

**HOW PRODUCT AVAILABILITY  
INFLUENCE CONSUMERS WHILE  
BUYING ICE CREAM**

By

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A thesis submitted to the Department of Business Administration in partial fulfillment of  
the requirements for the degree of  
MBA

Masters of Business Administration

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## **DECLARATION**

It is hereby declared that

1. The thesis submitted is my original work while completing the MBA degree at BRAC University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material that has been accepted or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all of the main sources of help.

**Student's Full Name & Signature:**

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## APPROVAL

The thesis/project titled “*How Product Availability Influence Consumers While Buying Ice Cream*” submitted by *Abu Sadat Chowdhury (16364054)* of Fall Semester, 2019 has been accepted as satisfactory in partial fulfilment of the requirement for the degree of MBA on 26<sup>th</sup> January 2020.

### Examining Committee:

Supervisor: (Member)	<hr/> <p>Zaheed Hosein Mohammad Al-Din Senior Lecturer, MBA Department BRAC University</p>
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## **ETHICS STATEMENT**

## ABSTRACT

In this study, my focus is to find out the factors that have a significant influence on the buying pattern of Ice Cream. This study mostly considered Ice Cream products that usually consume by students such as Stick Ice Cream or Cone Ice Cream. Based on my findings availability is the most significant factor that influences consumers to have Ice Cream. That is why I have developed my research title “*How Product Availability Influence Consumers While Buying Ice Cream*”. For this research, I have conducted exploratory research where I have found six factors that influence the buying pattern of Ice Cream. The influencing factors that I have considered are Flavor, Quality, Price, Availability, Appearance and Advertisement. For the conclusive research, I have set a sample size of 100 respondents who were mainly third year or final year students. Then I developed a questionnaire and collected data from the students of East West University and then after filtering that 100 responses I get 89 genuine responses than from there I have collected 80 responses randomly for my research. I used Microsoft Excel and SPSS, and with the help of these two instruments I find out the value of Cronbach’s Alpha, p-value and beta value using five-point Likert scale. Where I find that the internal consistency between the independent variables with the dependent variable is (.5322) which is 53.22%. Lastly, with the help of these values, I was able to find out that Flavor has a positive influence on buying Ice Cream but the results showed that it has a positive but insignificant influence on buying Ice Cream. After all other factors Quality, Price, Availability, Appearance, and Advertisement have a significant influence on the buying of Ice Cream. However, other than Availability all the factors have a positive influence on the buying pattern of Ice Cream. Finally, future research directions are presented in this study.

Keynotes: Ice cream; flavour; quality; price; availability; appearance; advertisement; consumer; buying behaviour.

## **DEDICATION**

I dedicate my dissertation work to my family and my teachers, my source of inspiration, wisdom, knowledge and understanding. A special feeling of gratitude to my loving parents whose words of encouragement and push for tenacity ring in my ears. My elder brother, younger brother, sisters-in-law who have never left my side and are very special.

I also dedicate this dissertation to all my life teachers who have supported me throughout the process. I will always appreciate all they have done, especially Ashif Sir for helping me develop my technology skills, Rubai Sir for the installing marketing DNA in my brain, and Hasan Maksud Sir for helping me to master the Operation Management dots.

I dedicate this work and give special thanks to my best friend Ezaz Leo and my wonderful niece Sahar for being there for me throughout the entire program. Both of you have been my best cheerleaders.

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**LIST OF ACRONYMS**

SPSS	Statistical Package for the Social Sciences
Offtake	Sales to Consumer
SEC	Social Economic Class/Condition

## GLOSSARY

Glossary:	An alphabetical list of key terms
Cronbach Alpha	Cronbach's alpha or coefficient alpha is the most famous and commonly used among reliability coefficients.
Hypothesis Testing and Null Hypothesis	A statistical hypothesis test is a method of statistical inference; that is testable based on observing a process that is modelled via a set of random variables. The null hypothesis attempts to show that no variation exists between variables, or that a single variable is no different than zero.
P-Value	The P-value or calculated probability is the estimated probability of rejecting the null hypothesis (H <sub>0</sub> ) of a study question when that hypothesis is true.
R Squared (R <sup>2</sup> )	is a statistical measure that represents the proportion of the variance for a dependent variable that's explained by an independent variable or variables in a regression model. It may also be known as the coefficient of determination.
Safety stock	Safety stock is a term used by logisticians to describe a level of extra stock that is maintained to mitigate the risk of stockouts caused by uncertainties in supply and demand. Adequate safety stock levels permit business operations to proceed according to their plans.
Thesis	An extended research paper that is part of the final exam process for a graduate degree. The document may also be classified as a project or collection of extended essays.
T value	It represents the difference between the mean or average scores of two groups while taking into account any variation in scores.
Regression Analysis	In statistical modelling, regression analysis is a set of statistical processes for estimating the relationships between a dependent variable (often called the 'outcome variable') and one or more independent variables (often called 'predictors', 'covariates', or 'features').
Reliability Coefficient Test	Reliability test refers to how dependably or consistently a test measures a characteristic.
Reorder Point	The reorder point is the level of inventory which triggers an action to replenish that particular inventory stock. It is a minimum amount of an item which a firm holds in stock, such that, when the stock falls to this amount, the item must be reordered.
Quantitative Research	Quantitative research is the process of collecting and analyzing numerical data. It can be used to find patterns and averages, make predictions, test causal relationships, and generalize results to wider populations.
Qualitative Research	Qualitative research relies on unstructured and non-numerical data. The data include field notes written by the researcher during the course of his or her observation, interviews and questionnaires.

# **CHAPTER ONE**

## **OVERVIEW OF THE STUDY**

## 1.0 INTRODUCTION

Ice Cream is a soft, sweet frozen food made with milk and cream and typically flavoured with vanilla, fruit, or other ingredients. This frozen dessert usually made from dairy products, such as milk and cream, and often combined with fruits or other ingredients and flavours. Ice Cream (derived from earlier iced cream or cream ice) is a sweetened frozen food typically eaten as a snack or dessert. It may be made from dairy milk or cream and is flavoured with a sweetener, either sugar or an alternative, and any spice, such as cocoa or vanilla. Colourings are usually added, in addition to stabilizers. The result is a smooth, semi-solid foam that is solid at very low temperatures (below 2 °C or 35 °F). It becomes more malleable as its temperature increases. The meaning of the name "Ice Cream" varies from one country to another. Terms such as "frozen custard," "frozen yoghurt," "sorbet," "gelato," and others are used to distinguish different varieties and styles. Products that do not meet the criteria to be called Ice Cream are sometimes labelled "frozen dairy dessert" instead. This frozen dessert is served chilled to ensure its quality. This product is consumed by all classes of people, especially children. This product comes in many different flavours i.e. chocolate, strawberry, vanilla etc. The most common form of Ice Cream is a cone (an ice cream covered with a biscuit), box and stick (an ice cream, which is enclosed with a stick). These products are consumed occasionally especially during the summer season. Ice cream may be served in dishes, for eating with a spoon or licked from edible cones. Ice Cream may be served with other desserts, such as yoghurt, or sweets, sundaes, milkshakes, Ice Cream cakes and even baked items, such as Baked Sandwiches. As my research requires, I have emphasized on the consumer insights of Ice Cream preferences. Based on the findings suggested techniques to ensure product availability.

## **CHAPTER TWO**

### **PROBLEM DEFINITION**

## 2.0 PROBLEM DEFINITION

The main objective of the study will be to find out what consumers think or the preferences that come to their minds when they think of buying an Ice Cream. People consider having “sweets” to delight their tongue. Sweets were the only component to indulge our taste. However, the invention of Ice Cream is considered as a substitute for having sweets. Therefore, there is a need to research to find the sustainability of Ice Cream. This research will help the Ice Cream companies to find out what the consumers value more while buying an Ice Cream. In the future, this will help to sustain Ice Cream products in the market for the long run. It will also help companies what the consumers want when they buy Ice Cream and when the consumers will prefer a new flavour of Ice Cream and to understand their needs, wants and demands.

### 2.1 Background of the Problem

Increased demand, economic development and changes in the lifestyle have resulted in a great impact on the peoples' mind and their demand for buying Ice Cream. Ice Cream consumption is still high. It has become a culture in this country to have Ice Cream on any occasion. People love to have sweets after finishing their meal where Ice Cream is considered as one of the most important desserts. It attracts warmth, closeness and family bonding. Technology has a great contribution towards introducing new flavours of Ice Cream. Ice Cream is one of the prime reasons for increasing emotional bonding among peers.

On top of that, the lifestyle of the Bangladeshi people particularly the middle class and elite class in the urban areas have been changing very fast, which has resulted in greater movements and greater use of branded Ice Cream products in the country. To make the product available in all the relevant point of sales channels; Ice Cream companies might need to change its strategy while dealing with the consumers' mind in this competitive market.

As consumer behaviour is dynamic so before taking any strategic decision Ice Cream product industry should consider various factors related to their product and marketing policies. Thus, from the holistic viewpoint, I think the study on ***How Product Availability Influence Consumers While Buying Ice Cream*** will be very significant to the relative industry.

## 2.2 Statement of the Problem

The purpose of this research project is to represent the factors that a customer consider while buying Ice cream. The decisions made to have research on choices that a customer made while buying Ice Cream, as it is a very important sector for a marketer. Consumers evaluate a product based on information cues. (Olson & Jacoby, 1972). The objective of the research is to find out what are the effective factors that influence people while buying Ice Cream. To identify the possible factors at first I went through an **Exploratory (Qualitative) marketing research** to identify some necessary steps for having a clear concept about our main purpose or objective of the study. This exploratory research has been finalized based on secondary data.

The problems are given below-

### *I. Core Problem:*

“Which factors influence customers while buying Ice Cream?”

### *II. Marketing Research Problems*

What are the most triggering factors that may have a significant influence on consumers while buying Ice cream?



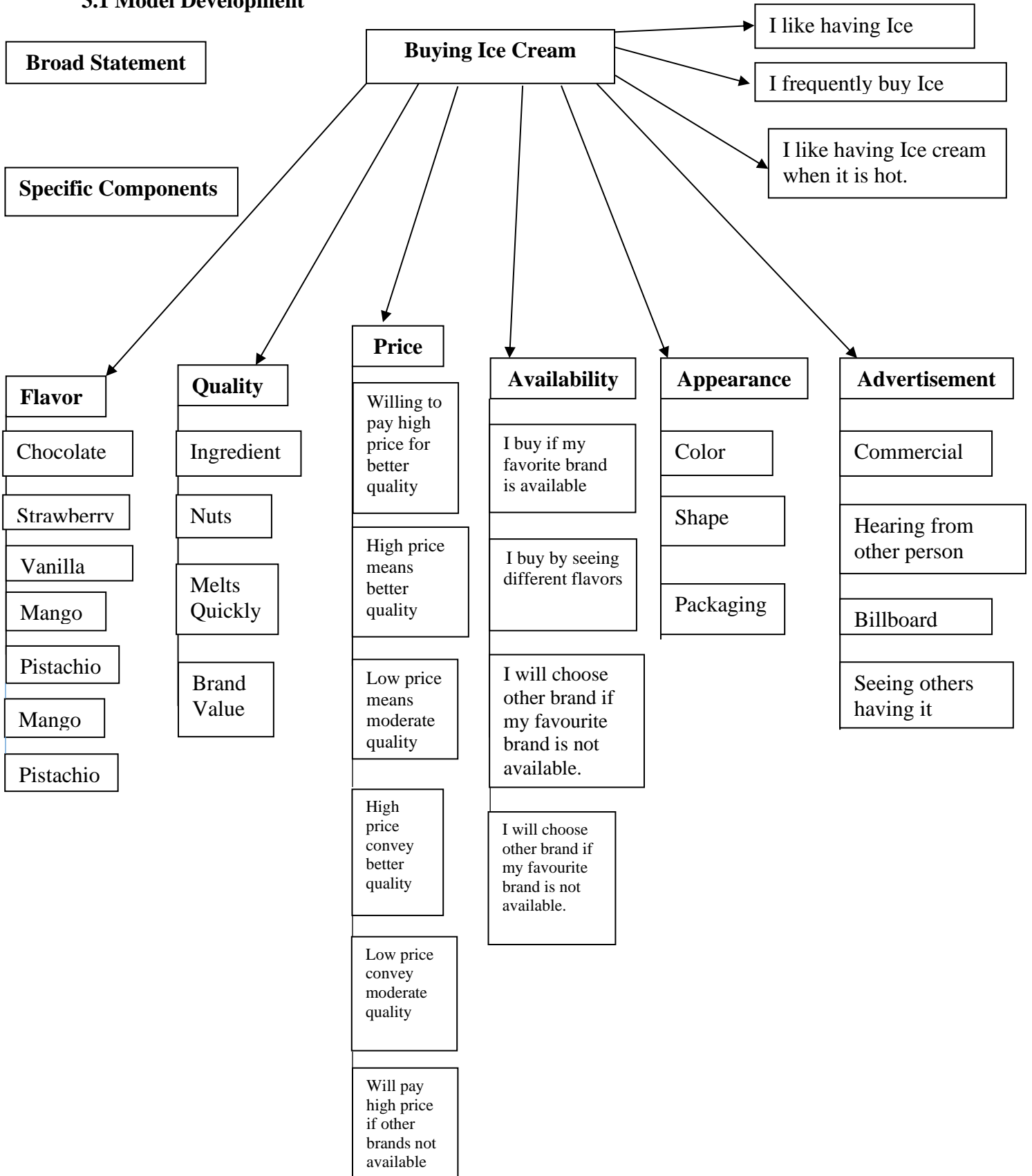
## **CHAPTER THREE**

### **APPROACH TO THE PROBLEM**

### **3.0 APPROACH TO THE PROBLEM**

In this research, my focus is to find out the factors, which have a significant influence on the buying decision pattern of Ice Cream. To identify the reasons behind it I have conducted exploratory research where I have found six factors that influence the buying pattern of Ice Cream. The influencing factors that I have considered are Flavor, Quality, Price, Availability, Appearance and Advertisement. These variables are to be described under the research design, then for data collection, I have to select a sample, for analyzing data I have to determine the relevant analysis technique and finally the findings will be interpreted with the existing body of knowledge.

3.1 Model Development



### 3.2 Theory Development

To identify the influencing factors while buying Ice cream, I have conducted exploratory research and according to my findings, I have found some relevant factors that mainly influence the buying behaviour. They are:

- The flavour of Ice cream.
- Quality of Ice cream.
- Price of Ice cream.
- Availability of Ice cream.
- Appearance of Ice cream.
- Advertisement for Ice cream.

Therefore, these are the factors I have been considered and based on that I have conducted my research. First, I have developed a Questionnaire based on these data, and then I have done a pre-test for the more accuracy of the Questionnaire. Then for my data collection, I have selected a sample size of 100 respondents and then after the survey, I have filtered the responses and get 90 genuine responses, but for conducting my research, I have selected 80 responses randomly. Moreover, for analyzing data, I have used Microsoft Excel and SPSS, and with the help of these two instruments I find out the value of Cronbach's Alpha, p-value and beta value using five-point Likert scale and finally, the findings have been interpreted based on the values that have been found.

### 3.3 Analytical Model Development

For the research process, I followed **Multiple Regression Equation** to identify the components known as dependent and independent variables and their relationship among one another and their impacts on the research. The Multiple Regression Equation is,

$$Y \text{ (buying of Ice cream)} = x_1 * (\text{Flavor}) b_1 + x_2 * (\text{Quality}) b_2 + x_3 * (\text{Price}) b_3 + x_4 * (\text{Availability}) b_4 + x_5 * (\text{Appearance}) b_5 + x_6 * (\text{Advertisement}) b_6$$

## **CHAPTER FOUR**

### **LITERATURE REVIEW**

#### 4.0 LITERATURE REVIEW

Review of literature shows the previous studies carried out by the researcher in this field. Previous studies are reviewed to gain insight into the extent of research. The research problem can be more understood and made specific referring to theories, reports, records and other information made in similar studies. This will provide the researcher with the knowledge on what lines the study should proceed and serves to narrow the problem. The main objective of the study is to measure “*How Product Availability Influence Consumers While Buying Ice Cream*” among the people and the reviews are as follows:

The relative constructs of the study are Flavor, Quality, Price, availability of Ice Cream, the appearance of Ice Cream and advertisement of the Ice Cream. Besides, who is a consumer and who is a customer; their basic differences are also presented. The study of consumer behaviour of some scholars is illustrated to show interrelated connections among them.

##### **Flavor**

The distinctive taste of a food or drink or the general quality of taste in a food. Moreover, flavoring refers to a substance used to alter or enhance the taste of food or drink or an indication of the essential character of something. In the case of Ice cream, flavor is considered as a vital element. It brings the smell of ice cream. Different flavor brings the different flavor in Ice cream. In this research, I have considered chocolate, strawberry, vanilla, mango and pistachio flavor. It plays a vital role in the buying decision of the customer. Different people have different taste some people want strawberry, some want mango and some want chocolate. It depends on the person’s mood what flavor he or she wants to taste and it based on different situations. That is why I have considered flavor as an instrument of my factors.

##### **Quality**

Quality is the ability of a product to satisfy a consumer's needs and requirements (McCarthy & William, 1991). One of the important factor considered by consumers while buying Ice Cream is the quality. Quality is the ongoing process of building and sustaining relationships by assessing, anticipating, and fulfilling stated and implied needs. A focus-group participant told us “the more

people who buy a brand, the better quality it is.” Another important aspect of improving quality is an emphasis on brand. ISO 8402-1986 standard defines quality as "the totality of features and characteristics of a product or service that bears its ability to satisfy stated or implied needs."

Quality is such an issue that no one can ignore while consuming an Ice Cream. In my research, quality is considered as an important factor because customer always considers the taste, which is directly influenced by ingredients. Quality is the best indicator of the product's durability, reliability, precision, and other valued attributes. As Ice Cream is a chilled dessert, so melting quality of it also determines its quality. The high quality perception often depends on consumers' distinct liking and beliefs toward the brand. Thus, a brand may contain quality attributes but it may not satisfy consumers' preference if it does not fit with their perceptions and beliefs of high quality. Typically, consumers recognize the quality levels of different brands through categorical information as well as experience with the brand and they form positive or negative perceptions about the quality of a specific brand. When consumers are convinced with quality of a brand, they evaluate a brand positively. Consumers also feel pride of owning quality product because they perceive better quality as an image of social status. Sometimes, the perception of quality is diverse among consumers. For a brand, different consumers hold different perception vis-à-vis brand quality. A brand might be coded as "high quality" by some consumers, and "medium quality" or "low quality" by others. Again, product quality perceptions are also varied based on the product class. Therefore, quality is such a factor that can assure the customer about the value that an Ice cream promises to deliver.

**Perceived quality** is the customer's judgment about a product's overall excellence or superiority that is different from objective quality (Zeithaml 1988). Objective quality refers to the technical, measurable and verifiable nature of products/services, processes and quality controls. He classified the concept of perceived quality in two groups of factors that are intrinsic attributes and extrinsic attributes. The intrinsic attributes are related to the physical aspects of a product (e.g. colour, flavour, form and appearance); on the other hand, extrinsic attributes are related to the product, but not in the physical part of this one (e.g. brand name, stamp of quality, price, store, packaging and production information). It's difficult to generalize attributes as they are specific to product categories.

Zeithaml (1988) classify the concept of perceived quality in two groups of factors that are intrinsic attributes and extrinsic attributes. The intrinsic attributes are related to the physical aspects of a product (e.g. colour, flavour, form and appearance); on the other hand, extrinsic attributes are related to the product, but not in the physical part of this one (e.g. brand name, stamp of quality, price, store, packaging and production information. It's difficult to generalize attributes as they are specific to product categories (Olson and Jacoby 1972)

### Price

Kotler and Armstrong describe price as the money charged for products or services or the sum of values that is exchanged by consumers for having the benefits of that product or service.

Price plays a pivotal role in a consumer's choice of brand. Many consumers organize their products category knowledge in terms of the price bands of different products. Price perception is the process by which consumers translate price into meaningful cognitions, and it has interested researchers for several years (Lichtenstein, Block, & Black, 1988). Consumers want to get highest utility from a brand, which they purchase by sacrificing money and benefit from other competitive brands.

Price conveys information to the consumer about product quality (Erikson & Johansson, 1985). The importance of price as a function of perceived quality has been extensively studied more than any other factors in this sphere (Dodds et al., 1991; Swan, 1974; Wheatley & Chiu, 1977; Zeithaml, 1988). High priced brands likewise perceive to be higher quality. Thus, price information is extensively used as an extrinsic cue to evaluate a brand. Therefore, price can play both role as an indicator of the amount of sacrifice needed to purchase a product and an indicator of the level of quality.

Therefore, the price of an Ice Cream plays a significant role in the buying decision of Ice Cream, which is why the companies do the market segmentation to find out the purchasing power of different income groups in the society. Consumers want to get highest utility from a brand, which they purchase by sacrificing money and benefit from other competitive brands. So if a brand can achieve high quality in terms of low price, the consumer develops favourable evaluation towards that brand. Low-income groups may be influenced by the price of the product while the high-



income groups are not that much bother about that. That is why we have considered flavour as an instrument of our factors.

### **Availability of Ice Cream**

Availability of product describes whether the desired products are available or not. A firm that ensures availability of product holds a strong position in the market and the mind of the customers. Throughout the world, all the firms give a huge amount of emphasis in providing product availability so that they can hold a strong position in the market.

Here in our research, availability of Ice cream in a shop is considered as an important factor because there is a huge amount of competitor brands available. Sometimes in case of buying a product, we choose those products, which we were not aware of, and hence the packaging, ingredients, and the flavour influences us to buy the product. The visibility of a product plays a major role here.

### **Appearance of Ice Cream**

Appetence refers to the way that someone or something looks. It may be an impression given by someone or something, although this may be misleading. In our content, the colour and texture play a significant role for influencing consumers. The visibility of a product influenced the consumers more than the invisibility of a product. Moreover, this factor influences consumers as fast as any other factors.

### **The Advertisement for The Ice Cream**

Advertising is a paid non-personal communication from an identified sponsor using mass media to persuade or influence the audience. It is all about effective communication of the message through effective media like television, radio, internet, newspaper, magazines, billboards, banners, brochures, etc. There are various types of advertising; it focuses on the development of long-term brand identity and image. The reference group has been recognized as a ubiquitous feature that influences the purchase. The Company can build characters that are congruent with their brands and the target audience.

In our content, Advertisement is the best way to grab the consumers' attention. While in this case many companies are more focused on the advertisement of their product congruent with their brands to their target audience and want to increase their sales as fast as possible. It also influences the consumers to buy a product and tells them all the benefits and attributes of a product.

Bansal Taylor And James (2005)<sup>107</sup> has mentioned that through advertisement/promotion product offering can be communicated best and regarded to be a one of the most essential medium. Promotion has been used by all firms for new product introduction in a market. In order to force essential consumers to buy new services or product, promotion is regarded to be a good communication medium. This is providing awareness about the company and new services or products as well. Baron, Harris, Harris (2003)<sup>108</sup>, has mentioned that promotional activities has major target to set a new service or product in the market to aim consumer, develop sales to enhance share market, create requirement for essential customer and devise strategy to rival other products.

According to Bell, and Luddington (2006)<sup>109</sup>, Promotional activities and advertisement are regarded to be stimuli to gain responses of essential consumers in the form of sales development. The promotion comprises of discounts, distribute samples among people, product display at market, premiums, contests, etc. The activities of promotion bring much developments if these are supplied from time to time and outcomes in better influence of sales. If they are well organized and scheduled systematically according to best practices, the activities become more efficient. Well scheduled promotional is also helpful for supplying those services and products whose customers are not wishing to agree it.

### **Consumer and Customer**

A customer is a person or company who purchases goods and services. A customer becomes a consumer when he or she uses the goods or services i.e. where there is some consumption.

Therefore we can define a consumer as an individual who (buys and) uses a product or service. So, the consumer could be the customer that goes into the shop to buy the sweets. However, the final consumer may not always be the customer. For example, a parent goes into the sweet shop and buys some sweets. He or she does not eat them, and so they are not the consumer. The child

would eat the sweets and be the consumer, although he or she did not buy the sweets and so they are not the initial customer.

The reason we need to know the difference between a consumer and the customer is that we will want to design communications and understand the consumer behaviour of the person that instigates and influences a buying decision as well as the final consumer. For example, the child will influence the mother's decision on which sweets to buy. **(What is a Customer Tim Friesner - Marketing Teacher Website)**

### **Consumer Buying Behaviour**

The behaviour of consumer is considered to be the study of why, when, where and how people prefer or prefer not to buy a particular product. It takes into consideration and mix together the basics of their economic status, their psychology, the society and the social anthropology. It in short tries to recognize the decision of the buyer either individually or collectively. It examines uniqueness of individual customers such as their behavioural variables and demographics in an effort to identify state of people's requirements.

Aaker, David and George (1971) in the book "Consumerism: Search for the consumer Interest" makes an effort to evaluate influence on the buyer from their close group such as friends, reference groups, family as well as in general the society. The general definition of consumer behaviour is that one of the studies a marketer uses to understand a consumer better and forecast on how their behaviours change when coming to buying decisions.

According to Schiffmann (1993), consumer behaviour is the sum of learned values, customs and beliefs that serve to direct the members of a specific society. According to Brian Mullen (2001) from the book "The Psychology of Consumer Behaviour" consumer behaviour is the decision maker or behaviour of the consumer in the market place of the services and goods. From the application of psychology, sociology, and demographics, the marketers can begin to understand why the consumers form attitudes and make decisions to purchase the product. Consumer behaviour is based on the consumer playing three different roles of buyer, payer and user.

Consumers consume things of daily use and also buy and consume the products according to their needs, preferences and buying capacities. Those products may be consumable goods, speciality goods, durable goods or industrial goods (Mellott, 1993) What the people are buying, how they are buying, where and when they are buying, how much quantity they prefer to buy all depends on their self-concept, perception, social and cultural background and also on their age, attitudes, family cycle, motivation, beliefs values, social class, personality and many other factors.

Howard and Sheth (1968) have explained how consumers' buying patterns are influenced by criteria from within and outside. They said the consumer's brains were a black box that could internalize stimulating aspects. These aspects can create notions in the brain that could be productive or non-productive. Thus customer could agree or reject. This formulation forms the premise for the stimuli reaction mechanism.

**CHAPTER FIVE**  
**RESEARCH DESIGN**

## **5.0 RESEARCH DESIGN**

The main purpose of this research is to find out which factors the customers usually consider when they buy Ice cream. For the findings, I used both the exploratory research design and the Conclusive research design. Therefore, to find out the most influencing factors I first conducted the Exploratory research than I have conducted the Descriptive research to find out who should be considered, and when and where they should be contacted to find the answers of my Causal research. My research is Conclusive research.

### **5.1 Type of Research Design**

I have applied a single cross-sectional research design method. My research design follows the exploratory method. The research has both qualitative and quantitative part.

### **5.2 Information Needs**

To conduct the research I used secondary and primary information. I have read various article based on Ice Cream research that worked as secondary sources. I have also collected information from those people who regularly consume Ice Cream.

### **5.3 Data Collection from Secondary Sources**

I have collected most of my secondary data from the internet and websites and other related researches. I also took the help of the secondary data so that I can get the appropriate result, findings and reasons for the problem that helped me to deal with. The data from the secondary sources helps me to better identify and define the problem. It also gives me the knowledge of how should I approach to the problem and which research design will be appropriate for the study. Through websites, I was able to find out which factors are necessary to keep in this research and based on that I have developed the factors which influences the buying behaviour of customers while buying Ice cream.

However, in this report, I minimize the usage of secondary data as much as possible. I also used secondary data only in cases where I could not use primary data.

#### **5.4 Data Collection from Primary Sources**

To know about the responses; I have used the questionnaire method in the sample survey. A researcher uses the questionnaire technique for collecting data more than any other method. The questionnaire, were non-disguised because the questionnaire was constructed so that the objective is clear to the respondent. The respondents were aware of the objective. They knew why they asked to fill the questionnaire. After collecting the responses, the data was coded into the computer for further processing.

The primary data has been collected from the survey that I have conducted on my research “Evaluation of factors while buying Ice cream”. Here I have developed my questionnaire based on the factors (Flavor, Quality, Price, Availability, Appearance, and Advertisement) that I have considered for my research. In the questionnaire, I first developed a filter question so that respondent can think and answer the questions from his own experience and point of view.

I have surveyed students where the sample size was 100 students, after the survey I have filtered the responses that have been taken from the survey and then approved 90 responses, and lastly, from there I collected 80 responses randomly.

#### **5.5 Scaling Techniques**

I have used a five-point Likert scale to measure the attitude of customers towards the various factors that influence the buying decision. I have used the number of categories, balanced, non-forced type of questions in the questionnaire so that the respondents can answer the questions easily.

#### **5.6 Questionnaire Development and Pretesting**

At first, I conducted an Exploratory Research before preparing the final questionnaire. The main objective of this Exploratory Research is to get the factors that influence the buying of Ice cream (independent variables).

I have developed a simple and concise questionnaire for the ease of answering the respondents. I have developed the non-comparative questions in the questionnaire.

I have used a five-point Likert scale where the options started from strongly disagree to strongly agree and the rating started from 1 to 5. I have used balanced questions in the questionnaire where I have also maintained a number of categories and non-forced type of questions. My objective was to make the respondents understand the questions easily and answer the questions according to his or her perception and judgment. The questions were prepared based on the six factors that I have considered for the research. There are six independent variables and one dependent variable and I have developed the whole questionnaire to identify how these independent variables influence the dependent variable. Besides, under each independent variable, I again developed some items to measure the reliability of the variables.

There were two demographic questions in the questionnaire to understand the types and backgrounds of the respondents. At the very first of the questionnaire, I have introduced the reasons and myself behind my research and what was the purpose of this study. There is one filter question at the beginning of the questionnaire to make feel the respondents the part of the situation or environment and answer from their perception.

Lastly, before conducting the survey I tested the questionnaire to find any mistakes if present. I have tested the questionnaire among some students and then at last my supervisor checked it. That is why the answers to all the questions are designed in Likert scales for later use in SPSS software to conduct statistical analysis.

### **5.7 Sampling Techniques**

I have surveyed 100 students from East West University. From those 100 responses, I have filtered and discarded 10 responses because that was not appropriately answered and in some cases, the respondent forgets to tick the answer. Then from another 90 responses, I have taken 80 responses randomly. According to the factors the independent variables, I actually needed 70 responses but I have taken 80 responses to get the more accurate result of the research. While conducting this survey my focus was on students who usually buy Ice cream and who have aged between 18 to 28 years. Because this population can better define the problem and give the more accurate result of the problem that, I was dealing with to found out.



## 5.8 Fieldwork

It was really easy for me to cope up with given conditions and go for the samples because the required sample were students of the private university as I have only taken as a sample as the students of East West University. Therefore, finding those samples was not a challenge for me as I were a former student of East West University. Also, there were a huge of co-operation especially from the sixth and seven semester students who helped me a lot for filling out the questionnaire.

## 5.9 Research Question and Hypothesis Development

In the earlier part of my research process, through **Exploratory research**, I had identified some triggering factors like- **Flavor, Quality, Price, Availability, Appearance and Advertisements**. These may create a significant influence on the consumers while buying an Ice Cream. To measure the influence of these factors, I conducted some Research Questions (**RQs**) and Hypothesis (**H**). I needed these Hypotheses to prepare my **Research Questionnaire** for generating the opinion. Therefore, I have developed Research Questions (**RQs**) and Hypothesis (**H**) in the following way:

### Research Question:

1. Does Flavor significantly influence customers to buy Ice Cream?
2. Does Quality have a favourable impact while buying an Ice cream?
3. Does Price significantly influence customers to buy Ice Cream?
4. Does Availability of an Ice Cream significantly influence customers to buy Ice Cream?
5. Does the Appearance of an Ice Cream significantly influence customers to buy Ice Cream?
6. Does the Advertisement for an Ice Cream significantly influence customers to buy Ice Cream?

**Hypothesis:**

**H1:** The flavour of the Ice cream influence while buying an Ice cream.

**H2:** The quality of an Ice cream influence while buying an Ice cream.

**H3:** The price has a direct positive affect while buying an Ice cream.

**H4:** Availability of Ice cream in the market has a favourable impact on buying an Ice cream.

**H5:** Appearance of An Ice Cream has a positive effect while buying an Ice cream.

**H6:** The advertisement for Ice cream creates a positive attitude while buying an Ice cream.

## **CHAPTER SIX**

### **DATA ANALYSIS**

## **6.0 DATA ANALYSIS**

The main reason for this research is to find out whether the factors I have taken have any relationship with the buying decision. I have developed a structured questionnaire for the study based on Likert five point's scale. To analysis data, I have chosen reliability taste to find out the result. Also, to know the relationship of these factors with buying decision I am going to conduct regression analysis. Those factors will be tested in SPSS.

### **6.1 Research Methodology**

The study began with exploratory research. To find out the factors that a consumer consider while buying an Ice cream. I have gone through the collection of secondary data analysis, which helps me to find out the factors influencing consumer behaviour while buying Ice Cream. In the secondary reports, I have figured out the specific components that have a direct effect on consumer decision of buying Ice Cream. This report is mainly a Quantitative report but it also includes some Qualitative portion. This study carried out both based on primary and secondary data. For the primary data, I have developed a structured questionnaire survey among students aged between 18-27 years. I have taken information from a sample size of 100 respondents. My main survey was conducted in the location of East West University premises.

### **6.2 Pre-test**

To determine the factors that influence a consumer's buying decision, exploratory research had been conducted. A convenient sample of 10 students had been used to get the independent variables (Flavor, Price, Quality, Availability, Appearance and Advertisements for our research. This helped to get insight in the significance of the affecting factors.

## **CHAPTER SEVEN**

### **RESULTS**

## 7.0 Results

After analysis, the following results are revealed.

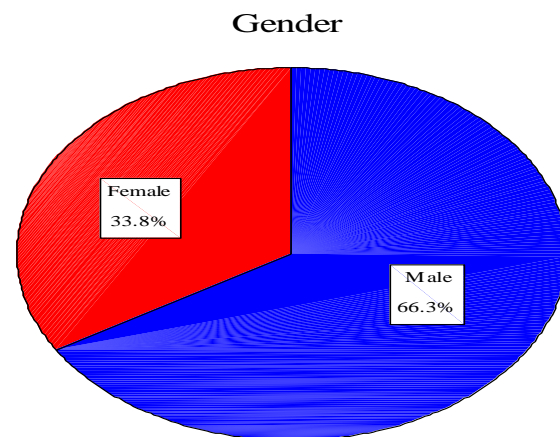
### 7.1 Measurement of the Variables

The Likert scale that had been used here had a total of 32 questions, 6 for the dependent variables, the rest 26 for six independent variables. The reliability or the internal consistency of the questions had been measured Cronbach coefficient alpha using the statistical software SPSS. The minimum acceptable range for primary research has to be more than 0.5.

#### 7.1.1 Demographic Factors

		Frequency	Percent
Valid	Male	53	66.3
	Female	27	33.8
	Total	80	100.0

*Table 1: Gender Classifications*



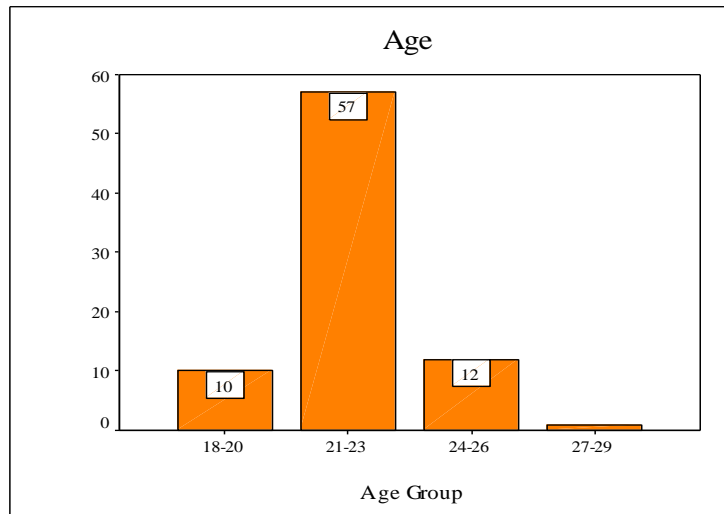
*Figure 1: Source: SPSS "Gender Classifications"*

While interviewing respondents, who were students of a private university (East-West University), most of them were male participants. Around 66.3% of them were male and the rest 33.8% were female with the sample size of 80.

Age			
		Frequency	Percent
Valid	18-20	10	12.5
	21-23	57	71.3
	24-26	12	15.0
	27-29	1	1.3
	Total	80	100.0

*Table 2: Age Variations*

Since we have chosen respondents from a private university most of the respondents were of age 20 to 23 years.



*Figure 2: Source: SPSS "Age Variations Bar Chart"*

## 7.2 Reliability Testing

Cronbach alpha of the six dependent variables was .3640; however, after deducting the third Dependent variable price the alpha value turned .4723. However, after deducting the sixth dependent variable scale advertisement the alpha value turned to .5322. (See Appendix 2)

The questions regarding price had an alpha value of .4652. After deducting the third Question of the price, the alpha value turned into .5122. Again, we had to deduct question four of the price the alpha value turned to .6338 (See Appendix 2).

The Cronbach alpha value for the variable availability was .2111, so we deduct the first question of availability we had an alpha value of .2965. Although we have considered .50 in the alpha value but here because of lack of variable we have taken this into consideration. (See Appendix 1).

In case of buying Ice cream the main dependent variable, the alpha value was .5472, but after deducting the third question of buying ice cream the alpha value turned to .7007. (See Appendix 2)

## Summary of the Reliability Measurement

Dimensions	Number of Items	Alpha Value
<b>Dependent Variable</b>	<b>4</b>	<b>.5322</b>
Flavor	5	.4503
Quality	4	.6003
Price	2	.6338
Availability	2	.2965
Appearance	3	.7854
Advertisement	4	.5911

*Table 3: Summary of Reliability Measurement*

***Interpretation:***

The reliability test of the dependent variable for the six variables has been extracted from the reliability analysis. From the previous exploratory research, the overall alpha stands to be .5322, which means that all the independent variables had an internal consistency of 53.22% among each other, which is more than 50%.

### **7.3 Analysis Techniques**

Once the reliability analysis was done, we calculated the mean value of dependent variables and independent variables. Finally, we completed the analysis part through regression analysis.

#### ***7.3.1 Regression Equation:***

$$Y' = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + b_6 x_6$$

Where, x1 = Flavor

X2 = Quality

X3 = Price

X4 = Availability of Ice Cream

X5 = Appearance of Ice Cream

X6 = Advertisement for Ice Cream



**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.357 <sup>a</sup>	.128	.056	.6848

a. Predictors: (Constant), AVG\_ADV, AVG\_QTY, AVG\_PRC, AVG\_AVL, AVG\_APR, AVG\_FLV

*Table 4: Source: SPSS “R Square Model”***Regression Analysis:**

From the regression analysis, we have found that the Value of R Square is (.128). That means independent variables (Flavor, Quality, Price, Appearance, Availability, and Advertisement) has 12.8% impact over the dependent variable (evaluation of buying an Ice Cream). In other words, the dependent variable (evaluation of buying an Ice Cream) can be influenced by 12.8% by the independent variable (Flavor, Quality, Price, Appearance, Availability, and Advertisement)

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.291	.740		3.096	.003
	AVG_FLV	.303	.137	.265	2.210	.030
	AVG_QTY	8.372E-03	.103	.009	.081	.935
	AVG_PRC	6.261E-02	.103	.072	.608	.545
	AVG_AVL	-4.17E-02	.115	-.042	-.361	.719
	AVG_APR	6.462E-03	.091	.008	.071	.944
	AVG_ADV	.161	.117	.157	1.376	.173

a. Dependent Variable: AVG\_BUY

*Table 5: Source: SPSS “Co-Efficient of Dependent Variables”*

**Standardized Coefficients of Dependent Variable with The Beta Value:**

Variables	Correlation	Comment
The flavor of Ice Cream	0.265	There is a weak, positive relationship
Quality of Ice Cream	0.009	This is a weak, positive Relationship
Price of Ice Cream	0.072	This is a weak, positive Relationship
Availability of Ice Cream	-0.042	This is a weak, inverse Relationship
The appearance of Ice Cream	0.516	This is a moderate positive relationship
Advertisement for Ice Cream	0.157	This is a weak, positive Relationship

*Table 6: Source: SPSS “Co-Efficient of Dependent Variables with Beta Value”*

**7.3.2 Hypothesis Testing:**

In this section, our hypothesis based on the six factors that significantly influence the customers while buying an Ice Cream.

- H1.** The flavor of the Ice cream influence while buying an Ice cream.

**Ha:** The flavor of the Ice cream does **not** influence while buying an Ice cream.

Independent Variables	Standardized Regression Coefficient ( $\beta$ )	t value	Sig. / P value
Flavor	.265	2.210	.003

The observed table shows that Flavor has a Positive influence ( $\beta=.265$ ) while buying Ice Cream. And we can see that P-value (.030) is lower than the alpha value (.05) so reject **H1**.

That means the flavor of the Ice cream **does not** influence while buying an Ice cream. Among the flavors Chocolate flavor is considered most negative.

- H2:** The quality of an Ice cream influence while buying an Ice cream.

**Ha:** Quality has **no** significant influence while buying an Ice cream.

Independent Variables	Standardized Regression Coefficient ( $\beta$ )	t value	P
Quality	.009	0.081	9.35

The observed table shows that Quality has a Positive influence ( $\beta=.009$ ) while buying Ice Cream. And we can see that the P-value (9.35) is higher than the alpha value (.05) so do not reject **H<sub>2</sub>**. That means The quality of an Ice cream influence while buying an Ice cream. Among the quality factors ingredients is considered less significant.

**3. H<sub>3</sub>:** The price has a direct positive affect while buying an Ice cream.

**Ha:** The price has **no** direct positive affect while buying an Ice cream.

Independent Variables	Standardized Regression Coefficient ( $\beta$ )	t value	P
Price	.072	0.608	0.545

The observed table shows that Price has a Positive influence ( $\beta=.072$ ) while buying Ice Cream. And we can see that the P-value (0.545) is higher than the alpha value (.05) so do not reject **H<sub>3</sub>**. That means The price has a direct positive affect while buying an Ice cream.

**4. H<sub>4</sub>:** Availability of Ice cream in the market has a favorable impact on buying an Ice cream.

**Ha:** Availability of Ice cream in the market has **no** favorable impact on buying an Ice cream.

Independent Variables	Standardized Regression Coefficient ( $\beta$ )	t value	P
Availability	-.042	-0.361	0.719

The observed table shows that Availability has an Inverse influence ( $\beta=-.042$ ) while buying Ice Cream. But we can see that the P-value (0.719) is higher than the alpha value (.05) so do not reject **H<sub>4</sub>**. That means Availability of Ice cream in the market has a favourable impact on buying an Ice cream.

5. **H5:** Appearance of An Ice Cream has a positive effect while buying an Ice cream.

**Ha:** Appearance of An Ice Cream has **no** positive effect while buying an Ice cream.

Independent Variables	Standardized Regression Coefficient ( $\beta$ )	t value	P
Appearance	.008	0.071	0.944

The observed table shows that Appearance has a Positive influence ( $\beta=-.008$ ) while buying Ice Cream. And we can see that the P-value (0.944) is higher than the alpha value (.05) so do not reject **H<sub>5</sub>**. That means the Appearance of An Ice Cream has a positive effect while buying an Ice cream.

6. **H6:** The advertisement for Ice cream creates a positive attitude while buying an Ice cream.

**Ha:** The advertisement for Ice cream creates a negative attitude while buying an Ice cream.

Independent Variables	Standardized Regression Coefficient ( $\beta$ )	t value	P
Advertisement	.157	1.376	0.173

The observed table shows that Advertisement has a Positive influence ( $\beta=-.157$ ) while buying Ice Cream. And we can see that the P-value (0.173) is higher than the alpha value (.05) so do not reject **H<sub>6</sub>**. That means advertisement of Ice cream creates a positive attitude while buying an Ice cream. Among the advertisements, billboard advertisements are considered less significant.

## **CHAPTER EIGHT**

### **FINDINGS**

## 8.0 Findings

In my research, which is on “*How Product Availability Influence Consumers While Buying Ice Cream*”, I have tried to find out the factors that influence customers to buy Ice Cream products. I have found six influencing factors (Flavor, Quality, Quality, Price, Availability, and Advertisement) by conducting an Exploratory Research.

These six factors were tested by conducting a Regression Analysis. The result indicates that out of the six factors, five factors have a significant influence on customers while buying ice cream. The five factors are Quality, Price, Appearance, Availability, and Advertisement. The only factor that does not show significant influence is Flavor. But in this study, it was hypothesized that flavour has a positive influence on buying Ice cream. However, the result shows that flavour has a positive but insignificant influence on buying Ice cream. So based on my findings I can say that while buying ice cream, customers give more importance to Quality, Price, Appearance, Availability and Advertisement while they give less importance to Flavor. One of the many reasons could be that people are increasingly becoming Quality conscious and Price becomes important to live a standard life. The flavour of an Ice Cream could be because of due the increase of daily necessities people are less conscious about the flavour of an Ice Cream. They want to indulge themselves having delight so flavour may be considered less significant to them.

## **CHAPTER NINE**

### **LIMITATIONS**

## 9.0 Limitations

- This is the first time I have done marketing research so I was less experienced in doing the research work. I was not fully efficient in developing a questionnaire. But in future, I will be able to do any kind of research.
- During the analysis, I came to know that the number of Independent variables we use the more accuracy we will get in the reliability test. So next time if I get the chance I will be careful about it.
- The study used students as a sample to test the hypotheses. However, as Oakes (1972) has pointed out regardless of what population is sampled, generalization can be made with caution to other populations. Thus, future research should consider samples other than students.
- When a consumer evaluates a brand, he/she may retrieve the factors directly related to a brand. It is important to include all the potential variables in a research setting to assess the effects of factors on consumers' evaluation process.
- The  $R^2$  (.128) value is low which suggests that there are other factors than the ones considered which also influence customers while Buying Ice Cream. Further study should include other factors besides the ones we considered here.
- In this study, flavour considered a positive cue in evaluating factors. But while Buying Ice Cream it has failed to prove its effectiveness. A question for future research involves the identification of reasons for it. The possibility is that flavour effects for Ice Cream may not be the same for other flavours. Results suggest that continuous research is necessary to achieve clearer empirical support. From a practical standpoint, the results of this study should provide managers with greater insight concerning introducing new flavours for potential buyers. In conclusion, future study should focus on which cues have a significant and positive influence on consumers' real behaviour towards Buying Ice Cream. Because there is always a scope of improvement in everything we do.



## **CHAPTER TEN**

### **LEARNINGS**

## 10.0 Learnings

Although this is the first time, I have done a thesis study but my learning was many.

- I have developed my questionnaire in English. Bangali is our native tongue, so it may be difficult for some students or respondents to understand the questions instantly. If the questionnaire was also translated into Bangla than this learning would not occur. Only for respondents capability to understand English; third and final year students were considered as respondents for this study.
- As students were considered as the core respondents of this study so, their Income level should be considered for conducting any buying pattern research. As mostly, they are depended on their parent's income but buying decision always comes from income level or the relevant pocket money a student has acquired.
- The time or season was also a crucial learning factor for my study. The survey was conducted during the summer season. During this time, offtake (sales to consumer) is higher than in the winter season. If this survey was conducted during the winter season, results may vary.
- Ice Cream is an impulse buying product. So availability should be the major considerations for buying Ice Cream.
- One of the factor, which I nor my exploratory research identified, was the shop size. Due to the capacity of the shop, the owner may consider not to sell Ice Cream products despite receiving a fridge from an Ice Cream manufacture. Therefore, product availability factor weakens here.

## **CHAPTER ELEVEN**

### **CONCLUSION**

## 11.0 Conclusion

Nowadays buying Ice Cream has become a culture in this country. So it important to preserve this culture and develop a new standard to it. People love to have sweets after finishing their meal where Ice cream is considered as one of the most important desserts. It attracts warmth, closeness and family bonding. Technology has a great contribution towards introducing new flavours of Ice cream.

Consumers' who bought Ice Cream for home consumption typically bought from a neighbourhood grocery store or confectionery which had been produced by a local manufacturer and was sold under the manufacturer's label. There is also a shift in consumer food-buying habits especially known as SEC (Social Economic Class/Condition); Consumers' today are away from small neighbourhood groceries and move to superstores or modern trade. The problems of supply and distribution concern mainly for the small dual-brand manufacturer.

Throughout the study, the factors which have been tested some have proven significant and some are insignificant. There might be some potential respondents who might provide a more accurate answer which could change some significant findings.

Other extraneous variables play a significant role. However, as they do not preferably play a heavy role so I have not considered these factors. I think these factors are unimportant (i.e. the color of the Ice cream, influence from the reference group, biscuit or nut in Ice cream) which might have a significant influence on my research.

**CHAPTER TWELVE**  
**RECOMMENDATION**

## 12.0 Recommendation

One of the objectives of my study was to help markets to know the significant factors that influence customers buying Ice Cream. Hence, from my study, I can recommend the following:

- Flavor of an Ice Cream is the most significant element in verifying the test of the Ice Cream. So technology should be developed to create new delicious flavours.
- Brand image of the Ice Cream is another significant element. The companies should instruct the retail outlets appropriately so that they can preserve the Ice Cream in prescribed temperature. If they do not such as if a customer receives a less crisp Ice Cream they might have changed their attitude towards the brand of Ice Cream. Hence, companies should be actively trying to enhance their brand image through communication to retailers by providing relevant training. Brand promotion activities also need to be considered to remain active in consumer preferences. Companies can also promote themselves economically through public relations and simple efforts of promoting word-of-mouth. Digital advertisements, such as applications in social networks like Facebook, Twitter, Instagram and Snapchat will help them to be on top of mind and enhance brand image i.e. moven-pick and baskin-robbins.
- Availability is the next important factor in my study. If the customers do not enjoy Ice Cream because of the scarcity of distribution, they may switch to other brands or try other dessert products. Therefore, one company should have multiple outlets in an area so that every region of the target market is covered. Also, shop owners should think ways to make their store beautifully decorated. However, decoration requires for a handsome amount of investment, further detailed studies should be done before leaping into huge investments.
- To ensure availability, a required safety stock should be maintained by retailers or modern trade shoppers by calculating the probability of demand, store capacity, lead time, fund allocation, seasonality and irregularity.
- For considering safety stock and re-order point seasonal variations should be considered; as Ice Cream demand in the summer season will not be the same against winter season. (See Appendix 4 for calculations of measuring safety stock and re-order point.

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# Appendix

**Appendix 1: Questionnaire**

This is the sample of the questionnaire which is offered to the respondents for the survey; is presented below:

**Questionnaire**

**“EVALUATION OF FACTORS WHILE BUYING ICE CREAM”**

Thank you for giving us the opportunity by sharing us your time to fill in the questionnaire. We assure you that all the data provided in the questionnaire will be kept confidential and used for academic purpose only. Your cooperation will be highly appreciated.

1. Do you consume Ice Cream? ( If yes, continue further)

- Yes
- No

**Please place your level of agreement for the following statements with a tick mark (√) in the appropriate box.**

	<b>Factors</b>	<b>Strongly Disagree 1</b>	<b>Disagree 2</b>	<b>Neutral 3</b>	<b>Agree 4</b>	<b>Strongly Agree 5</b>
<b>1</b>	I like having ice cream					
<b>2</b>	I frequently buy ice cream					
<b>3</b>	I like having ice cream when it is hot					
<b>4</b>	Flavor of an ice cream influenced me to buy it					
<b>5</b>	I prefer chocolate flavor ice cream					
<b>6</b>	I prefer strawberry flavor ice cream					
<b>7</b>	I prefer vanilla flavor ice cream					
<b>8</b>	I prefer mango flavor ice cream					
<b>9</b>	I prefer pistachio flavor ice cream					
<b>10</b>	Quality of an ice cream influenced me to buy it					
<b>11</b>	I think ingredients influence the taste of an ice cream					
<b>12</b>	I prefer nuts in my ice cream					
<b>13</b>	I won't buy ice cream that melts quickly					
<b>14</b>	I prefer brand while buying ice cream					

Appendix

	<b>Factors</b>	<b>Strongly Disagree 1</b>	<b>Disagree 2</b>	<b>Neutral 3</b>	<b>Agree 4</b>	<b>Strongly Agree 5</b>
15	Price of an ice cream influence me to buy it					
16	I am willing to pay high price for better quality ice cream					
17	I think high price means better quality					
18	I think low price means moderate quality					
19	I will pay high price if other ice cream brands are not available					
20	Availability influence me to buy an ice cream					
21	I buy if my favorite brand is available in the shop					
22	I buy ice cream by seeing different flavors					
23	I will choose other brand if my favorite brand is not available					
24	Appearance of an ice cream influence me to buy it					
25	I buy ice cream by seeing its color					
26	I buy ice cream by seeing its shape					
27	I buy ice cream by seeing the color of its package					
28	Advertisement of an ice cream influence me to buy it					
29	I buy ice cream after seeing an commercial					
30	I buy ice cream by hearing it from other person					
31	I buy ice cream by seeing it in billboard					
32	I buy ice cream while seeing others having it					

**Demographics Questions:**

1. **My Age**    18-20    21-23    24-26    27-29    30-32

2. **My Gender**    Male    Female

**Thank you for your time and cooperation.**

## Appendix

### Appendix 2: Internal Consistency Test

#### A. Internal Consistency Test

##### 1. Dependent Variable

Cronbach's Alpha	N of Items
.3640	6

**Now We Delete Price From Here**

#### R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )

		Mean	Std Dev	Cases
1.	Q4_FLV	4.1000	.8657	80.0
2.	Q10_QTY	4.2250	.8109	80.0
3.	Q15_PRC	3.4625	1.0427	80.0
4.	Q20_AVL	3.5750	.9649	80.0
5.	Q24_APP	3.5000	.9937	80.0
6.	Q28_ADD	3.3125	1.0505	80.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	22.1750	7.9184	2.8140	6

#### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Alpha if Item Deleted
Q4_FLV	18.0750	6.0196	.2706	.2602
Q10_QTY	17.9500	6.2253	.2559	.2744
Q15_PRC	18.7125	7.1188	-.0517	.4723
Q20_AVL	18.6000	5.6354	.2951	.2330
Q24_APP	18.6750	5.6399	.2736	.2463
Q28_ADD	18.8625	6.5505	.0491	.4080

#### Reliability Coefficients

N of Cases =       80.0

N of Items =       6

Alpha =       .3640

## Appendix

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**After deducting dependent Price, we got**

Cronbach's Alpha	N of Items
.4723	5

**Now We Delete Advertisement From Here**

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )

		Mean	Std Dev	Cases
1.	Q4_FLV	4.1000	.8657	80.0
2.	Q10_QTY	4.2250	.8109	80.0
3.	Q20_AVL	3.5750	.9649	80.0
4.	Q24_APP	3.5000	.9937	80.0
5.	Q28_ADD	3.3125	1.0505	80.0

	Mean	Variance	Std Dev	N of Variables
Statistics for SCALE	18.7125	7.1188	2.6681	5

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Alpha if Item Deleted
Q4_FLV	14.6125	5.2277	.2884	.3948
Q10_QTY	14.4875	5.3163	.3062	.3875
Q20_AVL	15.1375	4.7530	.3410	.3521
Q24_APP	15.2125	4.9543	.2661	.4071
Q28_ADD	15.4000	5.5342	.0973	.5322

Reliability Coefficients

N of Cases = 80.0

N of Items = 5

Alpha = .4723



## Appendix

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**After deducting dependent variable Advertisement, we got**

Cronbach's Alpha	N of Items
.5322	4

**After Price & Advertisement Final Answer of Dependent variable that we should consider**

### R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )

		Mean	Std Dev	Cases
1.	Q4_FLV	4.1000	.8657	80.0
2.	Q10_QTY	4.2250	.8109	80.0
3.	Q20_AVL	3.5750	.9649	80.0
4.	Q24_APP	3.5000	.9937	80.0

	Mean	Variance	Std Dev	N of Variables
Statistics for SCALE	15.4000	5.5342	2.3525	4

#### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Alpha if Item Deleted
Q4_FLV	11.3000	3.6051	.3589	.4282
Q10_QTY	11.1750	3.9437	.2897	.4853
Q20_AVL	11.8250	3.3867	.3425	.4395
Q24_APP	11.9000	3.4582	.2946	.4859

#### Reliability Coefficients

N of Cases = 80.0

N of Items = 4

Alpha = .5322

### **Reliability of Buying Ice Cream**

Cronbach's Alpha	N of Items
.5472	3

## Appendix

### We should delete q3 to make it more reliable

#### R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )

		Mean	Std Dev	Cases
1.	Q1	4.3125	.7043	80.0
2.	Q2	3.7000	.8916	80.0
3.	Q3	3.7875	1.2497	80.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	11.8000	4.4911	2.1192	3

#### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
Q1	7.4875	2.9112	.4510	.3809
Q2	8.1000	2.4456	.4485	.3170
Q3	8.0125	1.9872	.2674	.7007

#### Reliability Coefficients

N of Cases = 80.0

N of Items = 3

Alpha = .5472

#### After deducting q3, we got

Cronbach's Alpha	N of Items
.7007	2

#### R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )

		Mean	Std Dev	Cases
1.	Q1	4.3125	.7043	80.0
2.	Q2	3.7000	.8916	80.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	8.0125	1.9872	1.4097	2

## Appendix

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### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
Q1	3.7000	.7949	.5543	.
Q2	4.3125	.4960	.5543	.

### Reliability Coefficients

N of Cases = 80.0

N of Items = 2

Alpha = .7007

**The Reliability Between q1 & q2 is .70 after Removing q3 .So now we will find the avg of q1 & q2 to find Y**

avg_buy			
4	4.5	4.5	5
3.5	4	5	4
4.5	4.5	2.5	3
5	3	3	3
5	3	4	5
3.5	3.5	3.5	4
4.5	4.5	4.5	3
4.5	4.5	3.5	5
3.5	4.5	3.5	4
3.5	4	5	4
4	4.5	4.5	3
3	3.5	5	4.5
4.5	5	4.5	3.5
5	3.5	3.5	3.5
4	3	3.5	4.5
3.5	3	4	4.5
3	4	4	5
4.5	3.5	4.5	3.5
2.5	4.5	5	4.5
4.5	3	4	5

## Appendix

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### **2. Independent Variable**

#### 2.1 Flavor

Cronbach's Alpha	N of Items
.4503	5

#### **Reliability of Flavor**

**The 1<sup>st</sup> test of flavor .Here we don't need to delete so we should consider this.**

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )

		Mean	Std Dev	Cases
1.	Q5_1F	3.7875	1.1659	80.0
2.	Q6_2F	3.6625	1.0902	80.0
3.	Q7_3F	3.5375	.9801	80.0
4.	Q8_4F	3.2875	1.2345	80.0
5.	Q9_5F	3.2625	1.0280	80.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	17.5375	9.5176	3.0851	5

#### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Alpha if Item Deleted
Q5_1F	13.7500	6.6203	.2563	.3808
Q6_2F	13.8750	6.4905	.3310	.3266
Q7_3F	14.0000	7.6456	.1682	.4390
Q8_4F	14.2500	6.8228	.1816	.4412
Q9_5F	14.2750	7.0627	.2559	.3833

#### Reliability Coefficients

N of Cases = 80.0

N of Items = 5

Alpha = .4503

## Appendix

**So now we will find the avg of q5\_1f,q6\_2f,q7\_3f,q8\_4f,q9\_5f to find X1**

avg_flv			
3.8	2.6	3.2	4.4
2.4	2	3.8	1.8
4.2	3.2	3	4.2
3	2.6	3.4	3.6
3.6	4	3	3.4
3.4	4	3.6	4.2
3.4	3.6	3.4	4
4	3.8	3	4.8
3	3.4	4.4	4.2
3.6	3.8	3.4	4.2
3.2	3.4	3	3.8
3.6	3.8	2.6	4.2
3.6	2.4	4	2.8
3.8	4.2	3	3
3.4	4	4.2	3.6
3.6	3.4	4.8	3.4
3.4	3.8	3.8	3.2
3.8	2.6	4.2	3
3.2	4.2	3.2	3.6
2.8	2.2	3.8	4.6

### 2.2 Quality

Cronbach's Alpha	N of Items
.6003	4

### Reliability of Quality

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )					
		Mean	Std Dev	Cases	
1.	Q11_1Q	4.0375	.9202	80.0	
2.	Q12_2Q	3.4500	1.3398	80.0	
3.	Q13_3Q	3.9125	1.1495	80.0	
4.	Q14_4Q	4.0625	1.0231	80.0	
Statistics for SCALE		Mean 15.4625	Variance 9.1125	Std Dev 3.0187	N of Variables 4

## Appendix

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### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
Q11_1Q	11.4250	6.9057	.2812	.5958
Q12_2Q	12.0125	4.5948	.4741	.4505
Q13_3Q	11.5500	5.8709	.3447	.5576
Q14_4Q	11.4000	5.8633	.4445	.4862

### Reliability Coefficients

N of Cases = 80.0

N of Items = 4

Alpha = .6003

**Here we don't need to delete so we should consider this. So now we will find the avg of q11\_1q,q12\_2q,q13\_3q,q14\_4q to find X2**

avg_qty			
4.75	2.75	4.75	3.25
4.25	4.75	3.25	4.5
5	4.5	4.75	4.25
3.5	3.5	3.75	4.5
4	3	3.75	3.5
5	4.75	4.75	4.5
3.5	5	3	4.25
4.75	5	3.75	3.75
3.5	4	4.75	3.25
5	3	2.25	3.75
4	2.5	2	3.75
3.75	4.5	3.5	3.25
3.75	2.25	5	3.5
5	4.25	3	4.25
2.75	3.75	3.5	3.25
3.5	4.25	2.5	4.75
3.5	4.5	4	3.25
4.5	3.5	4.25	3.25
4.25	4.5	2.5	3.75
4	4	3.25	4

## Appendix

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### 2.3 Price

Cronbach's Alpha	N of Items
.4652	4

### Reliability of Price

**We have to delete q18 to make it more reliable. 1<sup>st</sup> step of price**

#### R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )

		Mean	Std Dev	Cases
1.	Q16_1P	3.9375	.9853	80.0
2.	Q17_2P	3.7250	.8997	80.0
3.	Q18_3P	3.3500	.7971	80.0
4.	Q19_4P	3.1375	1.1664	80.0

	Mean	Variance	Std Dev	N of Variables
Statistics for SCALE	14.1500	5.8000	2.4083	4

#### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Alpha if Item Deleted
Q16_1P	10.2125	3.5872	.3328	.3268
Q17_2P	10.4250	3.4120	.4749	.1957
Q18_3P	10.8000	4.7696	.1134	.5122
Q19_4P	11.0125	3.6074	.1878	.4955

#### Reliability Coefficients

N of Cases = 80.0

N of Items = 4

Alpha = .4652

**After deducting q18\_3P, we got**

Cronbach's Alpha	N of Items
.5122	3

## Appendix

### R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )

		Mean	Std Dev	Cases
1.	Q16_1P	3.9375	.9853	80.0
2.	Q17_2P	3.7250	.8997	80.0
3.	Q19_4P	3.1375	1.1664	80.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	10.8000	4.7696	2.1839	3

#### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
Q16_1P	6.8625	2.4745	.4273	.2461
Q17_2P	7.0750	2.8297	.3734	.3523
Q19_4P	7.6625	2.6062	.2132	.6338

#### Reliability Coefficients

N of Cases =      80.0                                  N of Items =      3

Alpha =      .5122

**We have to delete q19 to make it more reliable. 2<sup>st</sup> step of price**

**After deducting q19\_4p, we got**

Cronbach's Alpha	N of Items
.6338	2

### R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )

		Mean	Std Dev	Cases
1.	Q16_1P	3.9375	.9853	80.0
2.	Q17_2P	3.7250	.8997	80.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	7.6625	2.6062	1.6144	2



## Appendix

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### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
Q16_1P	3.7250	.8095	.4659	.
Q17_2P	3.9375	.9707	.4659	.

### Reliability Coefficients

N of Cases = 80.0

N of Items = 2

Alpha = .6338

**So now we will find the avg of q16\_1p,q17\_2p to find X3**

avg_prc			
4	3.5	4.5	4
3	5	3	3
4	3.5	3.5	4
5	3.5	3.5	4
4.5	3.5	4	3.5
4	4	4.5	3.5
5	3.5	4.5	4
5	3.5	3.5	4
4	5	5	5
4	3	3.5	5
4.5	4	4	2
3	4	1.5	5
4	4.5	3	3.5
3	3	4	3.5
3.5	4	3.5	4
4.5	5	3.5	3.5
3.5	4.5	4	3
1	5	5	2.5
4	3	4	3
3	5	4.5	3.5

## Appendix

### 2.4 Availability

Cronbach's Alpha	N of Items
.2111	3

### Reliability of Availability

**We have to delete q21 to make it more reliable.**

#### RELIABILITY ANALYSIS - SCALE (ALPHA)

		Mean	Std Dev	Cases
1.	Q21_1AV	4.0625	.8908	80.0
2.	Q22_2AV	3.9125	.8448	80.0
3.	Q23_3AV	3.4000	1.0013	80.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	11.3750	2.9209	1.7091	3

#### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
Q21_1AV	7.3125	2.0150	.0444	.2965
Q22_2AV	7.4625	1.8214	.1692	.0278
Q23_3AV	7.9750	1.5943	.1282	.1092

#### Reliability Coefficients

N of Cases = 80.0

N of Items = 3

Alpha = .2111

**After deducting q21\_1Av, we got**

Cronbach's Alpha	N of Items
.2965	2

## Appendix

### R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )

		Mean	Std Dev	Cases
1.	Q22_2AV	3.9125	.8448	80.0
2.	Q23_3AV	3.4000	1.0013	80.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	7.3125	2.0150	1.4195	2

#### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
Q22_2AV	3.4000	1.0025	.1766	.
Q23_3AV	3.9125	.7138	.1766	.

#### Reliability Coefficients

N of Cases = 80.0

N of Items = 2

Alpha = .2965

### **So now we will find the avg of q22\_2Av,q23\_3Av to find X4**

avg_avl			
4	3.5	2.5	4.5
3	4.5	4.5	4
4	2.5	4	5
3	2.5	3.5	3
4	2.5	4	3.5
2	4	3.5	3
2.5	3.5	4	2.5
4	4	4	4
4	3.5	4	3
4	4	2.5	4
3.5	4	5	3
3.5	2.5	2.5	4
3.5	3	3.5	3.5
4	4	4.5	4
4	4	3.5	4
4	4	2.5	2.5
4	5	4.5	3
4.5	5	4	3.5
3	3.5	5	4
3	4	4.5	3.5

## Appendix

### 2.5 Appearance

Cronbach's Alpha	N of Items
.7854	3

### Reliability of Appearance

**Here we do not need to delete so we should consider this.**

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )

		Mean	Std Dev	Cases
1.	Q25_1AP	3.1625	1.0487	80.0
2.	Q26_2AP	3.0375	1.1074	80.0
3.	Q27_3AP	3.0750	1.0765	80.0

Statistics for	Mean	Variance	Std Dev	N of
SCALE	9.2750	7.3158	2.7048	Variables 3

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Alpha if Item Deleted
Q25_1AP	6.1125	3.5948	.6591	.6729
Q26_2AP	6.2375	3.3479	.6765	.6507
Q27_3AP	6.2000	3.8582	.5436	.7941

### Reliability Coefficients

N of Cases =      80.0                                  N of Items =    3

Alpha =      .7854

**So now we will find the avg of q25\_1Ap,q26\_2Ap, ,q27\_3Ap to find X5**

avg_apr			
2.33	2	2	4.67
4	3	4.33	2.67
3.67	2.67	4.33	3
3.67	3	2.33	3
3.33	1.67	4	3.33
3	4	3.67	2.67
3.33	3	2	2.67

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3.33	3	2	2
3.33	4	3	5
3	3	4.33	4.67
2	2.67	4	3.33
3.33	2.33	2	3
1.33	3	2	2
4	3	5	3.67
3	3.33	2	2.67
3.67	2.67	2.67	3.33
2	4.33	3.67	3
1	1	3.67	3
2.33	3.33	3.67	3.33
2.33	4.67	5	3

### 2.6 Advertisement

Cronbach's Alpha	N of Items
.5911	4

### Reliability of Advertisement

#### R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   ( A L P H A )

		Mean	Std Dev	Cases
1.	Q29_1AD	2.9500	.9264	80.0
2.	Q30_2AD	3.4000	1.0013	80.0
3.	Q31_3AD	3.0875	1.0212	80.0
4.	Q32_4AD	3.3125	1.1539	80.0

Statistics for	Mean	Variance	Std Dev	N of Variables
SCALE	12.7500	7.6076	2.7582	4

#### Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
Q29_1AD	9.8000	5.4025	.3127	.5624
Q30_2AD	9.3500	4.5342	.4857	.4306
Q31_3AD	9.6625	4.8593	.3788	.5146
Q32_4AD	9.4375	4.6543	.3257	.5642

## Appendix

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Reliability Coefficients

N of Cases = 80.0

N of Items = 4

Alpha = .5911

**So now we will find the avg of q29\_1Ad,q30\_2Ad, q31\_3Ad, q32\_4Ad, to find X6**

avg_adv			
2.25	3	2.75	2.75
3.25	3.25	2	3.5
3.5	2.25	4	2.75
3.5	3.5	3	4.25
4	2.5	3.75	3.5
3.75	3	3	3.25
2.25	3.25	3.75	1.5
3.75	3	3.25	3.5
2	3.5	2.25	3.75
4.25	3.75	3.75	4.5
3	3.25	2.75	4.5
2.75	2	3	3.5
3.25	3.25	3	3.5
4	3.5	2.75	3
3.25	3.75	3.25	2
3.25	2	4	2.5
3	4.75	3.5	2
3	4.75	4.25	3.25
2.25	3.5	2.75	3.5
2.5	2.5	3.25	3

## Appendix

### Appendix 3: Regression Analysis

#### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.357 <sup>a</sup>	.128	.056	.6848

a. Predictors: (Constant), AVG\_ADV, AVG\_QTY, AVG\_PRC, AVG\_AVL, AVG\_APR, AVG\_FLV

#### Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.291	.740		3.096	.003
	AVG_FLV	.303	.137	.265	2.210	.030
	AVG_QTY	8.372E-03	.103	.009	.081	.935
	AVG_PRC	6.261E-02	.103	.072	.608	.545
	AVG_AVL	-4.17E-02	.115	-.042	-.361	.719
	AVG_APR	6.462E-03	.091	.008	.071	.944
	AVG_ADV	.161	.117	.157	1.376	.173

a. Dependent Variable: AVG\_BUY

#### Coefficients of Advertisements<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.077	.493		2.182	.032
	Q29_1AD	.204	.120	.180	1.699	.093
	Q30_2AD	.142	.119	.135	1.191	.237
	Q31_3AD	.389	.110	.378	3.523	.001
	Q32_4AD	-1.46E-02	.096	-.016	-.153	.879

a. Dependent Variable: Q28\_ADD

## Appendix

**Coefficients of Quality<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.320	.494		4.697	.000
	Q11_1Q	.332	.097	.376	3.402	.001
	Q12_2Q	-5.14E-02	.072	-.085	-.718	.475
	Q13_3Q	.146	.080	.207	1.822	.072
	Q14_4Q	4.263E-02	.092	.054	.463	.645

a. Dependent Variable: Q10\_QTY

**Coefficients of Flavor<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.005	.570		5.275	.000
	Q5_1F	.183	.088	.247	2.075	.041
	Q6_2F	3.466E-02	.096	.044	.363	.718
	Q7_3F	4.155E-02	.103	.047	.402	.689
	Q8_4F	3.320E-03	.081	.005	.041	.967
	Q9_5F	3.570E-02	.100	.042	.356	.723

a. Dependent Variable: Q4\_FLV



## Appendix

### Appendix 4: Safety Stock & Re-order Point Calculations

Daily Demand (d)	Frequency (f)	Mid Point (d + d /f)	Mid Point	Variance (Δ) = fD - MP	Variance = (200 - Mid Point)	(Δ) * (f)	(Δ) (f)
154 - 160	17	=MEDIAN(154,160)	157	=ABS(200-157)	43	=(17*43)	731
161 - 170	35	=MEDIAN(161,170)	165.5	=ABS(200-165.5)	34.5	=(35*34.5)	1207.5
171 - 180	51	=MEDIAN(171,180)	175.5	=ABS(200-175.5)	24.5	=(51*24.5)	1249.5
181 - 190	63	=MEDIAN(181,190)	185.5	=ABS(200-185.5)	14.5	=(63*14.5)	913.5
191 - 200	75	=MEDIAN(191,200)	195.5	=ABS(200-195.5)	4.5	=(75*4.5)	337.5
201 - 210	71	=MEDIAN(201,210)	205.5	=ABS(200-205.5)	5.5	=(71*5.5)	390.5
211 - 220	48	=MEDIAN(211,220)	215.5	=ABS(200-215.5)	15.5	=(48*15.5)	744
221 - 230	27	=MEDIAN(221,230)	225.5	=ABS(200-225.5)	25.5	=(27*25.5)	688.5
231 - 240	11	=MEDIAN(231,240)	235.5	=ABS(200-235.5)	35.5	=(11*35.5)	390.5
	$\sum f$					$\sum (\Delta) (f)$	
	398					6652.5	

Let Say, Annual Demand (D) for Ice Cream is 50,000 Units.

Operation Days is 250 Days in a year.

Daily Demand (d) = 50,000/250 = 200 Units

So, Average Daily Demand with Std. Dev. of Daily Demand Would be  $\sigma d = \sum (\Delta) (f) / \sum f$

Here,  $\sum (\Delta) (f) = 6652.5$  and  $\sum f = 398$

So,  $\sigma d = 6652.5 / 398 = 16.71$  Days.

To, Find the Average Lead Time With Std. Dev. of Lead Time we need;

## Appendix

Order Time	Lead Time (LT)	Lead Time (ABS) $\Delta = (\bar{L}T - LT1)$	$(\Delta) = (\bar{L}T - LT1)$	Lead Time ( $\Delta^2$ )	Lead Time Square
1	22	=ABS(21-22)	1	=(1^2)	1
2	17	=ABS(21-17)	4	=(4^2)	16
3	18	=ABS(21-18)	3	=(3^2)	9
4	27	=ABS(21-27)	6	=(6^2)	36
5	24	=ABS(21-24)	3	=(3^2)	9
6	19	=ABS(21-19)	2	=(2^2)	4
7	21	=ABS(21-21)	0	=(0^2)	0
8	20	=ABS(21-20)	1	=(1^2)	1
9	16	=ABS(21-16)	5	=(5^2)	25
10	21	=ABS(21-21)	0	=(0^2)	0
11	26	=ABS(21-26)	5	=(5^2)	25
12	18	=ABS(21-18)	3	=(3^2)	9
13	22	=ABS(21-22)	1	=(1^2)	1
14	25	=ABS(21-25)	4	=(4^2)	16
15	19	=ABS(21-19)	2	=(2^2)	4
	$\sum LT$			$\sum \Delta^2$	
	315			156	

Summation of Total Lead Time Lead which is  $\sum LT = 315$ ;

Frequency of Lead Times = 15 (Times);

So Lead Time Average =  $\sum LT / n$  (frequency) =  $315/15 = 21$  Days.

Average Lead Time With Std. Dev. of Lead Time will be  $\sigma LT$ .

Which is  $\sigma LT = \sqrt{\frac{\sum \Delta^2}{n}}$  ; Where  $\sum \Delta^2 = 156$  and  $n$  (frequency) = 15;

So  $\sqrt{\frac{\sum 156}{15}} = 3.22$  Days.

We are considering Normal distribution with uncertainty on-demand and independent lead time.

## Appendix

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At 95% confidence level We will calculate Safety stock and ROP (Re-Order Point)

$Z \times \sigma_{LT} \times D_{avg}$ ; Where

Z is the desired service level,

$\sigma_{LT}$  is the standard deviation of lead time, and  $D_{avg}$  is demand average.

Here we have considered 95% confidence level. from Z table we get the value 1.65

$Z * \text{SQRT} ((\text{Avg LT} * (\text{Demand Std Deviation})^2 + (\text{Avg Sale} * \text{Lead Time Std Deviation})^2)$

Where Avg. LT = 21 Days, Demand Std Deviation = 16.71;

Avg Sale (Daily Demand) = 200 Units, Lead Time With Std. Deviation = 3.22 Days

So, Safety Stock =  $1.65 * \text{SQRT} ((21 * 16.71^2 + 200^2 * 3.22^2)) = 1070.08537$

ROP = Average Daily Unit Sales x Delivery Lead Time + Safety Stock

$\text{ROP} = d * \text{LT} + Z \times \sigma_{LT} \times D_{avg}$

$\text{ROP} = 200 * 21 + 1070.08 = 5270.08.$

**Appendix 5: Z Table – Normal Distribution**

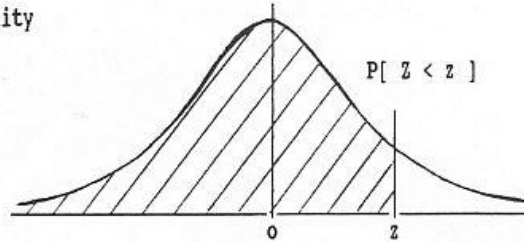
STANDARD STATISTICAL TABLES

1. Areas under the Normal Distribution

The table gives the cumulative probability up to the standardised normal value z

i.e.

$$P[ Z < z ] = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} \exp(-\frac{1}{2}z^2) dz$$



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5159	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7854
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8804	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9773	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9865	0.9868	0.9871	0.9874	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9924	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9980	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
z	3.00	3.10	3.20	3.30	3.40	3.50	3.60	3.70	3.80	3.90
P	0.9986	0.9990	0.9993	0.9995	0.9997	0.9998	0.9998	0.9999	0.9999	1.0000

# Data Sheet

Data Sheet

	Buying Ice Cream			Flavor						
	q1	q2	q3	q4	q5	q6	q7	q8	q9	
				DEP_FL						
<b>1</b>	4	4	4	4	5	4	4	3	3	
<b>2</b>	4	3	4	3	2	4	2	1	3	
<b>3</b>	5	4	4	3	4	5	4	3	5	
<b>4</b>	5	5	4	4	3	5	5	1	1	
<b>5</b>	5	5	5	5	5	4	3	3	3	
<b>6</b>	4	3	4	4	4	3	4	3	3	
<b>7</b>	5	4	5	5	5	3	4	2	3	
<b>8</b>	5	4	5	5	3	4	5	5	3	
<b>9</b>	4	3	4	3	2	2	4	3	4	
<b>10</b>	4	3	1	5	4	5	3	2	4	
<b>11</b>	4	4	5	4	4	3	3	3	3	
<b>12</b>	3	3	2	4	3	4	4	3	4	
<b>13</b>	5	4	4	4	4	4	4	3	3	
<b>14</b>	5	5	1	4	2	3	4	5	5	
<b>15</b>	4	4	5	1	2	4	4	4	3	
<b>16</b>	5	4	4	4	3	3	2	2	3	
<b>17</b>	4	3	4	4	3	5	4	3	3	
<b>18</b>	4	2	4	4	2	4	3	4	4	
<b>19</b>	5	4	4	5	1	5	5	5	3	
<b>20</b>	5	5	4	4	4	2	3	4	3	
<b>21</b>	3	2	2	5	2	4	2	4	2	
<b>22</b>	3	3	4	3	2	2	5	2	2	
<b>23</b>	4	4	5	3	5	5	4	4	3	
<b>24</b>	4	3	4	5	1	3	3	2	2	
<b>25</b>	5	4	4	4	3	2	4	1	3	
<b>26</b>	5	4	4	5	5	4	4	4	2	
<b>27</b>	4	3	5	2	1	1	2	3	3	
<b>28</b>	4	3	4	4	3	3	3	4	3	
<b>29</b>	5	5	4	4	2	4	3	1	3	
<b>30</b>	5	4	2	5	5	3	4	5	3	
<b>31</b>	5	5	5	5	4	5	3	4	4	
<b>32</b>	5	4	4	4	3	4	3	4	4	
<b>33</b>	4	3	5	4	5	4	4	2	4	
<b>34</b>	3	4	4	5	5	2	2	4	4	
<b>35</b>	5	3	4	4	3	4	4	4	4	
<b>36</b>	4	4	3	4	4	2	4	4	3	
<b>37</b>	5	4	4	4	4	4	5	3	3	
<b>38</b>	3	2	4	3	4	2	2	2	2	

## Data Sheet

<b>39</b>	5	4	5	4	5	5	1	5	5
<b>40</b>	5	4	5	5	5	5	4	2	4
<b>41</b>	5	4	4	4	4	5	3	2	3
<b>42</b>	4	4	4	5	4	4	5	3	3
<b>43</b>	5	4	3	5	4	3	3	2	4
<b>44</b>	3	3	4	4	4	5	3	4	3
<b>45</b>	4	2	2	5	3	3	3	3	3
<b>46</b>	5	3	5	4	4	3	3	5	3
<b>47</b>	4	3	5	2	4	3	4	3	3
<b>48</b>	5	4	4	5	4	5	2	1	3
<b>49</b>	5	4	4	5	5	2	4	2	5
<b>50</b>	5	4	3	4	4	4	2	3	4
<b>51</b>	4	4	2	4	5	4	2	1	3
<b>52</b>	5	4	4	3	5	4	3	2	2
<b>53</b>	5	4	4	5	5	5	5	5	2
<b>54</b>	3	4	5	3	3	4	3	5	2
<b>55</b>	5	5	5	5	5	4	4	1	1
<b>56</b>	4	3	2	2	3	4	2	3	1
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<b>59</b>	4	2	4	4	4	2	2	4	3
<b>60</b>	5	3	4	4	3	4	5	5	4
<b>61</b>	5	5	1	5	4	5	5	5	5
<b>62</b>	4	4	5	5	4	4	4	4	3
<b>63</b>	3	3	1	4	5	5	5	5	1
<b>64</b>	4	2	5	5	4	2	4	4	2
<b>65</b>	5	5	5	5	4	5	4	2	4
<b>66</b>	4	4	5	4	5	5	5	3	4
<b>67</b>	3	3	4	4	1	1	3	3	1
<b>68</b>	5	5	4	5	5	4	2	5	5
<b>69</b>	4	4	1	4	5	2	2	4	5
<b>70</b>	4	4	5	3	4	3	4	2	4
<b>71</b>	4	2	1	4	5	5	4	3	4
<b>72</b>	5	4	5	3	4	4	4	4	4
<b>73</b>	3	4	3	4	5	5	5	5	4
<b>74</b>	3	4	2	4	4	4	4	4	5
<b>75</b>	4	5	5	5	5	4	4	4	4
<b>76</b>	5	5	5	4	4	5	4	5	4
<b>77</b>	4	2	5	5	2	1	3	3	3
<b>78</b>	5	4	5	3	4	3	5	5	2
<b>79</b>	5	5	5	5	5	4	4	5	3

### Data Sheet

<b>80</b>	4	3	4	4	4	3	3	2	2
<b>81</b>	5	4	5	4	3	3	3	3	3
<b>82</b>	4	2	4	4	4	4	4	3	3
<b>83</b>	4	3	3	3	3	4	4	4	3
<b>84</b>	4	3	2	4	5	3	3	3	3
<b>85</b>	5	5	5	4	5	3	3	2	3
<b>86</b>	4	4	5	5	2	2	3	5	3
<b>87</b>	5	4	3	4	4	5	5	3	4
<b>88</b>	5	4	3	5	5	3	3	4	3
<b>89</b>	5	5	3	3	5	5	3	5	5

quality					price				
q10	q11	q12	q13	q14	q15	q16	q17	q18	q19
DEP_QL					DEP_PR				
5	5	5	4	5	4	5	3	3	2
3	3	4	5	5	4	2	4	3	3
5	5	5	5	5	4	4	4	4	4
3	4	5	1	4	3	5	5	3	5
5	5	3	5	3	5	4	5	4	4
4	5	5	5	5	3	4	4	4	2
4	5	2	2	5	4	5	5	3	3
5	4	5	5	5	1	5	5	4	3
3	3	4	4	3	3	3	5	4	2
5	5	5	5	5	3	5	3	3	2
4	4	3	5	4	4	4	5	2	2
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## Data Sheet

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## Data Sheet

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availability				appearance			
q20	q21	q22	q23	q24	q25	q26	q27
DEP_AV				DEP_AP			
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## Data Sheet

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## Data Sheet

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advertisement					demography	
q28	q29	q30	q31	q32	age	gender
DEP_AD						
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## Data Sheet

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## Data Sheet

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