

Multivariate Analysis of Variance Applied to 3G Mobile Market Segmentation : The Innovator Theory

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Abstract: Mobile communication and Internet are the most thriving industries in the 21st century. They tend to integrate recently. Human beings are used to construct a beautiful dream in communication: An internet service which can be enjoyed by a mobile and dexterous device. This article explores the demand of 3G cell phone consumers in Taiwan from the angle of technical management. Here we use the method of statistical theory and electrical machinery communication background to explain it. We also make the further market classification for the consumer. The findings have classified three clusters, VIP gold customer group possesses 34% most races grouping in earlier period which emphasized for the technical management. This cluster has a quantity demand to network, also is highly relative in each kind of function demands. We should pay attention to the degree of satisfaction from the consumer of this cluster. The population variable in this cluster, which the proportion is high in the transaction officer and the housekeeper, the age between 18~34 year-old, the scholarship is college, the incomes each month is above NT\$50,000, the female possess the most proportion, therefore, by higher proportion to these variables, we could propose the special marketing project and the cell phones with the corresponding functions. By taking the chance, we can construct the 3G communication tyrant industry.

Keywords: 3G, Mobile, prediction, Innovator.

1 INTRODUCTION

The evolution of communication engineering's techniques is never halt; better techniques are always going forward with the business modality. Even the most fantastic technique can't live without good business modality and this rule is the characteristic of communication industry [1]. From past to now, Taiwan had already developed a competitive network hardware industry; however, it still lacks the critical technique in communication engineering industry. The development experiences in South Korea specified that combining the equipment merchant and the telecommunication operation merchant is extremely important [2]. Samsung has the ability to develop semiconductor and telecommunication system through the demands from South Korean telecommunication (KT) operation merchant, Samsung knows what application should be developed. To see a wise, Taiwan needs the union between telecommunication operation merchant and equipment merchant now; as such, these two merchants can complement each other, hence develop proper strength of Taiwan in the telecommunication industry. By understanding technologies and

developments completely, constructing the genuine cell phone function surface with the consumer behavior, the cell phone industries in Taiwan can truly find its own cut point and then develops industries well. From the view of development, if Taiwan can grasp the critical technology and give the best marketing project to different markets, the prospects of development in future will be splendid. Taiwan had auctioned five piece of the third generations mobile communication frequency spectrum licenses in 2002 separately, and these contracts was captured by Fetnet telecom, Vibo telecom, Taiwan mobile, Chunghwa telecom and APBW telecom. The amount of money has reached 489 hundred million totally; this symbolizes that Taiwan's telecommunication market will stride into the 3G communication era slowly. This article investigates the future tendency of 3G market in Taiwan through the analysis from telephone and the most rigorous statistical algorithm. Subsequently, the demand of 3G cell phone's consumers can be understood and we will classify the consumer market from the direction of technical management. We expect to provide some thinking of telecommunication management and technical design for

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the industrial field from the theory and investigation of academic circle.

The rest of this paper is organized as follows. We discuss market segmentation in Section 2, the research construction and method in Section 3. We review statistical algorithm in Section 4 and the Innovator theory in section 5. The analysis process is mentioned in Section 6. Section 7 is a conclusion.

2 MARKET SEGMENTATION

Market segmentation [3] means applying suitable market segmentation variables to divide the whole market into many different groups which have the same attributes. Afterwards the industries will find their target market according to their own product or service localization. The purpose of market segmentation is to make a minimum differentiation in the consumers' community and the biggest differentiation between different communities [4]. The market segmentations which have similar behavior may then be confirmed. The products or the services which meet this community consumer's preference can also be developed. In this way, we can plan the effective marketing strategy to create more profits. The basic variables of general market segmentation can be divided into four types [5]; they are geography, population, psychology and behavior:

(1) Demographic Segmentation: The market is separated by every kind of statistic population variables. The sales can separate the market into different communities from three basic variables. They are the age and life stage, the gender and the income.

(2) Geographic Segmentation: The market is divided into different geographic regions by the nations, the birth provinces or countries, or cities etc.

(3) Psychographic Segmentation: The market is divided into different groups according to the social level, the living type or personal characteristic of consumers.

(4) Behavior Segmentation: The market is separated into different communities according to product knowledge, manners, use habits, responses and other behaviors which may need to be concerned. The effective market segmentation must have the following characteristics:

I. Measurability: refers to the degree of which the size and the purchasing power of the market segment can be measured.

II. Accessibility: refers to the degree of effectiveness of contact and services of a market segment.

III. Substantiality: refers a situation that a market segment whose scope is large enough or has a high profitability deserves to be exploited.

IV. Action ability: plan the effective marketing proposal especially for shaped market segmentation, the degree of attracts and serves its market segmentation. The market segmentation procedure includes four steps [6] [7], as shown in Figure 1:

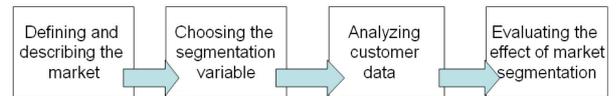


Fig. 1: The procedure of market segmentation

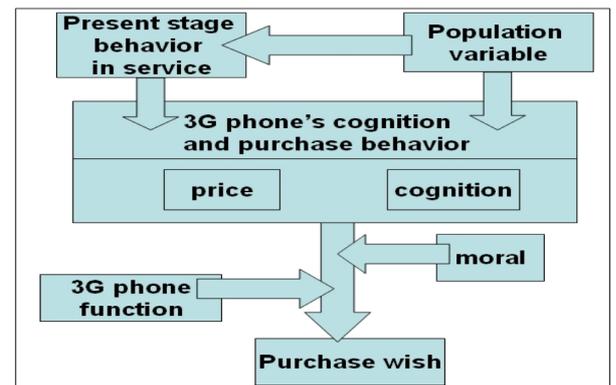


Fig. 2: Research construction

In general, the market segmentation model which often be used presently can be divided into following two kinds:

1. Prior segmentation model: This model predetermines the segmentation variable to know the segmented quantity and type immediately. The basis of market segmentation can be decided by choosing some segment standard beforehand, for example: The population variable, the brand loyalty etc. The common methods are the classification and the cross tabulation etc.

2. Posterior segmentation model: This model is also called Clustering-based Segmentation; that is, the quantity and type of the market segmentation can't be got beforehand. We must rely on a group of correlation variables and classify the consumers by clustering; the process can then be decided. The commonly used segmentation foundation variables are demand, manner, or other psychological variables. The common methods are Cluster Analysis, Multidimensional Scaling.

3 RESEARCH CONSTRUCTION AND METHOD

This study aims the 3G mobile communication market investigation in Taiwan, and the market segmentation is also made. From the following aspects, the statistic population variable, the present stage GSM phone behavior in service, the 3G phone cognition and the demand, we proposed a research construction for this study as shown in Figure 2:

This study takes the common populace who above 18 years old in Taiwan as the research object, (according to the announcement of 2004 national population survey from the highest level of the executive branch [8]) in view of its using condition at present stage, regarding the 3G phone receptivity, and the function request as research content, do the 3G phone market segmentation analysis. According to the research construction shows, in order to enable the important variable clearly defined, we classify and specify it individually as follows:

Definition of Taiwan area : The Taiwan area which is referred in this study includes the Taiwan main island and the Penghu islands; the inhabited area is divided into north, south, central and east these four regions. (The counting region classify the report based on July, 1993 Executive Yuan proclaim subscribes “the local count standard classification from Republic of China“ [9])

Definition of 3G phone : The 3G phone which is referred in this study means the third generation mobile communication system and its cooperative phone; here we take the communication system which is promoted by five 3G system industries in Taiwan as example. Present phone behavior in service : This refers to all kinds of conditions that research objects who use the phone at present stage, which includes carry time, use time, renewal frequency, the degree of satisfaction and the using motivation.

The cognition and purchase behavior of 3G phone : It includes the product perception, the product acceptance, the price acceptance and the purchase factors to the 3G cell phone. Because the product perception is different for each consumer, this study divides this cognition measurement into 3 kinds of degrees, namely for knew the 3G phone, heard but certainly not understand, not to know.

The functional demand for 3G phone : This refers to the services which are provided by the third generation mobile phone. These services are mainly used for the width frequency and the conformity diversification function, which can be classified into four types: 1. Communication function: The image telephone and the homepage browse 2. Entertainment function: Music downloading, network game and mobile phone television 3. Commercial function: Teleconference, electronic commerce and enterprise network 4. Living function: local information and news information.

The variables of population statistics : It refers to the basic data of the research object, this study take the gender, the age, the occupation, the blood, the residents, the education level and the monthly income as the variables of population statistics.

This study takes common populace in Taiwan as the population and adopts stratified random sampling method; the data are collected by telephone interview through using CATI system. (Computer-Assisted Telephone Interviewing) [10]. Here we make an introduction for sampling design.

(Field of investigation): This study takes Taiwan as the field of investigation which is divided into four

Table 1: Region

Region	North	Central	South	East
County	Taipei County,	Miaoli County,	Chiayi County,	Taitung County,
and	Taoyuan County,	Taichung County,	Tainan County,	Hualien County,
City	Hsinchu County,	Changhua County,	Kaohsiung County,	Yilan County
	Keelung City,	Nantou County,	Pingtung County,	
	Hsinchu City,	Yunlin County,	Penghu County,	
	Taipei City	Taichung City	Chiayi City,	
			Tainan City,	
			Kaohsiung City	

Table 2: The population structure of residential area and actual recycling examine

	Reclamation number	Expectation number of Population
North	2178	2135
Central	1052	1055
South	1177	1221
East	221	217
Sum	4628	4628

Table 3: Residence sample structure examine

	Inhabited area
Chi-Square	2.5339
Significance level	0.4692

regions: north, center, south and east. The classified method is listed on Table1. This study selects the common populace who above 18 years old in Taiwan for the research object.

(Sampling method): This study takes common populace in Taiwan as the population and adopts stratified random sampling method to divide Taiwan into four regions, north, central, south and east. The sampling is sampled by telephone investigation through the CATI system.

(Sample structure): The population structure is examined according to the actual recycling condition. The population structure of residential area and the actual recycling examination are shown in Table 2. From table 3, we observed that the significance level is bigger than 0.05, this indicates the sample recycling result and the population structure are identically.

4 STATISTICAL ALGORITHM

1)Chi-Square Test [11] : The chi-square test is used for measuring the difference between the expected values of

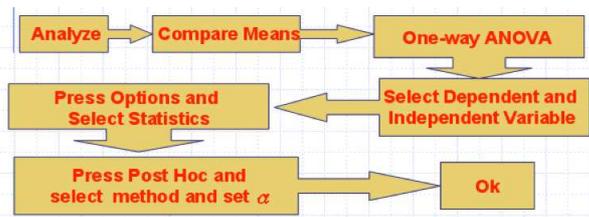


Fig. 3: One-Way ANOVA actual flow

each cells in the contingency Table. This study uses Chi-Square Test to investigate the discrepancies in the basic personal information of the behavior in service, the 3G cognition, the purchase behavior and so on. The χ^2 statistic can be computed by:

$$\chi^2 = \sum_i \sum_j \frac{(E_{ij} - O_{ij})^2}{E_{ij}} \dots (1)$$

Where O_{ij} is the observed number of instantiated features belonging to region R_j in class L_i ; i.e. $O_{ij} = n_{ij}$ and E_{ij} is the number of instantiated features that we would expect for n_{ij} if the region was independent of the class. Hence

$$E_{ij} = \frac{n_i n_j}{n} \dots (2)$$

In statistics, there is not one chi-square distribution but one for each degree of freedom. It can be shown that the degrees of freedom in this case are $(k-1)(m-1)$. Once we have computed the χ^2 statistic for our contingency Table, we can compute the probability from the definition of the χ^2 distribution, the probability that this particular contingency Table was the result of random chance. The smaller this probability is, the more confident we can be that the distribution we have before is likely to be useful for discriminative purposes.

$$H_0 : P_{A1} = P_{B1}, P_{A2} = P_{B2}, \dots, P_{AK} = P_{BK}, Df = (k-1)(m-1)$$

$$\text{Reject region: } \chi^2 > \chi^2_{\alpha}(df) \dots (3)$$

2) One-Way ANOVA [12]: The ANOVA is based on the fact that two independent estimates of the population variance can be obtained from the sample data. It compares group means by analyzing comparisons of variance estimates. This study uses this method to understand the differences in the function variable, the basic document, the behavior in service at present stage and so on.

3) Scheffe Test [13]: Scheffe's S is used to find the correlation among every sample groups. After using One-Way ANOVA, this study uses the multiple comparison method to inspect whether the different results occur under the different experimental variation levels or not. Once it is conspicuous, the Scheffe multiple comparison method remains to discover the source of significant influence. The Scheffe test is customarily used with unequal sample sizes, although it could be used with equal sample sizes. The critical value for the Scheffe test is the degrees of freedom for the between variance

times the critical value for the one-way ANOVA. This simplifies to be: $CV = (k-1) F(k-1, N-k, \alpha) \dots (4)$

Calculating this test statistic is not a trivial work. Pure mathematicians argued that this shouldn't be called F because it doesn't have an F distribution (it's the degrees of freedom times an F); however, we still reserve this test. As the test statistic is greater than the critical value the H_0 is rejected. Note, this is a lower-tail test. If there is no difference between the means, the numerator will close to zero, and performing an upper-tail test wouldn't show anything.

$$TS : F_s = \frac{(\bar{x}_i - \bar{x}_j)^2}{S_w^2 (\frac{1}{n_i} + \frac{1}{n_j})} \dots (5)$$

4) Kruskal-Wallis [14]: If the situation is unsuitable for ANOVA (i.e. the variance is unequal), the Kruskal-Wallis test is used in this study to understand whether the population mean values with three or above have the difference or not. After then, we use the independent sample T test to examine the difference degree between various categories. Let n_i ($i = 1, 2, \dots, k$) represent the sample sizes for each k group (i.e., samples) of the data; rank the combined sample and compute R_i (the sum of the ranks for group i). Then the Kruskal-Wallis test statistic is:

$$H = \frac{12}{n(n+1)} \sum_{i=1}^k \frac{R_i^2}{n_i} - 3(n+1) \dots (6)$$

This statistic approximates the chi-square distribution with $k-1$ degrees of freedom if the null hypothesis of equal populations is true. Each n_i is called valid only if there are at least 5 data for the approximation.

When the test statistic H is greater than $CHIPPF(\alpha, k-1)$, we reject the null hypothesis of equal population means. Where $CHIPPF$ is the chi-square percent point function

More formally,

$$H_0 : \mu_1 = \mu_2 = \dots = \mu_k$$

$$H_A : \mu_i \neq \mu_j \text{ for at least one set of } i \text{ and } j.$$

Test Statistic:

$$H = \frac{12}{n(n+1)} \sum_{i=1}^k \frac{R_i^2}{n_i} - 3(n+1) \dots (7)$$

Significance Level: α , typically set to 0.05.

Critical Region: $H > CHIPPF(\alpha, k-1)$ where $CHIPPF$ is the chi-square percent point function.

Conclusion: when the test statistic falls in the critical region, reject the null hypothesis.

5) Cluster Analysis [15]: Cluster analysis (CA) is a rather loose collection of statistical methods that is used to assign cases to groups (clusters). Group members share certain properties in common and it is hoped that the resultant classification will provide some insight into a research topic. The classification has the effect of reducing the dimensionality of a data Table by reducing the number of rows (cases).

K-means (MacQueen, 1967) is one of the simplest unsupervised learning algorithms that solve the well known clustering problem. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed a priori. The main idea is to define k centroids, one for each

cluster. These centroids should be placed in a cunning way because of different location causes different result. So, the better choice is to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set and associate it to the nearest centroid. When no point is pending, the first step is completed and an early group age is done. At this point we need to re-calculate k new centroids as bar centers of the clusters resulting from the previous step. After we have these k new centroids, a new binding has to be done between the same data set points and the nearest new centroid. A loop has been generated. As a result of this loop we may notice that the k centroids change their location step by step until no more changes are done. In other words centroids do not move any more.

Finally, this algorithm aims at minimizing an objective function, in this case a squared error function. The objective function

$$J = \sum_{j=1}^k \sum_{i=1}^n \|x_i^{(j)} - c_j\|^2 \dots (8)$$

where $\|x_i^{(j)} - c_j\|^2$ is a chosen distance measure between a data point $x_i^{(j)}$ and the cluster center c_j , is an indicator of the distance of the n data points from their respective cluster centers. The algorithm is composed of the following steps:

1. Place K points into the space represented by the objects that are being clustered. These points represent initial group centroids.
2. Assign each object to the group that has the closest centroid.
3. When all objects have been assigned, recalculate the positions of the K centroids.
4. Repeat Steps 2 and 3 until the centroids no longer move. This produces a separation of the objects into groups from which the metric to be minimized can be calculated.

Although it can be proved that the procedure will always terminate, the k-means algorithm does not necessarily find the most optimal configuration, corresponding to the global objective function minimum. The algorithm is also significantly sensitive to the initial randomly selected cluster centers. The k-means algorithm can be run multiple times to reduce this effect. K-means is a simple algorithm that has been adapted to many problem domains. As we are going to see, it is a good candidate for extension to work with fuzzy feature vectors.

6) Discriminant analysis [16] : Discriminant analysis is a technique for classifying a set of observations into predefined classes. The purpose is to determine the class of an observation based on a set of variables known as predictors or input variables. The model is built based on a set of observations for which the classes are known. This set of observations is sometimes referred to as the training set. Based on the training set, the technique constructs a set of linear functions of the predictors, known as discriminant functions, such that

$L = b_1x_1 + b_2x_2 + \dots + b_nx_n + c$, where the b's are discriminant coefficients, the x's are the input variables or predictors and c is a constant. These discriminant functions are used to predict the class of a new observation with unknown class. For a k class problem k discriminant functions are constructed. Given a new observation, all the k discriminant functions are evaluated and the observation is assigned to class i if the i^{th} discriminant function has the highest value.

This study framework separate the questionnaire into four major parts, they are "the present stage phone behavior in service", "the 3G phone cognition and the purchase behavior", "the 3G phone function demand" and "the individual basic document". Firstly, the analysis method simply describes statistics of these four parts and presents the result through the frequency distribution. By observing the situation of sample distribution, we can analyze the following three items through the cross tabulate; they are "the present stage phone behavior in service", "the 3G phone cognition and the purchase behavior" and "the individual basic document". Hence the significant problem can then be exposed. The reasons or characteristics for those non-significant items are also discussed. Next, we use the One-Way ANOVA to discuss the correlation of the 3G phone function demand among three variables; "the present stage phone behavior in service", "the 3G phone cognition and the purchase behavior", and "individual basic document". The Nonparametric method and Scheffe Test are applied to help the comparison. Afterwards, we take the demand of 3G phone function as variable and use the Cluster Analysis to separate the sample groups [17]. After clustering, a cross analysis is made between the the clusters and other questions to find out whether there are different characteristics among clusters. Also, the Discriminate Analysis is performed in meanwhile to exam the accuracy of the clustering. Finally, we use the result of CA to do the market segmentation [18] [19].

5 TECHNICAL MANAGEMENT

The promoting of 3G phone, inevitably, was used first by those so-called Innovators [20] [21] in the beginning. These people occupied about 2.5% of the whole market. For the people who uses subsequently are so-called Early Adopter and they occupied 13.5% approximately. These two kinds of people occupied 16% totally in the whole market [22] as shown in Figure 4.

According to the adoptive time for new technologies, the market can be divided into two groups, the Early Majority and the Late Majority, each occupies about 34% respectively. Those recalcitrants who refused to accept the 3G phone occupied 16% approximately. Most of new technical products, after experiencing such evolution, can be accepted by most people.

Take the 3G phone for example; the first user groups of 3G phone are the people who invent it. These people

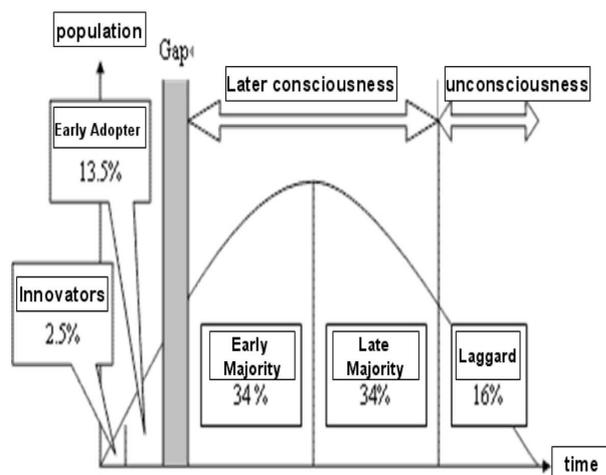


Fig. 4: Technology management marketing model

are the front 2.5%. Their work is to expedite new technology; therefore, they use those new technologies frequently. The people who extremely demand technologies in their life or work and the group who embrace the new technology by instinct will begin to accept the new technology. These people, so called professional consumers, occupied 13.5% in whole market. They always assemble computer themselves, and they like to talk about new technologies.

These extreme frantic, which has an intimate acquaintance with specification, the using behavior is different from populace, who is able to endure the extremely inconvenience and high price which brings from the immature technology. For example, those people could watch the low resolution PDA in the staggering metro-car and do not feel dizzy but enjoy it.

It is very important to maintain good relationship with this group; because they can control other consumer's purchase decision through the media of remarks, website forums, BBS and so on. However, these people are not stupid; they endorse the good products and maintain high allegiance of the brand, for this reason, the sell fulcrum often falls on the specification of product itself [23].

About the Early Majority who occupied 34% presented completely different basic being. For these people, please do not discuss too many details of specifications on marketing; also, please do not discuss the technicalities. These people can be moved easily by the simple demand or obviously diverse function demand. For example, the first brand personal computer of mainland China association technology, when sells this kind of high tech product of the computer, the demand only is "do not let own treasure child lose to the others".

For the people who detects lateness are so called Late Majority, they also occupied 34% in the market. They often start to use some kinds of high tech product only if

the majority of people in the society had already used. "So long as has well on" is the viewpoint of these people. This is why the elder always request us to buy a cheaply cell phone when they need. At this time, the marketing demand of social pressure is quite effective. For an example: "Had you bought transcription machine? Try this one, cheap and also easy to use".

In the later period, the technical products have often fallen into the developed market price battle field already, each kind of marketing demand can't stand against the low price demand effectively. If the technical product inventor can't promote new innovation, that is, improves the function or promotes a brand-new product, the product's life cycle will soon expire. "Same price but more function" may be the most effective demand.

The spirit of technical marketing depends on the following facts: Use different marketing packing design and demand, price, sales channel, customer service and so forth for each phase of users, lifting the product's prevalent rate to extremity to meet the populace acceptance degree. Before the market becomes nearly saturated, create another wave of innovation. However this technical marketing pattern tells us that, the view of this 16% predictors' marketing methods is completely different from view of the mainstream populace's marketing methods [24].

Please note that there is an apparent gap between the predictor and rearward detector. This is the most vivid and interesting aspect of this model. The gap explained that there exists a huge gap need to be overcome during the process which the new technologies diffuse from the predictor to the rearward detector. Whether the gap will be overcome or not is the key to make the new technology be accepted by the mainstream populace.

However, there are too many technical products in the history; which can only degenerate into the commoner application at last, even vanishes in the historical stage because they can't stride over the crucial 16%.

This study has discovered some important patterns and conformed to the early adopter 16% group, the partial early majority 34% group and partial late majority 34% group respectively.

6 ANALYSIS

(1) This study takes Taiwanese consumer as an object. The occupations of participants are mostly service staff, sales clerk, technician and the assistant in this study, accounts for 35% of all participants approximately. In part of blood-type, the blood-type O is the biggest species in our research, which accounts for 40.8%; the most common participant age falls in 45~54 years old and it accounts for 24.4%; As for the educational background, the high school stands on a vantage point, which occupies 37.6% of all participants. In the aspect of the disposable income, there are 33.1% of participants below NT\$5,000 dollars. In regard to the usage situation of cell phone presently,

there are 96.3% of participants who own cell phone now and nearly 88.9% who owns a phone number at most. The generality of the phone expense per month are below NT\$1,000 dollars, which occupied 52%. There are 38.3% of participants replacing their phone among one or two years; the main reason why people exchange their phone is better function, the satisfaction of present cell phone is mainly ordinary and satisfied, accounts for 34.7%, 25.6% respectively. For the participant who doesn't have cell phone presently, there are also 59.3% of participants wish to apply for the cell phone; the major motivation of applying for the cell phone is convenient and then is the job requirement.

(2) In the 3G phone cognition and the purchase part, there are nearly 43.9% participants know the 3G phone, 34.5% participants has heard about it, it shows that the majority of participants already knew this product; They obtain the information mainly from the television, secondly is from Internet; There are only 5.6% participants owns a 3G phone and a number at present. This indicates that the utilization ratio is low. Chunghwa telecom and Taiwan mobile system have the most possession, 49.0% and 30.2% respectively. The price which the participant willing to pay for purchase the 3G phone accounts for 37.9% is mainly NT\$5001~10000; The group who is willing to pay NT\$1001~1500 for the monthly fee approximately occupy 40%; Nearly 50% participants willing to buy a 3G phone, and there are 18.8% participants could not decided yet(still in consideration); Most people, 64.8% of the whole, has purchased the phone for longer than 1 year; the proportion disparity for the effectible factor of purchasing the 3G phone is not that large, most mainly for the price and the function. They are 52.2% and 48.7% respectively. Because the using time mostly above 1 year, possibly it is not well-known in the market at present, the common populace does not understand the difference with 2G, 2.5G handset, although cause 50% populace willing to purchase it, but all wants to wait and consider for some time, mostly do not desire to purchase it immediately, and tend to purchase the high value on phone prices, the receptivity of monthly fee is also high, indicate that the participant's cognition to the 3G phone belongs to high expense, This may explain that the acceptance is high but they still wouldn't purchase it immediately. About the morals part, 59.7% participants think that the video phone and the localization function would harm individual privacy; Also there are 70.8% participants worry that the 3G phone provides the network service and on-line transaction function may let personal data release to outside.

(3) After comparing the following three parts with the basic document alternatively: the situation of present phone behavior in service, the cognition of 3G phone and the purchase behavior; we find the factors which affect the purchase wish are: "Do you know what is the 3G phone?" and "How many cell phones do you have now?". The participants who knew the 3G phone have higher

Table 4: Tabulated Statistics I

Options	Purchase 3G or not * knew 3G or not	Occupation * Replace cell phone day time	Scholarship * Knew 3G or not	Age * Will 3G affect personal privacy	Inhabited area * Let personal data released
Pattern	The purchase rate is higher if knew the 3G phone	The proportion of, husbandry-forestry, fishing ,pasturage renew the cell phone in three months is higher	Above the master degree has higher rate, knew the 3G phone	The Age "45~54" has higher proportion to the privacy affection	North area regard the data would be released

Table 5: Tabulated Statistics II

Options	Income * Let personal data released	Using cell phone or not * Knew 3G	Replace cell phone daytime * Owns 3G or not	Replace cell phone daytime * Owns Phone number
Pattern	Below NT\$5,000 Has higher proportions	People who used cell phone has higher proportion	The proportion who owns 3G phone replaces the phone is highly	The proportion who owns phone no. replaces the 3G is highly in 3 months

possibility of buying 3G phones than those who did not know; the participant who owns 1 or 2 cell phones will purchase the 3G phone comparatively high to the participant who has above three cell phones. The proportion of changing a new cell phone in three months is higher in these kinds of occupations: husbandry, forestry, fishing, pasturage. Also it reveals the correlation of the frequency of replacing the phone and whether the person has the 3G phone or not. The data reveals that people who owns the 3G phone and number, has the higher proportion to replace the cell phone in three months. And those whose education is above master degree has a higher proportion of knowing the 3G phone. The age between 45~54 years old occupy higher proportion, regard the 3G phone affects personal privacy; The participants live in north inhabited area and each month's income below NT\$5,000 dollars, occupying a high proportion, think that due to the 3G phone provides the network and on-line transaction function can let private data released outside as shown in Table 4, 5.

Because the 3G cell phone is a new product, common populaces may not understand its function in depth, for

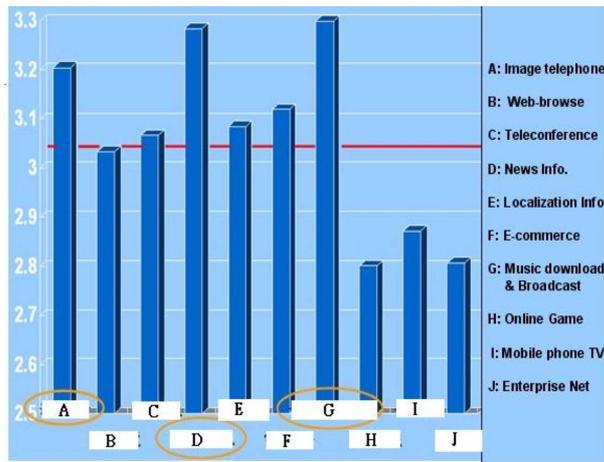


Fig. 5: Function demand comparison

this reason, the inquiring option of function demand is inclining to careless. However, this study observes it through the mean value and attempts to understand the tendency of participant’s demand. From Table 5-3, we can observe that the most desirable service function in 3G phone are music downloading and broadcasting, the news information, the image telephone, the e-commerce, the localization information, the teleconference and the web-browse in order. As regards the on-line game, the mobile phone television and the enterprise network application are inclined to unnecessary as shown in Figure 5.

(4)In the part of function demand variable, after comparing it with present phone behavior in service, the cognition and purchase of 3G phone and basic document; we discovered the participant who owns cell phone has higher demand to the television cell phone. And the participants who replace their phone “in three months” and “from one year to two years” has higher demand to the teleconference function than the participant who replaces phone “from three months to half year”; the participant who replaces phone “Above two years” has higher demand to locate function than the participant who replaces phone “half year to a year”; Compares with the participant who “did not know” the 3G phone, the participant who “Knew” the 3G phone has higher demand to the teleconference; The participants who did not know their blood-type has lower demand to teleconference function than the participants who know their blood-type; the participants between “25~34 years old” has higher demand to the news information than the participants between “the 35~54 years old” and “the 18~24 years old”. In the part of enterprise network function demand, the participants between “18~24 years old” has higher demand to the enterprise network function than the participants between “the 35~44 years old” and “the 55~64 years old”; the feminine participants has higher

Table 6: Tabulated Statistics III

Options	Using cell phone or not * TV function	Replace cell phone day time * Tele-conference	Replace cell phone Daytime * Localization info.	Knew 3G * tele-conference	Blood-type * Tele-conference
Pattern	The person owns cell phone has higher demand on TV function	The participant who replaces the phone “each three months” and “a year to two years” has the higher demand to the tele-conference function	The participant who replaces the phone “Above two years” has the higher demand to locate function	The participant “Knew” the 3G phone has higher demand to the tele-conference	The participant who did not know their blood-type has lower demand to tele-conference function

Table 7: Tabulated Statistics IV

Options	Age * News info.	Age * Enterprise network	Inhabited area * Enterprise network	Gender * Enterprise network
Pattern	Age within “25~34” Has higher demand on News Info. than “35~54” and “18~24”	Age within “18~24” Has higher demand on Enterprise network than “35~44” and “55~64”	South area has lower demand on Enterprise network	Female has higher demand on Enterprise network

demand than the males on enterprise network function; The south area participants compare with other local area and the 55~64 years old compare with the participants within other ages all have lower demand to the corporate network function as shown in Table 6, 7.

(5)This study regards function variable as the Cluster Analysis foundation and divides the participants into three groups; the correct rate cluster of discrimination reaches 99.3% by way of Discriminant Analysis, so it may be known that the function variable can discriminate the consumer of 3G phones effectively as shown in Figure 6.

The cluster 1 is the VIP gold customer group, its participants have higher demand regarding the enterprise network, second is the image telephone, the news

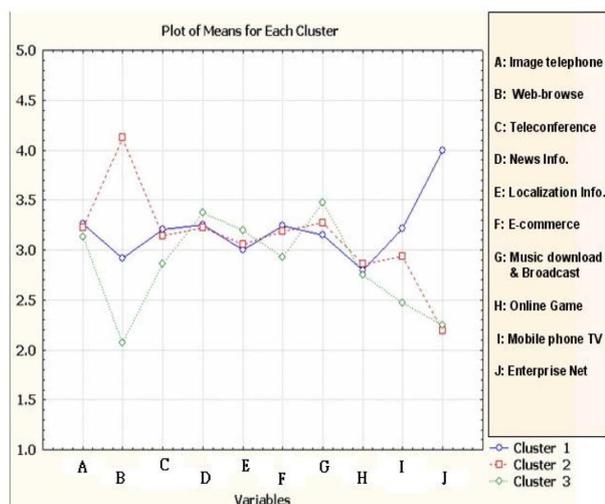


Fig. 6: Cluster Analysis

information and the e-commerce; nevertheless, they do not very need the on-line game function. On the whole, this group has higher demand than other groups. In the aspect of population statistic variable, the occupation of this group are usually clerical worker and housekeep accounts; their age fall within the 18~34 years old; the inhabited area is located at eastern part; their educational background are usually college; the monthly income is above NT\$50,000 dollars; their gender are female mostly and they often have the B blood-type.

The cluster 2 is the network information technology group, the characteristic of this group is highly demand for the homepage browsing function, the next is music downloading and broadcasting; they do not need enterprise network function very much. In the aspect of population statistic variable, their occupation are usually husbandry, forestry, fishing, herd, laborer, mechanic, and student; the age are within the 45~64 years old; they usually live in south area; their educational background are above master degree or junior high respectively; their monthly income is NT\$30001~50000 dollars, their gender are usually male and they usually have AB blood-type.

The cluster 3 is the common customer group, relative to other two groups; this group uses less service function. However, it has higher demand in the part of localization function. The most unneeded function demand for this group is network browsing function. In the aspect of population statistic variable, their occupation are mostly retirees; their age are within the 35~44 years old; the inhabited area for them are located at south; their educational background are junior high school; their monthly income is below NT\$5,000 dollars, their gender are usually male and they usually do not know their

blood-type. Table 8 is the demand Table of the three kinds of clusters.

7 CONCLUSION

The appearance of 3G phone, makes the global communication industry faced with the brand-new challenge, There are five communication industries already show the positive performance in Taiwan at present, wanted to obtain the initiative in this 3G inside track, but the official operation actually not guaranteed has the same prospect as the 3G phone, therefore, we should first evaluate the whole development, draw up the strategy carefully before invest massive costs, then achieve the goal.

From this study, regarding the 3G phone cognition analysis and the purchase part, we discover that there are approximately 75% populace had heard the 3G phone at present in Taiwan, and there are also 50% populace indicate to purchase it, but the purchase time will retard after a year, we suggest the dealer may use television and the network to expose it in this period of time, increases consumer's impression, make it well-known, and cooperate with the Famous brand merchant, develop the practical and the quality guaranteed 3G phone, promote populace's approval in order to occupy the leading status in the next wave of 3G cell phone.

As the front article to say, the 3G phone has a diverse function compares with the GSM system, including the general telephone conversation service, it increases many adaptations, the entertainment, the multiplex service function, synthesizes service which generalize the various of domestic and foreign systems promotes by dealer, the entire 3G service project makes one exclaimed in surprise, but while the 3G service function seep into daily life, regarding the obviously difference in the society and the culture, will be directly affect the 3G service on the development in different regions, the different countries and the nationalities will present the obviously territoriality to the 3G phone function service demand, if the dealer didn't pass through the consideration, develops all kinds of function service directly, possibly may cause the burden and the waste of operation cost, we suggest the dealer should in accordance with Taiwan consumer's characteristic, take the neighborhood Asian country as reference, like Japanese and South Korea's development experience, seeks the match demand function to Taiwan populace, reduces the nonessential cost disbursement, also can enter much tradable service stratum. For providing service part, in view of three kinds of clusters which differentiates, we cite different marketing proposals as follows:

(1) VIP gold customer group : The cluster has big quantity of demand to enterprise network, also has relatively higher demand in each kind of function, it may categorize into the foundation of makes money, and it should especially pay attention to the degree of

satisfaction of this cluster. This group in the population statistic variable, the occupation which are the clerical worker and the housekeep accounts for higher proportion, the age within the 18~34 years old, the scholarship for college, each month income is above NT\$50,000 dollars, the gender is female, accounts for many proportions, we can propose the special marketing plan to these higher proportions variables. In the marketing proposal, we may promote 1) Cooperate with the company and the enterprise and then promotes the application preferential benefit. 2) Ultra large capacity memorandum function 3) New function as necessary introduced 4) On-line shopping 5) The special personnel service 6) The discount of higher used quantity to customer etc. We have to pay attention to this cluster that they are the enormous part of 34% early majority who surmount after Gap in the technical management marketing pattern.

(2) Network information technology group : This cluster characteristic has highly demand regarding the web-browsing function, also has music downloading and the broadcast function, they have similar habitude, we suggest that it can merge together and layout a marketing plan. The occupation of husbandry, forestry, fishing and herd, laborer and mechanic, and student occupy higher proportion in statistic population variable of this cluster, the age within the 45~64 years old, the south inhabited area, the scholarship above master degree or junior high, each monthly income is NT\$30001~50000 dollars, the male, the AB blood-type accounts for higher proportions, we suggest the dealer to propose the marketing plan in view of the above basic document characteristic. In the marketing suggestion, we may promote 1) The ultra highly effective data transmitting 2) Cooperates with the album company to promote the new song to download 3) Coordinate with cell phone merchant, providing the durable phone which bears falls 4) Expand cell phone conversation volume function and so on. But we must especially pay attention to this cluster that the lynchpin of innovator and the 16% early adopter most are in the technical management marketing pattern.

(3) Common customer group : this group is opposite to other two groups, it seldom uses each service function, but compares with other groups, it has higher demand quantity to the localization function demand, the dealer may provides service which needed by this characteristic. The occupation take retirement proportion as high, the age within the 35~44 years old, the inhabited area for the south, the scholarship is junior high level, each monthly income is below NT\$5,000 dollars, the male, the blood-type is not knowing account for higher proportions in statistic population variable of this cluster. In the marketing suggestion, we may promote 1) Global localization, satellite navigation 2) The economy monthly rent scheme 3) Promotes the easy-operating function phone with the merchant. We must especially pay attention to this cluster that the 34% early majority after surmounts Gap and another part the 34% late majority in the technical management marketing pattern.

In the acceptance of the 3G phone price, the price which the participant willing to pay for purchase the 3G phone most mainly is NT\$5001~10000 dollars, second is NT\$2001~5000 dollars, but the monthly rent price willing to pay each month on the 3G phone is NT\$1001~1500 dollars primarily, second is NT\$501~1000 dollars, we have a suggestion that the dealer may provide the middle price position strategy to assault the market share, then consolidated customer group by monthly rent, also may promote the basic cell phone, fixed the customers who need not many function demand, let the customer choose the project they need, and cost separately, or provides the method of high price low monthly rent, Coordinate with the diversification of the 3G function service, apply the discrimination cluster, promotes every kinds of tradable service choice [25], we can spend the least costs and achieves the biggest benefit.

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