actual data; they should be done without estimating at or making up data to add the missing information. Animated interactive infographics will happen to common by using HTML5 in websites; it makes infographics much more interesting.

Considering the infographic as a tool for helping human extend capacities beyond the brain limitation, physical tools like tangible things can help human life easier, such as Notebook [22], Mobile Phone, etc. Non-physical tools (or sets of tools and practices), for instance statistical data and the scientific method, developed for helping the audience look beyond what would normally see, and to overcome biases and some negative habits of mind. The same is true for great visual displays of information.

When constructing an infographic, one must consider how best to get across the information and the purpose. Elements of design factor into this; the visuals need to support the information and should not detract from it. The purpose of the infographic informs how information is presented (i.e. statistically, linearly, and procedurally) as well as the images used. When people interact with infographics in two primary ways which are as consumers and as creators of learning (or cognitive processes) measure when human is ready to move from a consumer to a creator. Humans must be able to remember and understand information before they are able to analyze or evaluate and finally synthesize or create it. Additionally, there are certain skills necessary to create an infographic, both technical and literacy-based. We can see from all the questions for infographic evaluation that there are many questions about what information and data should be used and they have to be correct. The presentation should be only beautiful and attractive, but that is a secondary component of their quality. They are, above all, accurate [10]. Every single detail is double-checked and reviewed by experts; every line, patch, and shade of color has a meaning and a function. So the evaluation is matter because it can help creating the good infographic and make it easier for the audience/user/people to understand the main idea of the infographic.

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