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Abstract: The aim of this article is to identify the factors affecting customer attitudes toward SMS advertising in the Palestinian banking sector using data clustering. A survey questionnaire was designed and distributed to collect primary data. In total 412 usable questionnaires were analyzed using data clustering. The findings reveal that relevancy, entertainment, informativeness, and creditability have positive impact on the attitudes of the Palestinian customers towards the Banks' SMS advertising. Data clustering, however, provided empirical evidence that most of the respondents are annoyed by the SMS advertising which requires developing policies and procedures at the bank level to get the customers consent (permission) to receive SMS advertisements prior to sending them to customers.

1 Introduction

According to Varnali [1], the rapid advancement of technology and the increasing number of mobile phone owners in addition to the creation of social media channels, has created new markets and niches were created. These changes also created new marketing communication channels such as SMS, E-mail, and MMS [2]. There are more mobile devices on the world than humans, and the number is expected to increase year after year [3]. According to Statista [4], the global number of mobile phone users reached 7.26 billion in 2022 of which 6.64 billion are smartphone users. More than 90% of mobile phone users pointed out that they send or receive at least one text message every week. This demonstrates the global importance and popularity of SMS advertising [5].

SMS is an effective marketing tool [6,7]. According to the International Telecommunications Union [8], mobile phone subscriptions increased by nearly 54.1 percent from 2010 to 2020, and the use of mobile devices for advertising grew due to the increased use of phone calls [9], and especially SMS, which resulted in customers being more engaged with the organizations' products [10]. As a result, given the importance of SMS advertising to advertisers, it's vital to understand the drivers and barriers to SMS advertising. Dix et al., [11] found that SMS advertising has been successful as a brand vehicle as well as a stimulant for customer

reactions which makes SMS advertising unique for businesses to reach out to customers (e.g., [12]).

The banking industry is one of the sectors at the forefront of SMS marketing. Many prior studies have been undertaken in different countries to explore customer attitudes. According to the Palestinian Monetary Authority (PMA) [13], there are 13 registered banks in Gaza and the West Bank, with 378 branches. In addition, there are around 7366 people employed in the Palestinian banking industry. SMS advertising has exploded in popularity in Western and European nations, but it is still in its infancy in the Middle East and Asia [14].

According to established marketing theories such as the theory of reasoned action (TRA) [15], the theory of planned behavior (TPB) [16], and the uses and gratifications theory (U&G) [17], consumer attitudes toward advertising influence their behavioral reactions. The technology acceptance model (TAM) [18] was based on TRA and has recently been expanded to include new technology/medium adoption. The current study provides and assesses a research model that includes TRA, TAM, U&G, and previous research into SMS advertising based on the principles of these theories utilizing data clustering approach.

The contributions of this study include theoretical and practical aspects: The theoretical aspects: SMS advertising is a unique advertising technique that depends on the validity of prior research on advertising efficacy. We begin by

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analyzing the specific qualities of SMS communication in order to obtain insight into the effectiveness of SMS advertising. Relevancy, entertainment, informativeness, irritation, and credibility may become crucial variables since SMS is a personal, highly interactive, and culturally sensitive medium. Second, examining Palestinian customers' attitudes toward SMS advertising contributes to the ongoing studies on the field. Understanding customer attitudes toward SMS advertising is crucial, since this information might be used in the establishment of policies focused on increasing ad delivery via mobile technology. Consumer attitudes of SMS advertising, as well as other interactive advertising, are likely to influence mobile advertising intentions and behavior. Finally, as a practical contribution, the full grasp of advertising efficacy from the perspective of consumers helps marketers to build successful marketing strategies with some helpful recommendations.

The remainder of the paper is divided into the following sections: The theoretical framework is presented in Section 2. The methodology is discussed in Section 3. In Section 4, experiment results are summarized. The conclusion is discussed in Section 5.

2 Theoretical framework

2.1 Attitudes towards SMS advertising

For Haddock & Maio [19], attitude creates a pattern in which people infer an individual's level of likeness or hate for a given issue. This study just focuses on SMS advertising being a small fraction of the overall mobile advertising alternatives, which account for the majority of total digital advertising. People prefer to get relevant information and offers via SMS [20]. The popularity of SMS mobile advertising originates from the fact that it is easily accessible to customers as the mobile phone is a pocket-sized portable device that is always with the prospective customer. SMS advertising is the most popular and simplest strategy to reach customers in a nation like Palestine, where dealing with new generations of broadband cellular network technology is limited due to the unique Palestinian political context [21]. However, because consumer attitude is the driving force behind consumer behavior, researchers agree that advertising efforts will be wasted due to perceptual blocking and selective distortion if they do not encourage the positive attitude to shine brighter than the negative one [22].

2.2 Factors affecting SMS advertising

Relevancy: Relevant SMS advertising content can be explained from two perspectives: (1) sending SMS advertisements that are relevant to consumers' interests. This will influence their perception of SMS advertising as a valuable service; and (2) SMS advertisements add value to consumers when they are appropriately delivered at the right time [23]. In order for advertisements to be effective, they must be relevant. According to Alalwan [24], SMS

advertising are appreciated by customers when they are received at a vital time and location. Therefore, marketers should consider the customers' circumstances by delivering appropriate SMS advertising with valuable information or shortening the time required to profit from the sellers' services [25].

Entertainment: Entertainment as defined by Lee & Cho, [26] is the desire to satisfy an audience's demand for escape, distraction, esthetic fulfillment, or emotional delight. The advertising value of entertainment is directly proportional to the advertising value of traditional advertising [27]. Sung [28] stated that entertainment has evolved into one of the most important advertising building criteria, and it is now employed to attract customers and boost advertising effectiveness. Consumer attitudes were positively influenced by SMS advertising entertainment. The most important relationship among other elements is the favorable relationship between SMS entertainment and customer perceptions [29].

Informativeness: Sharma et al., [30] defined informativeness as the delivery of information to consumers through promoting product features that meet their prospective pleasure. Advertising is used to inform customers about new products, their features, and their prices. Informativeness is regarded a beneficial advertising criterion since it provides consumers with helpful information [31]. Consumer SMS information should be timely, reliable, and valuable in order to encourage them to respond to advertisements [32]. Informativeness has the ability to alter recognition, attitude, satisfaction, and the outcome of resource provision. According to Peifer et al., [33], people's perceptions of informativeness are based on their assessment of whether all of the information they get is valuable or not.

Irritation: Unless they have given their approval, most consumers have a negative attitude towards mobile advertising [34]. As a result, any SMS marketing to potential clients should always be preceded by their permission. Consumers may react badly to SMS advertising if this is not done. Gutierrez et al., [35] consider consumer permission a key component in determining how consumers feel about SMS advertising. As a result, having an interactive two-way SMS service allows the advertiser to develop a communication channel with the target audience, where the audience is expected to reply to SMS messages in order to demonstrate satisfaction with the SMS marketing campaign [36].

Credibility: Credibility is the degree to which the customer recognizes true and believable promises made about the brand in the advertisement [37]. According to Hani et al., [38], a variety of elements influence the credibility of an advertising, particularly the reputation of the business and the advertisement carrier. Furthermore, Haider and Shakib [39] pointed out that the method by which the communication is delivered often affects trust. Email communications, for example, have little credibility unless

they are communicated in textual form by a well-known brand. Consumer attitudes towards SMS advertising's credibility value are shown to be substantially linked to consumer views regarding SMS advertising in general [40]. Consumers' attitudes about advertisements will be negatively affected if they do not believe the advertisements are trustworthy [41].

3 Methodology

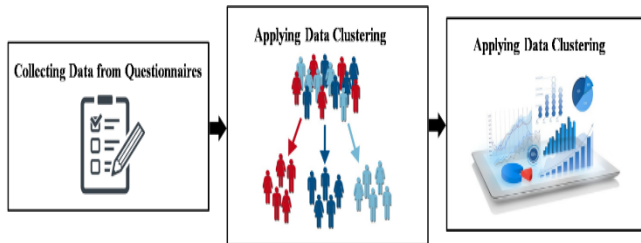In this section, we describe the applied procedures in a graph as shown in Fig. 1.

Fig. 1: The applied procedures

3.1 Participants

The questionnaire was completed and returned by 412 respondents. Fig. 2 reveals that there were 254 males and 158 females among the respondents. The majority of respondents (281) had a bachelor's degree, and 383 of them were under the age of 45.
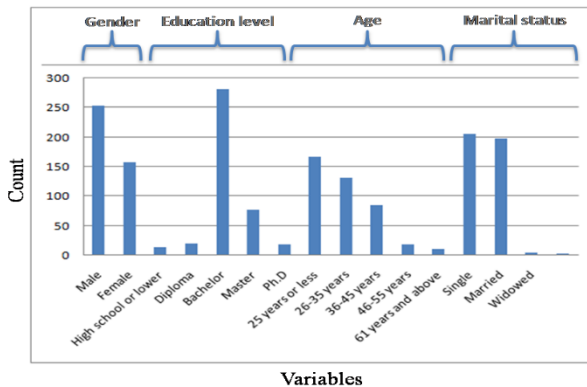

Fig. 2: Respondents' demographics

3.2 Procedures

In order to analyze factors affecting customer attitudes toward SMS advertising in the Palestinian banking sector by using data clustering, a questionnaire was performed using a Google form, served as the major data collection method for the study. The URL for the Google form was extensively shared on social media (Facebook, WhatsApp, and emails).

To meet with local language limits, the original questionnaire was accurately translated into Arabic. It was then reviewed and pilot tested for correctness by two native Arabic speakers.

3.3 Measures

A 5-point Likert scale questionnaire was used to conduct the assessment (1 = strongly disagree, 2 = disagree, 3 = no opinion/neutral, 4 = agree, and 5 = strongly agree). It was divided into six sections. The first section evaluates the relevancy of SMS advertising by using three items derived from Qousa and Wady [42]. The second portion, which was developed in relation to Aydin and Karamehmet [43], assesses the entertainment using four items. Three items were designed in accordance with Qousa and Wady [42] for the third section, which dealt with informativeness. The fourth section assessed at the degree of irritation by using four items from Rajesh et al [36]. Furthermore, the fifth portion assessed credibility using five questions derived from Zabadi et al., [44]. Finally, the sixth section, which was adapted from Eshra and Beshir [10], employed five items to determine the attitude toward SMS advertising.

3.4 Experiment Setup

The purpose of the current work is to employ data clustering for splitting consumers into groups based on their responses to the questionnaire. To cluster data, we use the K- means algorithm [45]. In the Google Colab environment, all of the tests were run using the Python programming language. The following are the packages that were used in the experiment:

• Numpy and Pandas are used to manipulate data.

• Scikit learn is used to implement machine learning models.

• Matplotlib is a data visualization and graphing application.

• Scipy represents hierarchical clustering with a dendrogram.

• Seaborn creates graphs.

4 Experiment Results

Several experiments have been conducted to analyze factors affecting customer attitudes toward SMS advertising in the Palestinian banking sector using data clustering. Cluster analysis was used to group the responses of the customers and analyze their attitudes. To identify the best number of clusters, we used the Elbow evaluation measure. We calculated the Calinski Harabasz Score for each number of clusters (K) [46]. Where K is an integer between 2 and 9. Fig. 3 shows that the best number of clusters is two since the highest score is set at this value. As a consequence of their responses, two groups of consumers have emerged. To validate our work, we used also Sihouette Score [47] as show in Fig. 4. This metric is broadly used for calculating the goodness of data clustering.
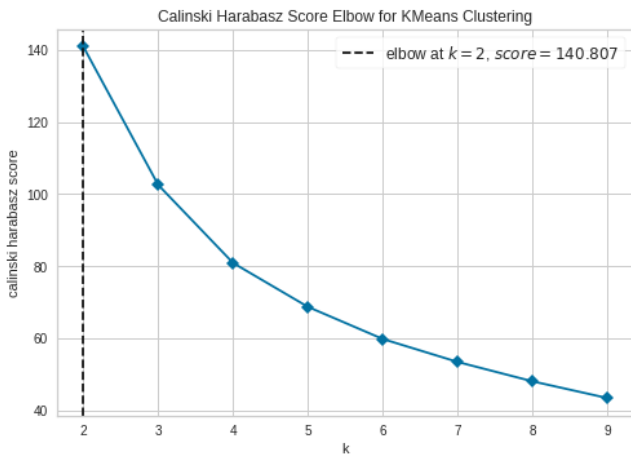
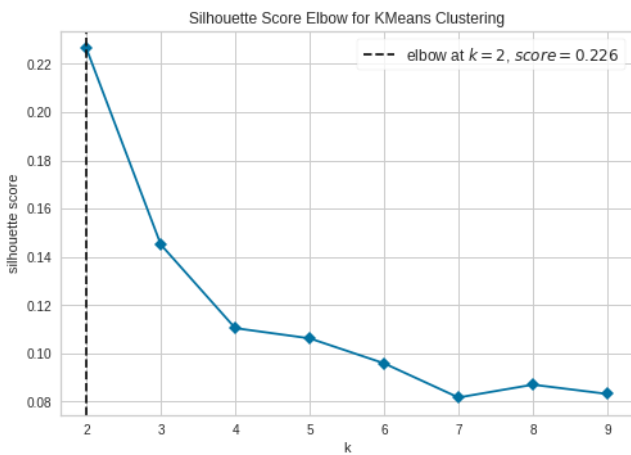**Fig. 3**: Elbow evaluation measure with Calinski Harabasz Score

Fig. 4: Elbow evaluation measure with Sihouette Score

To visualize the cluster analysis results, we used principal component analysis (PCA) to transform the data into two dimensions [48]. This technique provides competitive results in comparison with other related tools. The K-means method was then applied to the two-dimensional data [49]. Fig. 5 shows the two clusters (groups) that resulted from applying data clustering. The first cluster includes 255 samples. While, the second one has 157 samples.
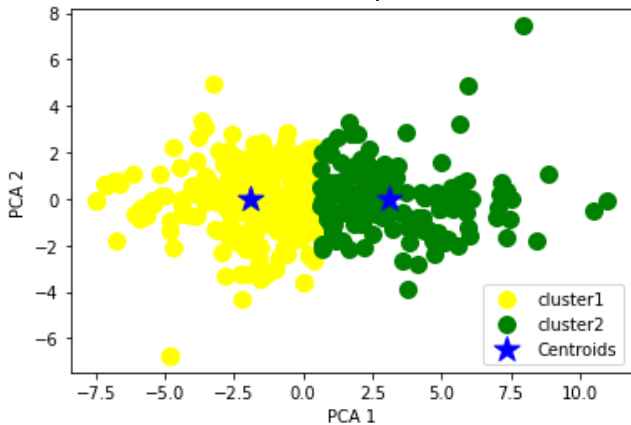

Fig. 5: Results of applying K-means with PCA

We used additional data clustering technique for a more in-depth investigation of factors affecting customer attitudes toward SMS advertising in the Palestinian banking sector. As illustrated in Fig. 6, we used a hierarchical clustering Dendrogram to visualize all linkages between consumer responses. In this graph, there are two notable clusters.
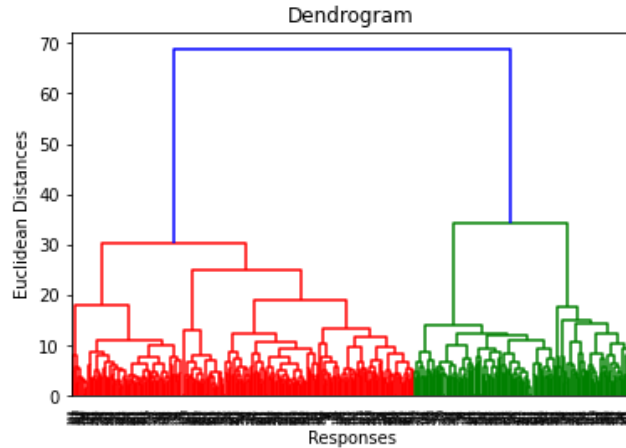

Fig. 6: Hierarchal clustering Dendrogram

As a result, we have been inspired to explore further into the two groups by analyzing each cluster individually. We analyzed each cluster by using different techniques. One of these techniques is based on studying the effect of the demographic variables on the cluster analysis. Fig. 7 shows that the demographic variables do not affect the results of data clustering. This is attributed to the fact that the distribution is compatible with the whole dataset (see Fig. 2).

Fig. 7: Cluster analysis with selected variables

Moreover, we analyzed each cluster using violin plots. Each plot shows the distribution of responses towards the survey questions. Figs. 8 and 9 show the analysis of first and second clusters respectively. According to the findings, there is no significant attention with the second cluster (Fig. 9). While, the analysis of first cluster (Fig. 8) shows some gaps that should be addressed.
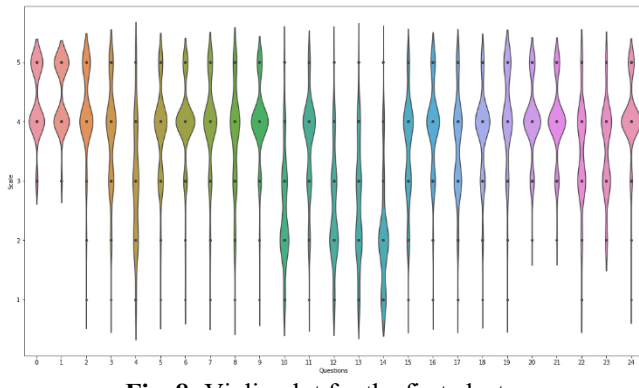
Fig. 8: Violin plot for the first cluster
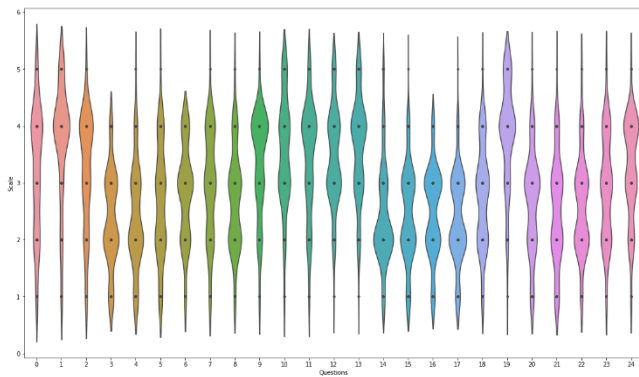
Fig. 9: Violin plot the second cluster

It is clear from figs. 8 and 9 that all respondents prefer to receive text messages that fit their needs as evident from their responses to questions 0 and 1. However, dividing the responses into two clusters (first cluster includes 255 responses and the second one has 157 responses) provided evidence that relevancy, entertainment, informativeness, creditability, and within the cultural context affect consumer attitudes toward SMS advertising. In this regard, both clusters reported positive attitudes towards SMS advertisement when the SMS advertising is relevant to their needs, jobs, activities and appropriate to customers' values and cultural context (Q0-Q2) this is in line with the findings of other researchers [50,51]. The respondents of the two clusters also reported that they enjoy receiving attractive and entertaining SMS advertisements (Q3-Q6), the results support the results reported by Haider and Shakib [39]. Furthermore, the two clusters considered timely, relevant needed and easy to understand information (Q7-Q10) affects their attitudes to accept SMS advertising. These findings also are in tandem with the work of Wang and Lan, [52]. In addition, the two clusters pointed out the importance of credibility to accept SMS advertising which support the findings of Keshavarz, [53]. For this, they require the SMS advertisements to be a reference for purchase, impressive, provide evidence to believe in the content, trusted, and sent by a known party (Q15-Q19).

However, the two clusters provided different responses concerning the irritation factor. Apparently, the first cluster which comprises 62% of the respondents reported that they

get annoyed by the received SMS, this is evident in their agreement with the statements 11-14. This agreement reveals negative attitude towards SMS advertising as they reported that: SMS advertising is irritating (Q11), SMS advertisements are annoying (Q13), SMS advertising disturbs them when using mobile devices (Q14) as SMS advertisements are almost everywhere (Q12). However, the second cluster (38% of the respondents) reported disagreement with the same statements revealing their positive attitude towards SMS advertising. Whereas the two clusters reported that they do not feel offended whenever they receive SMS advertising.

With the huge amount of data that they have, Palestinian banks can use clustering techniques to structure their unlabeled data. Banks have huge number of entities to deal with, putting those in different clusters and study the common patterns/characteristics for each cluster is crucial for banks' SMS advertisement. Once clusters are identified, it becomes easier to design suitable marketing campaigns Therefore, banks can use a clustering algorithm to discover different groups of their customers and improve their knowledge about the different market segments then target them more accurately with advertisements as their interaction with customers becomes unique and different for each group.

The clustering analysis reveals that Palestinian banks can improve their SMS advertising effectiveness by considering the following recommendations:

• Convey relevant messages to your identified clusters based on their needs, type of jobs, lifestyle and location.

• Make your SMS advertising as attractive and entertaining as possible. This can be done by defining the needs and demographics of each targeted cluster.

• Make your SMS advertising informative to your clusters by providing timely, needed and easy to understand messages.

• Design and develop credible SMS advertising by providing impressive purchase reference for your clusters based on correct and trusted source and content of your advertisements.

• Convey advertising messages that respect the cultural context of your clusters. This means respecting the values and beliefs, the norms and traditions, the different religious groups, and the gender differences.

• Understand your clusters by identifying their needs and characteristics to avoid possible irritation to your clusters. Ask for your customers' approval to receive SMS advertisements ahead of dispatching them.

5 Conclusion

In conclusion, this study sheds light on factors affecting customer attitudes toward SMS advertising in the Palestinian banking sector. The results reveal that relevancy, entertainment, informativeness, and creditability have positive impact on the attitudes of the Palestinian customers towards the Banks' SMS advertising. Data clustering, however, provided empirical evidence that most of the respondents are annoyed by the SMS advertising which

requires developing policies and procedures at the bank level to get the customers consent (permission) to receive SMS advertisements prior to sending them to customers.

The study's empirical results included contextual and application limitations. One of these limitations is that the study was performed in the banking sector, limiting the results' capacity to be applied to various sectors in Palestine. Future research might improve the current study model's ability to predict people's opinions by focusing on other components of mobile advertising, rather than only SMS advertising (i.e., voice advertising messages, video advertisements, pictorial advertisements).

Acknowledgment:

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