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DATA VISUALIZATION FOR CONTENT MARKETING DOMAIN IN SOCIAL MEDIA

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Abstract

The purpose of this research is to determine the proper data visualization on the domain of content marketing in social media. Based on interviews with marketers, they need a lot of time to read information from social media data to create content marketing strategy. It occurs due to inappropriate forms of data visualization, so that the data must be analysed again to get the desired information. To overcome this problem, further analysis is needed to know what kind of data visualization is suitable in the domain of content marketing on social media. The research method consisted of nine steps and used techniques such as empathy map, statistics, data mining, data visualization technique, acceptance testing, and usability testing to generate proper data visualization. To know if the data visualization is correct, acceptance testing was carried out on data visualization and usability testing on the prototype. Acceptance testing results indicated that 100% of the designed visualization forms are accepted. In addition, the results of usability testing on the prototype showed that effectiveness and efficiency reach 100%. From these results, it was concluded that visualization of data in the domain of content marketing on social media is made correctly.

Keywords: Content marketing, Data mining, Data visualization, Statistics, Social media.

1. Introduction

Content marketing is now widely used by marketers to attract customers. It is a marketing process to create and distribute content that aims to give appeal to the intended target audience [1]. The crucial thing in content marketing is the content marketing strategy. However, 62% of marketers do not have a solid strategy [2]. Several well-known brands use a data-driven approach to create a solid strategy. One source of data that can be used to create a content marketing strategy is social media. Social media produce a very large amount of data. The huge data can be a tremendous opportunity for marketers to improve marketing content strategies, such as understanding the target audience and content discovery [3].

Based on this phenomenon, an interview was conducted with one of the marketers. The problem that arises is that marketers need a lot of time to read information from the required social media data for content marketing, such as target audience segmentation. The main difficulty factor is because social media used by marketers provides an inappropriate form of data visualization. Therefore, the data must be reanalysed to get the desired information. The use of several techniques such as personas, statistics, data mining, and data visualization techniques were used to produce accurate data visualizations. To find out that the data visualization is correct, acceptance testing is carried out on the data visualization and usability testing on the prototype.

An effective way to present detailed data into information that is easily accepted is through the process of abstraction into visual information [4]. As explained earlier, marketers need a significant amount of time to read information from social media data relating to content marketing strategies. Therefore, further analysis is needed to determine what kind of data visualization is suitable on the domain of content marketing in social media. The resulting knowledge is used to create data visualizations right on the domain of content marketing in social media for marketers. The purpose of this research is to produce appropriate data visualization in the content marketing domain on social media for marketers.

2. Method

The research methodology was inspired by the book "Visualizing Data" which consists of seven steps namely acquire, parse, filter, mine, represent, refine, and interact [4]. The methodology adapted to the needs of this research is shown in Fig. 1.

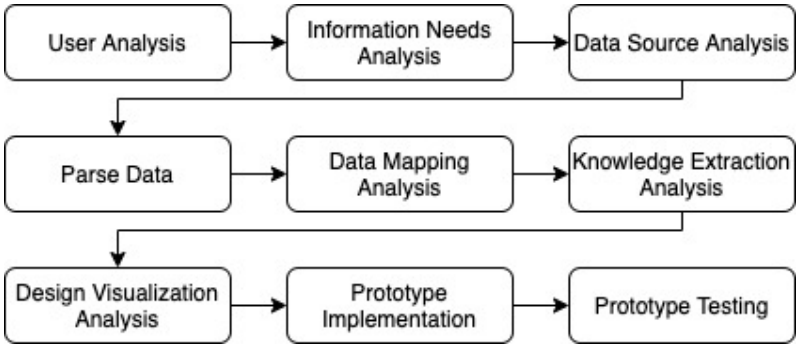

Fig. 1. Research methodology.

3. Results and Discussion

All stages in the research methodology are explained in more detail in this section. The explanation consists of input, process, and output for each stage.

3.1. User analysis

A good data visualization is well supported by identifying the users who read the visualization itself [4]. To identify the user, the technique used was interview. In this research, two marketers were interviewed. The interview is divided into three sections namely opener question, daily task, and use of content marketing tools section. The example question of each section is shown in Table 1.

Table 1. Interview section.

Section	Sample Question
Starter question	**What is your role in the content marketing team?**
Daily task question	**What activities do you do every day associated with content marketing?**
Use of content marketing tools question	**What difficulty do you face when using content marketing tools?**

The result of the interview is qualitative data. In this research, the empathy map is used as a tool to illustrate the interview result which is shown in Fig. 2. The result shows that the user has two pain points namely spending too much time to get and analyse the information about the target audience as well as finding a reason why the published content is not going well. Then, this empathy map is used as an archetype user to analyse, design, and test the data visualization in this research.

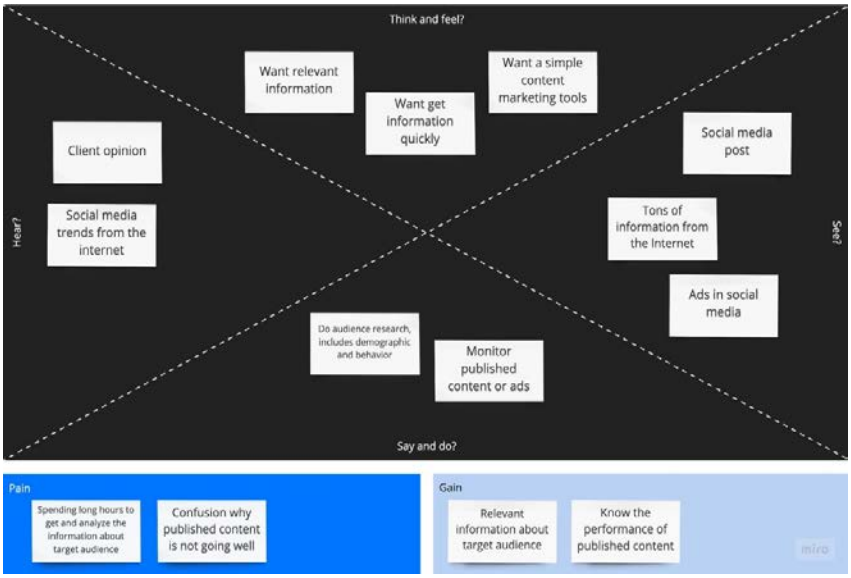

Fig. 2. Empathy map.

3.2. Information needs analysis

Stages in analysing information need to be implemented to determine what information is needed by marketers in the content marketing domain in social media [5]. Empathy map from the previous stage is used to determine the information needs. Furthermore, the pain and gain points outlined the information needs. The sample of information needs is shown in Table 2.

Table 2. Information needs.

Pain	Gain	Information Needs
Spending too much time to get and analyse the information of the target audience	Getting relevant information about the target audience quickly	How to know a segment interest of target audiences?
Finding a reason why the published content is not going well	Knowing the performance of published content	How to know the sentiment score from the post?

Based on the results of pain and gain analysis sections from the empathy map, nine information needs are generated. These information needs are used as a reference for visualizing the data on the domain of content marketing in social media.

3.3. Data source analysis

Data source analysis was conducted to analyse the characteristics of the data used [6]. The data source used is from Twitter. The data were obtained through a RESTful API provided by Twitter. Twitter data can be accessed through a specific endpoint [7]. The complete list of Twitter API endpoint can be accessed at https://developer.twitter.com/en/docs/api-reference-index. Example endpoint of Twitter API is shown in Table 3.

Table 3. Example of Twitter API.

Method	Endpoint Path	Output	URL Documentation
GET	users/show	User Object	https://developer.twitter.com/en/docs/accounts-and-users/follow-search-get-users/api-reference/get-users-show

Twitter API can be accessed through endpoints based on its features. The data obtained shaped as JSON (JavaScript Object Notation). It contains Twitter data objects, where the data objects are divided into several types, namely tweet objects, user objects, entities object, and geo objects.

3.4. Parse data

Parse data stage is carried out to make the data easier to be processed [7]. In this stage, text pre-processing and format conversion of data into a document-based database are done.

3.4.1. Text pre-processing

Text pre-processing stage is carried out because tweets data objects contain text is not structured. Data from a more structured pre-processing facilitates data mining stage [8]. The steps are shown in Fig. 3.

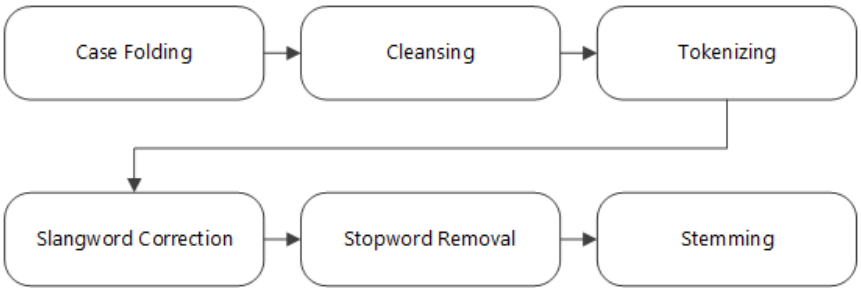

Fig. 3. Text pre-processing steps.

The sample result for a tweet that being pre-processed is shown in Table 4.

Table 4. Sample result of text pre-processing.

Input	Output
Pagi yg menyenangkan. Cari bubur mantap utk sarapan. https://t.co	[pagi, senang, cari, bubur, mantap, sarapan]

3.4.2. Document and data structure formation

Document-based database offers a good performance and scalability [9]. To make it easier to process data in the next stage, four types of documents were formed. Documents that formed are user documents, followers' document, and mention document. Endpoint used and output objects of the document formed is shown in Table 5.

This stage produces three documents. The documents are user documents, followers document, and mentions document. The documents were used as a data source for the visualization.

3.5. Data mapping analysis

Data mapping stage was conducted to choose, and map data based on the information needs [9]. Mapping data to the sample information is shown in Table 6.

3.6. Knowledge extraction analysis

The data that have been obtained and mapped are then performed statistical calculations or data mining methods to extract useful information. Data mining technique is used because it can be used to analyse the data and summarize it into a useful information [9]. This stage also determines whether the information needs of an exploratory analysis to understand the context of the information needs. Therefore, it can be concluded if the information needs require knowledge extraction method. The knowledge extraction method mapping is also depended on

the characteristic of the data [10]. The knowledge extraction method mapping to sample information needs is shown in Table 7.

Table 5. Document formation.

Method	Endpoint	Output

User Document	followers/list
	users/show
		{
		"**_id**":String,
		"**user_profile**":{
		…
		},
		"**user_tweets**":[
		...
		]
		}

Followers Document	followers/list
	users/show
	statuses/user_timeline
		{
		"**_id**":String,
		"**following**":{
		…
		},
		"**follower_profile**":{
		...
		},
		"**follower_tweets**":[
		...
		],
		}

Mention Document	users/show
	statuses/mention_timeline
		{
		"**_id**":String,
		"**user_profile**":{
		…
		},
		"**user_mentions**":[
		...
		]
		}

Table 6. Mapping data to information needs.

Gain	Information Needs	Document Used
Getting relevant information on the target audience quickly	How to know the interest of a segment of the target audience?	User document, Followers document
Knowing the performance of published content	How to know the sentiment score from the post?	User document, Mention document

Table 7. Mapping knowledge extraction method.

Gain	Information Needs	Exploration Type	Method
Getting relevant information on the target audience quickly	Information to determine the interests of the target audience segment	Exploratory	Classification, Statistics (distribution frequency and mode)
Knowing the performance of published content	Information to find out the sentiment score of the post	Exploratory	Classification, Statistics (distribution frequency and mode)

3.7. Design visualization analysis

Design visualization analysis includes four steps that were inspired in the "storytelling with data" book. The steps are understanding the context, choosing the appropriate form of visualization, eliminating clutter, focusing attention, and testing the acceptance [11]. In this stage, the information needs used a sample, which is "How to know the interest of a segment of the target audience?".

3.7.1. Understanding context

Understanding the context of information needs is done by describing the context of who needs the information, what information will be delivered, and how the information is delivered. The example of context description is shown in Table 8.

Table 8. Understanding context.

Who	What	How
A content marketer	Knowing the interest of a segment of the target audience	Displays a comparison of the interests list of a target audience segment

3.7.2. Choosing appropriate type of visualization

Choosing an appropriate type of visualization is done by analysing how to understand the context stage. The example of choosing the appropriate type of visualization is shown in Table 9.

Table 9. Choosing appropriate type of visualization.

How	Visualization Type	Why
Displays a comparison of the interests list of a target audience segment	Horizontal bar chart	Compare several categories

3.7.3. Eliminating clutter

Data visualization is in accordance with principles that are not contain clutter. The visualization sketch should be made (See Fig. 4). The sketch is analysed and should not contain clutter.

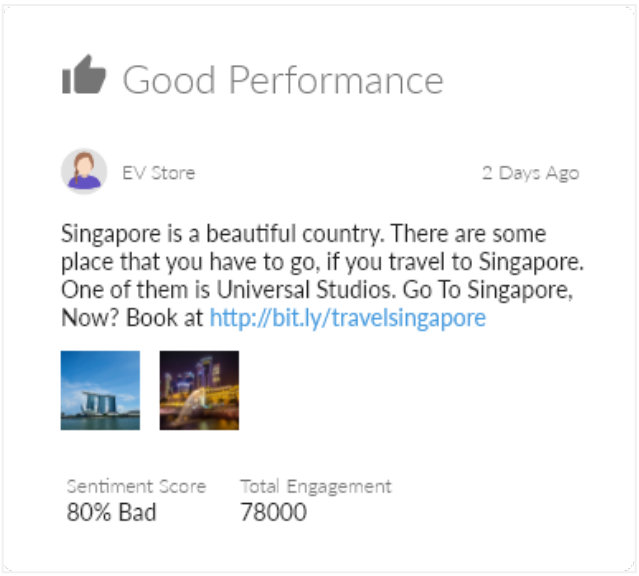

Fig. 4. Sketch of visualization.

The example of clutter analysis is shown in Table 10.

Table 10. Clutter analysis.

Principle	Explanation	Checklist
Alignment	Alignment used is left-aligned because reading information can be easier	✓
White space	White space is only used as a margin between components, so they do not overlap	✓
Closure	There is no unnecessary border on data visualization	✓
Continuity	Remove the y-axis border because the bar always starts from the same point so there is no interference between the label and the bar	✓

3.7.4. Focusing attention

Focusing attention was made to focus the user on the information. It is important to the user. The example of focusing attention analysis is shown in Table 11.

Table 11. Focusing attention.

How	Focused Information	Preattentive Attributes
Displays a comparison of the interests list of a target audience segment	Most dominant interest	Colour

The result of visualization after focusing the attention is shown in Fig. 5.

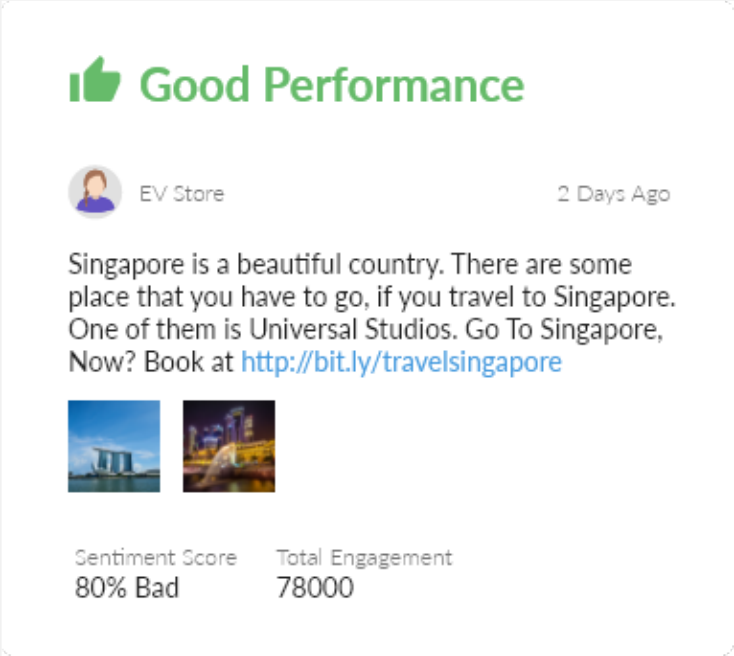

Fig. 5. Visualization that has been focused.

3.7.5. Acceptance testing

Testing is done by acceptance testing. The result of acceptance testing is shown in Table 12.

Table 12. Acceptance testing.

Actual Information	Obtained Information	Comment	Result
Comparison of the interests list of a target audience segment	Comparison of the interests list of a target audience segment	No comment	Accepted

A good data visualization can give the user a right information [12, 13]. Therefore, the acceptance criteria of this testing are the correct information obtained with no additional comment. The conclusion from acceptance testing is that the form of visualization is appropriate.

3.8. Prototype implementation

Data visualization was made in prototype form. Sequence information on the prototype is based on the card sorting results. It was grouping by the empathy maps pain and gain [12]. The prototype is shown in Figs. 6 and 7.

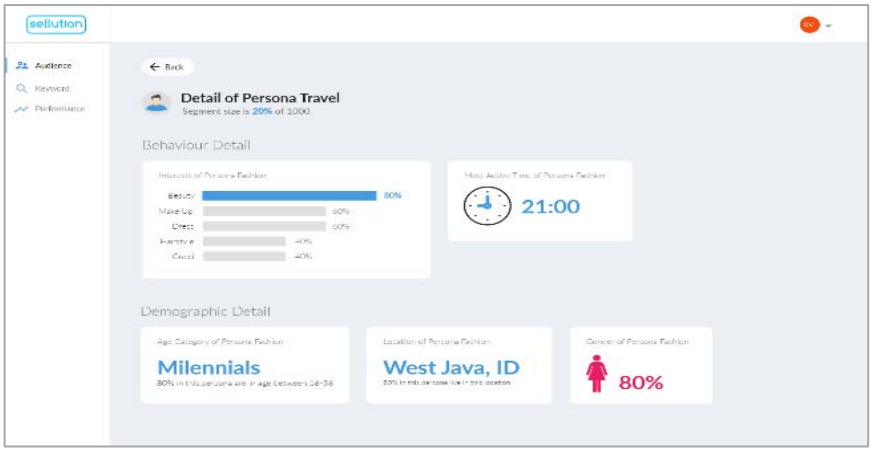

Fig. 6. Prototype of first group.

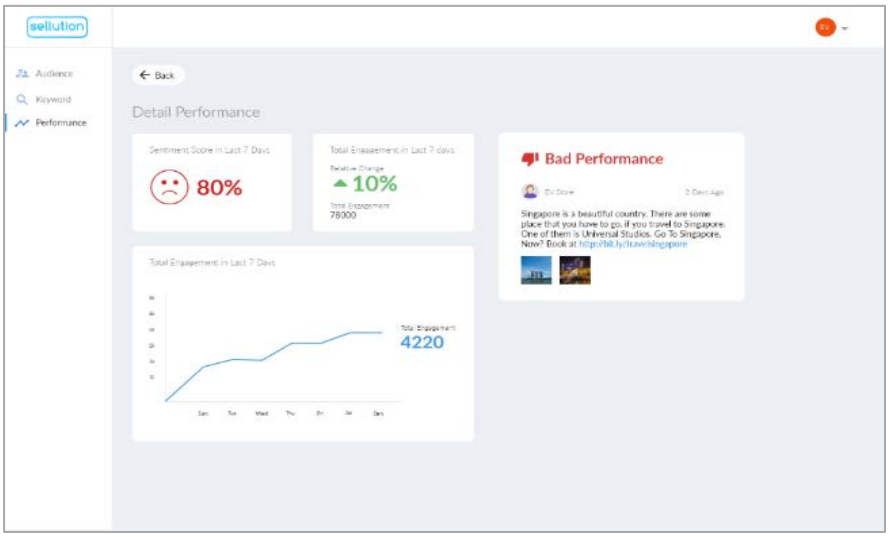

Fig. 7. Prototype of second group.

3.9. Prototype testing

Tests on a prototype was using usability testing techniques [13]. Scenario testing is divided based on the gain in the empathy map. There are two scenarios given to the user. The effectiveness and efficiency level are 100%, respectively.

4. Conclusion

Based on this research, the data visualization can increase the efficiency and effectiveness level of the content marketing research on social media. For the next research, there are a lot of data in social media that can be explored, and the data source are various.

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