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DESIGNING AN INTELLIGENT MARKETING NETWORK FOR MULTI-PURPOSE REQUIREMENTS BASED ON SHORT MESSAGE SERVICE (SMS)

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ABSTRACT

In the current era, development of information and communication technology has altered the way society information requirements are provided. Using SMS technology, the intelligent marketing network of requirements brings a good, low cost, and efficient opportunity for gaining information in all the fields. There are numerous means to marketing and advertising which all have their own pros and cons. In addition, some of the marketing and advertisings are not suitable for certain types of goods and services or they are not cost-effective. This network which designed by the purpose of creating an intelligent communicating bridge between supply and demand, is an electronic market that vendors present their good or service via SMS. On the other hand, customers ask for good's information or the service needed just by sending an SMS. As soon as the network received a message containing the applicant's request, it processes the request and after running the evaluation and assessment algorithm, the network chooses the best ads relating to the applicant's requirements from the network data center. These data will be sent to the customer with the cellphone number of the advertisement based on scheduling program. Furthermore, if the applicant's need was not available in the network in that instant, the request will remain active and upon receiving the requirement, information will be sent to the applicant. The main point to the evaluation and assessment algorithm is that this algorithm should have the capability to evaluate the messages and subsequently, rate them as well as having a special timing algorithm to send them. Message choosing algorithm should be concordant and fair meaning that the messages of advertisers and ad receivers will not face aggregation or lack.

Keywords: Intelligent Network, Data Center, Purposeful Marketing, Target Addressee, Selection and Evaluation Algorithm, Electronic Marketing

INTRODUCTION

Marketing and advertising have old backgrounds. Nowadays, marketing and advertising are done through email, telephone, aggregate SMS advertising, multi-media advertising, advertising goods, and so forth. All of these ways have their own merits and demerits.

Yuk did a research on a framework based on the reliability of vendor and customer in the year 2006. Daniel proposed a decision-making oriented model for mobile Commerce usages in 2006. Alexis *et al.,* 2010, analyzed the opportunities and challenges of processing advertisements and marketing on mobile devices. Wenjing studied the impact of intermediates on e-commerce. Dimitris and George surveyed the effective factors on mobile marketing. Business is the developed compeer of e-commerce. Concerning the e-commerce, mobile business usually copes with customer to vendor model (Simonovich, 2006).

Since mobile phones are always carried by humans, they bring a unique attribute to SMS which is being read in all the cellphones without pre-awareness to their contents and texts. Low cost and high penetration of SMS in the society lead to its attractiveness among other wireless advertising tools. Numerous number of e-commerce plans can be followed in mobile business. Mobile business is developed by the successful experience of e-commerce and advancement of wireless technologies. Just like e-commerce, mobile business place an emphasis on three areas of buying goods or services, advertisements, and providing satisfaction against cash. One of the advantages to short message service method compared to traditional methods is more and better interaction with customer. Privacy and security are of the coming challenges.

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The other problem is unrelated short messages. Therefore, correct selection of the people, having goal, and appropriate planning are the key solutions to this problem. SMS advertisements are known and used as obligatory advertisings. Historically, marketers want to increase the sale for a short period of time. Marketing with customer allowance means to take the customer's allowance in order to send him a short message with its cease time to receive the message at every time. Other usages of short message are electronic selling and buying, aggregate sending, and using SMS as novel tool for bank marketing and trading through cellphone (Patrick, 2002).

The Concepts of Marketing and Advertising

Consumer behavior is a set of activities which is done directly toward acquisition, using and disposal of goods and services. These activities consist of decision-making processes made before and after these actions (Golchinfar, 2007). Advertiser considers some issues such as size, targeting and response, quality, creativity potential, and information relating to consumption and measurement. Shown in figure 1, are the roles of mobile ads which help us in identification of motivations and various main points of helping (Akselsen, 2007). Concerning the growing competition of producers and the expansion of consuming markets of products, services, as well as scientific and technical advances, a great opportunity is provided to use telecommunication and communication facilities in order to benefit this situation to gain customers satisfaction and potentially an optimal condition for the organization. There are many ways to obtain customer's satisfaction such as reducing customer's cost of buying, saving in customer's time with quicker servicing, supplying products based on customer's need with reasonable price, development of information and communication technology, e-commerce, and websites which will influence the marketing which one of its factors is company's tendency toward direct marketing (Molayi, 2008).
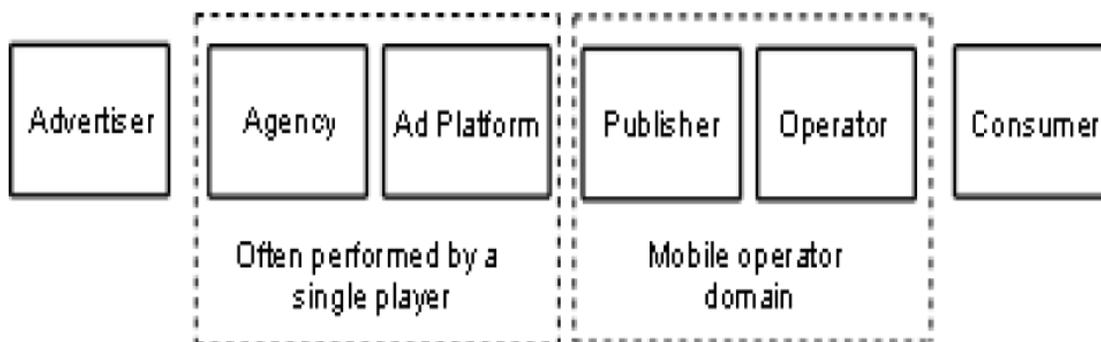

Figure 1: The roles in the advertising chain

Direct marketing is defined as implementing direct communication channels to the consumer in order to find the customer, deliver the product, and give service to the customer without using marketing intermediates. Direct marketing let the marketers receive more responds from the consumer and thus, use the target market more efficiently (Timothy, 2007).

Target market is a set of customers with similar needs or attributes which the company seeks to give them service. Selecting the target markets includes measuring and forecasting demands, dividing the market, targeting, and determining the positions. The steps to choose the target market are market dividing, market targeting, and determining the position in the market. Fundamentals of market dividing consist four parts which are geographic standard, demography criteria, psychological criteria (Social class, life style, personality, and so forth), and behavior criteria (Time of purchase, benefits, loyalty, and etc.). Market segmentation is a process in which the market would be divided to unique sub-divisions of customers which have the same needs and traits. E-commerce consists of Business to Business (B2B), Business to Consumer (B2C), Consumer to Consumer (C2C), and so forth (Wenjing, 2010).

Introducing the Intelligent Marketing Network of Requirements and its Functions

The intelligent marketing network of requirements designed with the purpose of creating a smart communication bridge between supply and demand, is an e-commerce in which the vendors present their

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goods or services with short messages. The consumers ask for product's information and services with sending an SMS as well. As brought in figure 2, upon receiving the short message containing the consumer's request, it will be processed and the best ad relating to consumer's requirements will be analyzed in data center using the techniques of text mining, data mining, and pattern matching. As a result, these data and the cellphones number of advertisers would be sent to the applicant via an SMS. In the case that the need was not available in the network, the request will be left active and upon receiving demand the relevant data will be sent to the consumer. This issue is one of the merits of this network compared to other means of marketing and advertising. In this method, every transaction is costly and the system is responsible for the both advertiser and ad receiver in order to send the best selection as well as sending determined number of messages. As a result, this system should use weighting algorithms to evaluate the messages and grade them. Furthermore, the system should have a specific timing algorithm for sending the messages. In addition, message sending algorithm should be fair and balanced to avoid the messages of advertiser and ad receiver to be aggregated more than usual (Han, 2009).
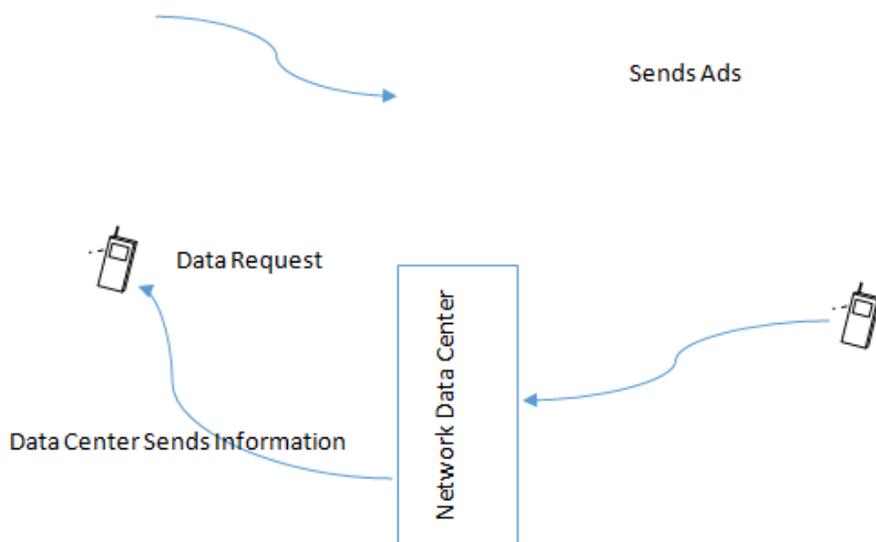

Figure 2: How to work with network from the view of consumers (See original document)

Telecommunication Company is now trying to set up some intelligent lines which cost the customer according to the number of short messages he or she sends. However, the cost of these short messages is more than the usual short messages tariff therefore, this network can earn money by making contraction with Telecommunication Company.

The Framework and the Way Intelligent Network of Requirements Works
Proposed Architecture of Intelligent Network of Requirements
Figure 3 shows the 3-layer architecture of the network. These layers are the outer, inner, user and management layer. The outer layer is the network communication port. The inner layer is the main server of the network which receives the information from the communication port and sends them to the operator for categorizing and indexing after their identification and initial processing. The server will find the contact after receiving the categorized and indexed messages. Finally, it will provide the communication ports with advertisements to be sent to the ad receivers. There is a communication port in the outer layer with which the consumers and the network members can communicate with each other. This layer can be on the platform of the Internet and uses one or several SIM cards as the information entering and exiting gateway. Communication port transmits all the receiving messages to the initial messages table for the server's software to identify the type of the message (Special customers, regular customers, and spams). In addition, communication port should send system messages (Such as sending

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stop message and etc.) as well as sending the processed advertisements to the ad receivers. After that, initial process should be performed on these messages for the valuable messages to be marked in this table and the acknowledgement message to be sent to the massage sender forthwith. After this step, messages should be categorized and indexed. The concept of categorizing is to determine that every message is related to which group of good or service. Indexing means determining the characteristics for instance, concerning the message of "Gray Peugeot 206 is for sale with the price of 11 million", this message will be categorized in information group of Peugeot 206 and the indexes of gray color and the price of 11 million will be assigned to this message. In the next step, the message should be approved by members' management.

In the case the message approved, it would be transferred to the table of advertiser and ad receivers. Now it is the time for the most important task of this layer, the server should process the approved messages and perform the algorithms of evaluation and selecting, and thus, the messages would be sent to the ad receivers.

One of the advantages of this network is a command which if the customer or another member does not want to receive or send an advertisement, he can send this command to the network communication port and consequently, the server layer will stop sending advertisements to him. This feature not only increases the consumer satisfaction, but also leads the credit percentage of the network flowing messages to be heightened. This layer consists of two completely distinct parts. The software of monitoring and management has various and multiple tasks. The most important task of this software is network configuration.

These configurations have a significant effect on the way the network performs. Some of the works such as users' management, categorizing, monitoring, messages indexing and their approval are done in management software.
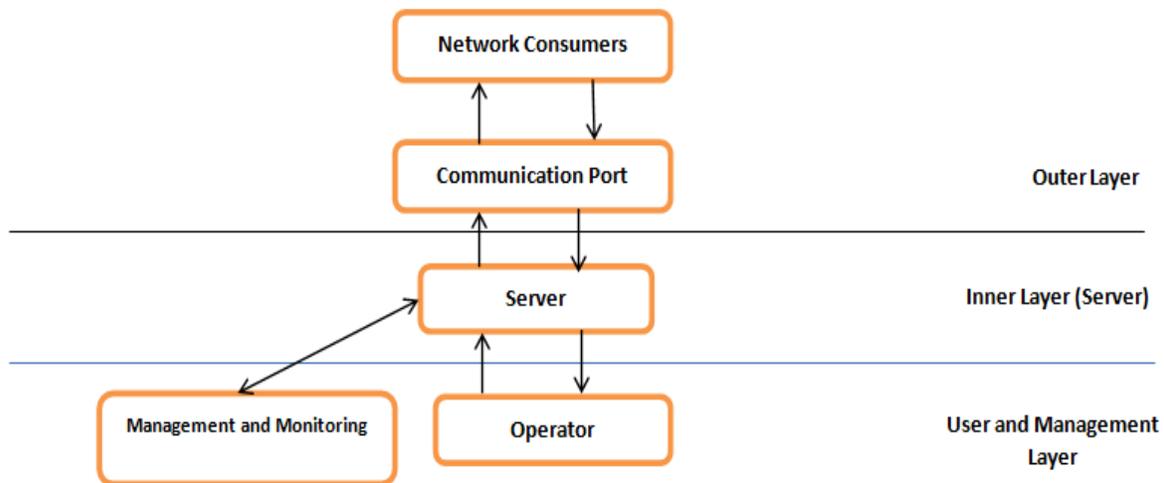

Figure 3: 3-layer architecture of intelligent marketing network of requirements

Network Configuration

Intelligent network of requirements has a wide a configuration. This configuration makes the performance of network flexible. However, any inconsistency in this network will reduce its performance. Figure 4 demonstrates the tree of market and its dependencies. The tree of market is a key element in the network data center which has tree-like configuration. Each of its components is called node. The children inherit all of their father's traits and characteristics. Every node has got its own nature and presents special supply and demands.

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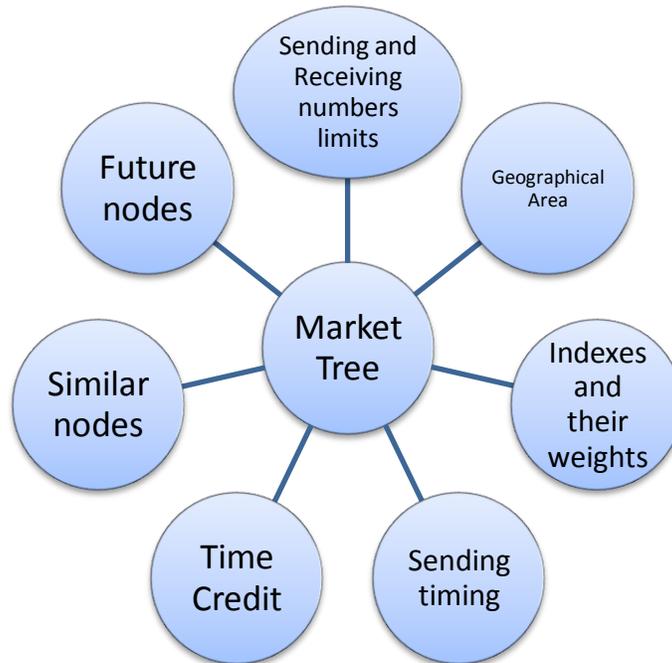
Figure 4: The tree of market and its dependencies

There should be laws for numbers of sending to the advertiser and numbers of receiving for the ad-receiver for the consumer (including the advertiser and the ad receiver) to confront with lack of messages or even receive an aggregate number of them. As a result, three parameters of minimum, average, and maximum are considered for the messages sent by the advertiser during one period in each node. On the other hand, a limit has been placed for the number of messages received by the ad-receiver daily. The other benefit to this method is that the network will not be discharged by information and thus, it will not happen for the network to not to have information to send after a short period of time. As a result, the ad receiver will not feel that the network has lost connection to him. However, if a large number of messages are about to send to the receiver daily, he would be confused and therefore, he might not choose any of the selections which leads the positive feedback of the network to be reduced.

Each node in a specific geographical area is valuable. The network encompasses various geographical regions. These regions are urban, county, district, provincial, regional, and national. Every node has its own characteristics (attributes). For example, automobile has its own color indices, year of manufacture, model, price and so on. Three kinds of indexes have been defined which are textual, numeric, and non-numeric. Each index has its own value and weight in each node. If someone wants to publish an ad in a newspaper, the price of the ad depends on the amount of space required for the ad as well as the page related to the ad. Naturally, the highest price is related to the first, last, and the middle page, respectively. Therefore, the issue of competition is of high importance here. Competition in this network means to be seen sooner. It means that the advertiser whose ad has received sooner compared with other advertisers, will have better achievements. To show the priority, starts are used in the network. The more the starts are, the more ad distribution would be in the network and messages will be sent in shorter periods of time as well as existing higher priority for the ad receiver in similar situations. Furthermore, the messages' life span should be determined in the network which is directly related to the node. With this mechanism, expired messages will not be released in the network which leads to higher reliability of the network messages. In order to reach this goal, a concept called sending schedule is explained. Briefly, sending schedule determines the sending priority, number of messages which should be released in the network, and message shelf life. When the ad receiver sends a request to the network, based on the request type and the requesting node, the period of time should be enabled. This period of time can be considered as the

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service life of the request message. As a result, a receiving schedule contains the expiry time and the number of stars. Similar to sending schedule, we can define a number of receiving schedules and assign them to each node. Sometimes it happens that the consumer demands a kind of product which is not available in abundance in the market, therefore, he may embrace similar commodities. Similar nodes are considered as neighboring nodes. Obviously, this possibility can be used when a sufficient number of messages to the client application does not exist. A considerable number of jobs in a specific market, has their own special order and sequence. We make this issue clear by presenting an example. When somebody is engaged in building a complex, he will need a structure welder for a period of time. Usually, a bit later he should start roofing and subsequently, walling will be started and so forth. So, when he asked for welder, he can guess that he would need a construction worker two months later and so other things after that. The network as a lateral function, considers the purposeful advertising and fulfills this issue with assigning future or forecasting nodes. Each of these predictions will be defined in a time interval based on the node prognostication type in order to be used and avoid the ad receiver to be bombarded with advertisements. The network can start operating after the configuration. Note that this configuration can also be changed during network activity.

The Procedure of Message Circulation

As previously mentioned and shown in figure 5, after the message is received in the communication port, it will be validated by server software then, the network manager sends the messages to the operator for them to be categorized and indexed. After the manager's validation of the messages, they will be changed to the network feeds and therefore, they can be used to be released in the network. Now it is the time for the server to evaluate the messages according to various considerations and prepare them to be sent to the applicant.
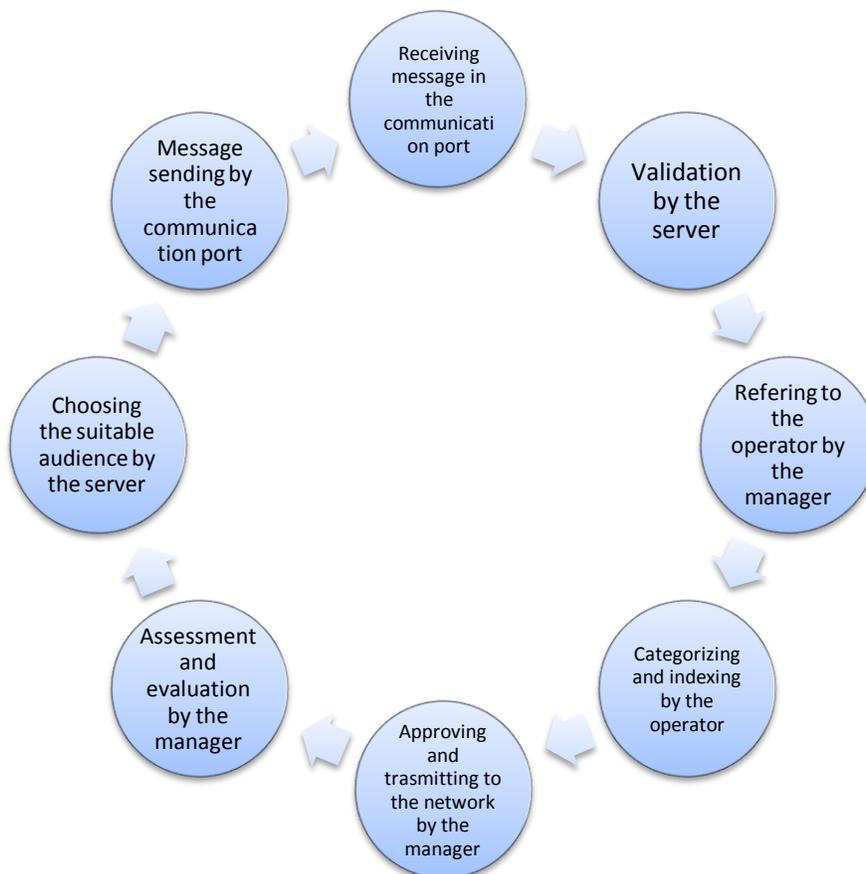

Figure 5: The procedure of message circulation in the network

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The processes are discussed and explained in detail in the following sections. Messages received through the communication port will be processed and indexed by the server. It should be recognized whether the message sender is the advertiser or ad receiver, a special network subscriber or a temporary customer and the sender geographical situation as well as the ad's stars should be determined. After the analysis of data mentioned, the message should be sent to operator by the manger to be indexed and categorized. After the server received the information, messages would be transferred to manager cartable for him to refer them to the operator in form of a packet to be categorized and indexed. Another function of management software is users and message packets management.

The operator assorts and indexes the messages, and selects the suitable state for them using the software and refers them to the manager. After the management analysis, complete messages will be approved and flowed in the network. Now, these messages have the capability to be released in the network.

The most important and complex process of the server layer is evaluation and selection of the messages. The algorithm input is the tables of advertisers and ad receivers and its output is a pair of advertiser and advertiser receiver coming with a number which is the evaluation indicator of this pair.

The following pseudo-code shows this algorithm. In this section this process will be explained step by step.

First, the messages of the valid advertiser will be identified. It means that the message is not expired yet, and concerning the type of subscription (number of stars), the message is still valid according to time and the number of messages in addition to no stopping ad sent to the network. After that, concerning the type of subscription, the allowed number of ads which can be sent by every advertiser will be obtained. This process will be done for consumers as well. Now, the evaluation process should be started. Advertiser and ad receivers have different priorities in accordance to each other. These priorities are categorized into 7 categories based on their value. The first priority is the advertisers and ad receivers who are placed in exactly the same node of market tree in addition to being in the same city. The second priority is the advertisers and ad receivers which the recorded node for the advertiser is a sub-set (child) of the ad receiver node in the market tree taking into account that the city is the same. The third priority is senders and receivers who are not in the same city but, they have the same node and they are located in the same scope defined for the node. The forth priority is the senders and receivers not located in the same city which the receiver node is from the sender's ancestors, however; they are placed in an acceptable geographical scope concerning market tree node. The fifth priority is the advertisers and ad receivers located in the same city with similar nodes. The sixth priority is the senders and receivers who are the predicting target of sender node and they are located in predicating time interval. The seventh priority is just like the sixth priority, however; in this priority the receiver node is placed in children group of sender's predicted nodes. It can be said that higher priorities have better targeting of contact selecting. Therefore, the first and second priorities have a great accuracy of targeting. Now, the sender and receiver pairs should be evaluated and they should be store in a table with their relating priority.

The attributes evaluation of sender-receiver pair will be obtained using the relation 3.1.

$$W = \sum_{i=1}^{n} SRNI_i + \sum_{i=1}^{n} SNI_i + \sum_{i=1}^{n} SRNNI_i + \sum_{i=1}^{n} SNNI_i + \sum_{i=1}^{n} SRTI_i + \sum_{i=1}^{n} STI_i \qquad (3.1)$$

In this relation **SRNI** is a percentage of numeric indexes weight shared between the sender and receiver which this amount is determined based on the indexes numeric interval adaptation. **SNI** is the weight of numeric indexes in the sender, however; they are not in the receiver. **SRNNI** is the weight of non-numeric indexes shared between the sender and the receiver and thus, the values to these barometers are the same. **SNNI** is the weight of non-numeric barometers existed in the sender but, not in the receiver. **SRTI** is a percentage of textual indexes weight shared between the sender and receiver which this amount is obtained based on the indices adaptation percentage. **STI** is the weight of textual indexes which are in the sender but not in the receiver. It is obvious that the evaluation is only done for the priorities of one to five, because the sixth and seventh priorities indexes will not play an important role.

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What is correct so far, is the quantity which based on that we can say how much adaption a sender-receiver pair has, however; priorities, geographical region of sender in accordance to receiver, and consumer's stars number are not taken into account yet. The next step is using these parameters in assessment which this work is called scoring. The score of a sender-receiver pair can be furnished using relation 3.2.

Point = Weight * Coefficient   (3.2)

In this equation **Weight** is the amount calculated in the previous phase and **Coefficient** is a ratio assigned based on customer number of stars and the type of geographical neighborhood and its priority.

```
Measure_Select_Alg()
 Begin
        Select_Active_Senders();//Select senders those are still validate
        Count_Capicity_Sender();//Counts the maximum messages that can be sent for each sender
        Select_Active_Recievers();//Select recievers those are still validate
        Count_Capicity_ Recievers();//Counts the maximum messages that can be sent for each reciever
        Weighting_Alg ();//Calculate and weight for each pair of sender and receiver based on the indices
        Pointing();//Balancing weight upon priority, numbers of stars and geographic neighborhood
        //End of measuring & beginning of selecting process
        Single_ Message_Send()//Sending a single message (best suitable available) for each sender that has
        //sent no message today
        Single_ Message_Reciever()//Sending a single message (best suitable available) for each reciever
        //that has sent no message today and also hasn't reach to minimum counter of according node
        Send_Avg_Receivers()//Sending message to recievers who have not reach to the average of related
        //node and also make a blacklist of the senders
        Send_Max_Receivers()//Sending                       message                       to
        re5555555555555555555555555555555555555555555555555555555555555555cievers   who
        have not reach to the maximum of //related node
 End
```

Pseudo-code of evaluation and selecting algorithm

After passing these steps, the sender-receiver pair will be tangibly compared and concerning the assigned score to this pair, we can distinguish how close they are to each other. After finishing the scoring, the evaluation will be finished. Thus, there would be a table containing a sender-receiver pair with their assessment relative score. We can now go to the next step. The process of selecting is done in four steps. The first step is the senders who did not have any sending in that day. The second step is the receivers who did not receive the minimum ads according to its node. The third step is the advertisers which their ad receiver couple has not received the average number of messages. The fourth step is the senders which their receiver pair has not received the maximum number of messages based on its node. As a result, the process of selecting among the receiver and sender pair will be finished and by passing these four steps the advertiser's message can be sent to the communication port in order to be sent to the ad receivers.

CONCLUSION

The main goal of designing and developing the intelligent network of requirements is to create a direct connection between the services and commodities owners and the audiences. Its lateral purpose can be predicting the current and future needs of the network subscribers as well as introducing the required

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goods and services. Simplicity in using, facilitating the expanding of network using culture, privacy of individuals, targeting the purpose market, message effectiveness due to audience tendency to receive ads, the ability to analyze the market and exploit its results, market segmentation, direct marketing, supporting various types of e-commerce, boundaries between marketing and advertising, forecasting future needs, having no intermediates, reducing the cost of goods advertisements, significant advertising cost reduction due to sending targeted messages, identification of target contacts, the capability of removing goods or services which are not valid, 3-layer architecture, targeting based on the predicting variable, categorizing while monitoring, flexibility, hierarchical structure, and possessing a balanced and fair selection and evaluation algorithm are of the most important attributes of the network. Network flexibility is its easy and impossible point. Furthermore, network configuration has brought high flexibility to the network performance. However, each fault and negligence in this configuration reduces the network efficiency as well as its reliability in the view of customers. The intelligent selection algorithm used in the server layer of the network is balanced and fair which guarantees no message lack or aggregation. Presented in table 1, is a comparison among the standard media. This comparison is based on three factors of cost, effectiveness, and accuracy in pointing the target contact. It should be said that in many cases, concerning the specific nature of ad, some of the media cannot be used. For instance, when an individual wants to sell his car, he can only use 2 or 3 media.

Table 1: The comparison of advertising and marketing media

Accuracy in pointing the target audience	Effectiveness	Cost	Availability	Media
Good	Excellent	Very high	Very high	Television
Average	Average	High	Average	Radio
Roughly good	Roughly average	Average	High	Internet
Low	Very low	Very low	High	E-mail
Low	Average	High	Low	Press
Average	Average	High	Low	Advertising Bulletins
Low	Low	Roughly high	Average	Telephone
Roughly low	Low	High	High	Advertising Posters
Low	Low	Low	High	Aggregate SMS
Excellent	Roughly excellent	Very low	High	Purposeful SMS

The network has its own audience but it is not common. It should not be considered as a drawback since the network is designed for these ilks of audiences. Since the network is on SMS platform, any defect in this platform leads to interruption in sending and receiving data. It is possible that some of the words have been filtered by mobile operators and there might not be an accurate list of them. In the case the transitions are Internet-base, the Internet disorders may be disruptive. In some of the occasions, mobile network traffic has a negative impact on sending and receiving short messages. The network is always in need of manpower for monitoring. However, as the time goes on, this dependency can be reduced using machine learning techniques. The message may never reach the destination if the audience is not available or his cellphone is off and etc. There is no guarantee for the massages to reach the destination in a short period of time. Delays can be more than several hours. It is feasible that for political reasons massage sending faces disruptions for several days. The algorithm of evaluation and assessment has a high timing level and it should be optimized.

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