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Consumer preferences for personal digital assistant (PDA) in Hong Kong : a conjoint analysis approach

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Lingnan University

Bachelor of Business Administration (Hons)

Department of Marketing and International Business

BUS 331 Business Project



Consumer Preferences for Personal
Digital Assistant (PDA) in Hong Kong:
A Conjoint Analysis Approach

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Abstract

Stepping into the 21st century, high technology becomes more and more important. Peoples not only use computers at home or in office, but also need to manage their work by computer outdoorsy. Therefore, PDA becomes a more popular mobile digital product in Hong Kong. Besides, because of its relatively low price, small in size and wide coverage of support software, number of PDA users in Hong Kong is increasing tremendously.

Since there are many special features of PDA that affect the consumers' decision, we are going to find out the consumer preferences for PDA by using a Conjoint Analysis Approach. Conjoint Analysis not only helps us to understand the consumers' preferences for each level of attributes, but also segmenting the market into different groups.

Base on the results found in our research, all respondents preferred color display. Palm OS no longer monopolized the PDA market and more consumers chose Win CE. Also, around 80% of the female respondents were not PDA users. All in all, most consumers are more concern with the screen display, price and operation system.

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Chapter 1

Introduction

Chapter 1 Introduction

1.1 Introduction

Stepping into the 21st century, high technology becomes more and more important. Personal computer becomes one of the necessities of the people in Hong Kong. People not only need the help of computers at home or office, but also need to manage and do their work outdoorsy. That is why notebook computers, handheld PC and PDA (Personal Digital Assistance) become more popular in Hong Kong. Because of the relatively low price, small in size and wide coverage of support software, PDA is the most popular mobile digital product in Hong Kong now.

A personal digital assistant (PDA) is a small pen-based computing device that runs software written to manage calendars, contacts, lists, and provide storage and retrieval of documents and images (Dickson, 1999). In Hong Kong, the number of PDA users is increasing. It is easy for you to see many users are using her PDA in the street. When they are taking the bus, they can read novels from his PDA. Besides, there are more and more reports about PDA from the magazine. More manufacturers produce her PDA to the market too, such as Acer, Sony and Instant-Dict. Consumers have more

choices when they decide to buy PDA. Moreover, users can buy different kind of accessories in the market. Hard cover case, USB cable and mobile phone parts are common accessories which can be found in the market.

1.2 Rationale

Why do we choose PDA as our research topic? Hong Kong is an international city. The speed of life cycle is very high. PDA is useful for us to manage our time schedule. It is small in size and high potential space for us to develop other functions. More and more electric manufacturers start to introduce its products in the market, such as NEC, Sharp and Sony. Under the keen competition of PDA, more functions have been added, such as MP3 player, higher resolution screen and extended memory medium. PDA manufacturers also hope these special characters can attract user to choose its product.

We are interested in investigate the conjoint relationship of consumer when they choose their favorite PDA, since there are many special features of PDA that affect the consumer decision. There are lots of special functions that can be found from PDA. What is the most important feature for the user? What criteria do we need to consider when we make the buying decision? PDA has a potential to become the necessary product of us. All of electric manufacturers hope to understand the consumer behavior of PDA.

Besides, conjoint analysis can help us to understand the segment pattern of PDA user. Different segments have different requirement of PDA. Group A concerns the operation system. However, Group B concerns the price only. So, we are interested to investigate the relationship between the segmentation of PDA user and the feature of PDA.

In this research project, analysis is carried out to investigate how product features affecting the buying decision. To eliminate the complexity and being more accurate, we decide to do in-depth interview in order to reduce the number of features of PDA.

1.3 Problem Identification

In fact, it is difficult for us to choose the feature of PDA in the conjoint analysis.

There are many different kinds of feature of one product. To find out the most important feature that affects the consumer decision is difficult.

1.4 Research Objectives

The general objective of our research is going to understand consumer preference for PDA in Hong Kong. Give recommendations to manufacturers to produce the new model of PDA. The specific objectives of our research are listed below:

1. To find out the consumer preference for PDA attributes.
2. Segmenting market and find out the preference for PDA of each segment.
3. To test the new designed product by market simulation.
4. To make recommendations to PDA manufacturers in doing product design.

1.5 Scope of Research

The aim of this project is to use conjoint analysis analyzing the purchase decision of Hong Kong people on PDA. To narrow down the research scope, PDA in this project are specifically referring to the PDA installed with Palm OS or Windows CE. The other operation system (OS) will not be considered because they are gaining an extremely small market share of PDA.

Also, our project reflects the situation of Hong Kong only. This is because different consumer in different places may have different preferences for PDA.

Chapter 2
Literature
Review

Chapter 2 Literature Review

2.1 What is PDA?

The name of PDA shows the function clearly. It is pocket size, light in weight and convenience for the users to use it every day. Most PDAs fit comfortably into the palm of your hand or your shirt pocket. They are too small to have keyboards, so you input information into the PDA by using a stylus and "writing" directly into the PDA, or by downloading information into your PDA from a personal computer (Dickson, 1999).

PDA is your personal assistant that can help you to manage all the jobs. Your time schedule can be organized efficiently, easily and clearly. There are many useful functions in order to help you to manage yourself to be better. You can download your required software from Internet. There are over thousands of software you can download. Some software are freeware and some only charge a small amount of fees. Different kinds of software can help you to do different kinds of work. There are agenda that can divide your work into different categories. It divides into 4 categories: Today, Tomorrow, Week and To Do. It reminds you that what thing do you need to do today,

tomorrow or this week. Also, you can download magazine or newspaper from Internet. Dictionary and novels also can be downloaded into PDA. Actually, PDA starts the idea of e-book actually. If PDA connects the earphone, it can play MP3 music too. PDA acts so many roles. You do not need to bring your MP3 player, mobile phone, dictionary, magazine and your pocket book. PDA can satisfy all you needs. It is not difficult for you to know the successful reason of PDA.

For PDA, it can be divided mainly into two operation systems: Palm OS and Windows CE. Palm OS and Windows CE are totally different operation system. Palm OS is new system that is designed for PDA only. Simple and Easy are main characteristics. However, Windows CE is just simple edition of Windows. All the specific characters can be found, such as start, program file. Someone think Windows CE is easier to use for the beginner. This is because Windows are very popular PC operation system. Palm 4.1 and Pocket CE 2002 are the newest version of operation system. Palm 4.1 can support 16-bit color and data can exchange from the extra memory extension freely. Pocket CE 2002 is simple edition of Windows XP. All new interfaces can give a fresh look to the users. Different brands of PDA are using

different operation system. They cannot change the operation system to another one. This is because two systems have two different hardware requirements.

The market share of these two operation systems is greatly different. They together occupy over 90% of PDA market. There is an unofficial search showing that the market ratio of Palm OS and Windows CE is 8:2. More people choose to use PDA which runs on Palm OS. It is because not only Palm Inc. manufactures PDA that runs Palm OS, but also there are many companies, such as Sony, to produce PDA that run Palm OS.

2.2 Business environment of PDA products in Hong Kong

PDA products have been found in Hong Kong since 1997, but at that time, most users were senior executives and professionals. There was very few companies invested money to produce PDA products at that time. As PDA products being more popular in the recent few years, many companies like Sony, NEC etc. also started their PDA product lines. This makes the competition in the PDA products market becomes very keen in the world. For example, Palm originally got around 70% market share 1 year ago, but in the latest report of the PDA products market, Palm only got around 35% market share in the second quarter of 2001 (李盈節, 14/11/2001).

The market situation is the same in Hong Kong. The competition in the market is very serious especially after the invention of the new Operation System (OS) – Windows CE. The market no more be monopolized by one company (Palm), and shared by two to three large brands and Taiwan brands.

2.3 Consumer Preferences

2.3.1 Concept of Consumer Preferences

Consumer preference is a straightforward concept, consumer preferences for a good is consumers' already established preferences (Chernev, 2001). Extant research demonstrated that consumers with an already established preference for one of the choice alternatives are likely to interpret the new information in a biased manner that bolsters the attractiveness of the initially more preferred option (Chernev, 2001). This is the reason why marketers would like to know the consumer preferences for a product before the invention. Consumer purchases are strongly influence by culture, social, personal and psychological characteristics (Kotler, 1991, p.164-175).

2.3.2 Consumer Preferences for PDA products in Hong Kong

Although PDA is not a new product in the market, it is under the developing period. Many large companies have just recognized the potential market of PDA products and designing their own PDA. The consumer preferences for PDA products is a curial subject for all producers because it is directly linked to the succeed of their products. It has been a major area of concern of most marketers and researchers.

As Personal Digital Assistance has just become popular in the recent years, there were no previous research papers on the consumer preference for PDA products in Hong Kong. We can consider the previous consumption pattern of PDA products to guess the consumer preferences for PDA. Most consumers in Hong Kong perceive that smaller size products equal to high technology especially for those mobile products. We can see the trend of the new notebooks and mobile phones in Hong Kong. Consumer may prefer in the same direction on PDA products. After conducting the research, we can find more information about the consumer preferences for PDA products in Hong Kong.

2.4 How people choose PDA?

PDA is a high technology product; the buying process of PDA is high involvement. When people going to buy a PDA, they must have many questions in their mind, what operating system (OS) runs the PDA? How much memory does the PDA have and can you expand it in the future? Is the screen color or monochromatic? Does it use household or rechargeable batteries? What accessories are available and how much do they cost (Benner and Enger, 2001)? These are the questions that consumers ask frequently but the manufacturers couldn't get the answer up till now. These questions are also the most key points to understand the consumer preferences for PDA.

In our research, these questions will be addressed base on the results obtained.

2.5 Conjoint Analysis

2.5.1 Concept of Conjoint Analysis

The focus of conjoint analysis is (Green and Srinivasan, 1990) squarely on the measurement of buyer preferences for product attribute levels (including price) and the buyer benefits that may flow from the product attributes. (Green and Krieger, 1991) It provides individual level measures of preferences, referred to as part-worths, and has been applied extensively to a wide variety of marketing problems. Conjoint analysis is not a new approach on marketing research; the concept of conjoint analysis will be discussed below.

Conjoint Analysis is concerned with the joint effect of two or more independent variables on the ordering of a dependent variable. A definition of conjoint analysis must proceed from its underlying assumption that a composition rule may be established to predict a response variable from two or more predictor variables. Conjoint analysis, like multidimensional scaling, is concerned with the measurement of psychological judgments, such as “consumer preference”.

(Evans, Moutinho and Raaij, 1999, p.227)

The primary purpose of Conjoint Analysis is to model human behavior, usually purchase behavior. By measuring purchase interest in a “complete” product or service, Conjoint Analysis captures the essential dilemma of market choice: the “perfect” product is seldom available but lesser alternatives are. By forcing respondents to trade-off competing values and needs, Conjoint Analysis is able to uncover purchase motivations that the respondent may be unwilling to admit to and sometimes, may even be unaware that he or she has. (McCullough)

A traditional measurement technique might elicit values of the importance of product attributes ranging from “extremely important” to “not at all important”. This method can, for example, isolate price as the “most important” attribute, but would give no direction as to what price levels are likely to generate price resistance. Even if an alternative technique identified particular styles, brands, and packages that were most preferred, it would give no indication as to which combination of these characteristics was preferred to another combination. Conjoint analysis gives managerial direction as to how to change the product or pricing, whereas other approaches give much less precise conclusions and direction (Gordon A., 1992).

In using conjoint analysis, researcher will first choose some main attributes of the products that will affect the consumer preference. For each attribute, researcher will find out two to three levels of it so that different combinations of the attributes can be found. These combinations are called product profiles.

For example, if there are three product attributes for PDA:

Product Attributes		
Price	Color	Design
Low	Black	A
Medium	White	B
High	Red	

Table 2.1: Different Levels of Product Attributes

The researcher can form 18 product profiles (3x3x2). Conjoint analysis software generates a desk of cards each of which combines levels of these product attributes. Respondents are asked to sort the cards generated into an order of preference. By compiling and analyzing the consumer's responses, software can derive the individual and group consumer's utility

functions for each attribute.

Utility, sometimes called part worth, is the buying preferences for product attributes. It can be a number that shows the consumers preference on that level of attributes, the higher the utility, the stronger the consumer's preference for that level of the attribute measure utility. The overall utility of concepts is determined by calculating the weighted sum of the attribute-level rankings.

Besides, the group utility function (part worth) can calculate the relative importance. Relative importance of an attribute is the difference between the highest and lowest utility for the attribute. The relative importance of attribute i is defined as:

$$R.I._i = \frac{range_i * 100}{\sum ranges}$$

(Bretton Clark, 1992)

2.5.2 Conjoint Techniques

The first step in doing Conjoint right is to pick the most appropriate method for your particular objectives and circumstances. In principle, the right technique will be the one that most closely mimics your marketplace dynamics.

(McCullough)

There are three types of conjoint technique:

1. Ratings-based Conjoint

Ratings-based Conjoint involves nominally rating individual product alternatives or pairwise rating two product alternatives simultaneously.

No-buy options are not easily accommodated in Rating-based Conjoint

(McCullough).

2. Choice-based Conjoint

Choice-based Conjoint offers respondents a series of choice sets, generally two to five alternative products. Respondents can pick any of the available alternatives or even elect not to buy, if none of the alternatives in that choice set are sufficiently attractive. This format closely mimics buying environments in markets with competition (McCullough).

3. Hybrid techniques

Hybrid techniques, approaches which combine self-explicated scaling with either Rating-based Conjoint or Choice-based Conjoint, are generally most appropriate when a large number of attributes must be included (McCullough).

2.5.3 Application of Conjoint Analysis

Marketers and Researchers have long been interested in new product development. They frequently use conjoint analysis to measure consumer preferences for alternative product concepts. Conjoint analysis can be used to design packaging, establish price, rank a hypothetical product against existing competitors already in the market and suggest modifications to existing products which would help to strength a product's preference (Evans, Moutinho and Raaij, 1999, p.227).

Conjoint analysis can provide answers to several of the questions typically asked by persons responsible for marketing and planning for consumer and industrial products and services. The types of output it produces can be grouped into several broad categories (Wyner, Gordin A., 1992).

1. Understanding Marketing Preferences
2. Predicting Market Choices
3. Developing Market Strategies
4. Segmenting the Market

Researchers not only used conjoint analysis on new product development, but also on market segmentation. Consumer can be segmented on the basis of their utility values or attribute importance scores. Simulations can be viewed as segmentation analyses that group people according to their most preferred product among the ones available (Wyner, Gordon A., 1992).

The concept of Conjoint Segmentation and Market Simulation will be discussed below.

2.6 Conjoint Segmentation

2.6.1 Concept of Segmentation

Market segmentation presupposes heterogeneity in buyers' preferences for products/services. The goal of segmentation is to obtain groups of customers that react similarly to elements of the marketing mix such as product features, price, and promotion. Ideally, customers within each segment respond similarly to product and marketing efforts, and differ strongly from customers in different segments. Segmentation is very important to all marketers because people with different geographic, demographic, psychographic and socioeconomic background may have different needs. Segmentation involves dividing the market into different segments with homogeneous buying behavior within a segment, but heterogeneous buying behavior between segments (Evans, Moutinho and Raaij, 1999, p.126). Therefore, segmenting the market into different categories and target the potential segment for the product can help marketers to achieve the goal of satisfying consumer needs and the success of their product.

Marketers use different segmentation variables to divide the market. Segmentation variables may be objective and subjective (Evans, Moutinho and Raaij, 1999, p.123). Those variables like gender, age, and marital status are objective variables. On the other hand, lifestyle, personality and purchase intention are subjective variables. Most researchers will collect these kinds of information for segmentation.

Many large companies also apply segmentation on inventing their products to the market but a firm must take care to choose its target market segment carefully. If it picks too narrow a group of segments, it may fail to reach the volume of sales and profits it needs (Berkowitz, Kerin, Hartley and Rudelius, 2000, p.268).

2.6.2 The Role of Conjoint Analysis in Segmentation

Most methods of segmentation fall far short of the goal of segmentation. The most common type of segmentation strategy involves grouping customers on the basis of demographic or other background variables. But these variables are generally not closely related to the buying behavior of interest.

Conjoint analysis is well suited for the implementation of selected types of market segmentation (Green and Krieger, 1991). Firstly, the focus of conjoint analysis is squarely on the measurement of buyer preferences for product attribute levels and the buyer benefits that may flow from the product attributes. Also, conjoint analysis is a micro-based measurement technique. Part-worth functions are measured at the individual level. Hence, if preference heterogeneity is present the researcher can find it.

Moreover, conjoint studies typically entail the collection of respondent background information (e.g., demographic data). One should bear in mind. However, that buyer background variable, particularly demographic ones, do not necessarily correlate well with attribute preference.

Lastly, conjoint studies usually include a buyer choice simulation stage in which the researcher can enter new or modified product profiles and find out who chooses them versus those of competitors.

2.6.3 Conjoint Segmentation Methods

There are two principal approaches to applied market segmentation.

1. Priori segmentation

In a priori segmentation, the researcher first chooses some variable(s) of interest (e.g., buyer's age, gender, principal benefit sought, and current brand) and then classifies buyers according to that designation (Wind, 1978).

2. Post hoc or cluster-based segmentation

In post hoc or cluster-based segmentation, the researcher chooses a battery of interrelated variables (e.g., psychographics characteristics, preferences for various user benefits associated with the product category).

Person-by-variable "scores" then are clustered into person groups whose average within-group similarity is high and whose between-group similarity is low (Wind, 1978).

Figure 2.1 is a schematic diagram of the proposed segmentation approach.

The researcher's initial focus: buyer background characteristics versus product attribute part-worths (as computed from conjoint analysis). (Green and Krieger, 1991, p.20-31)

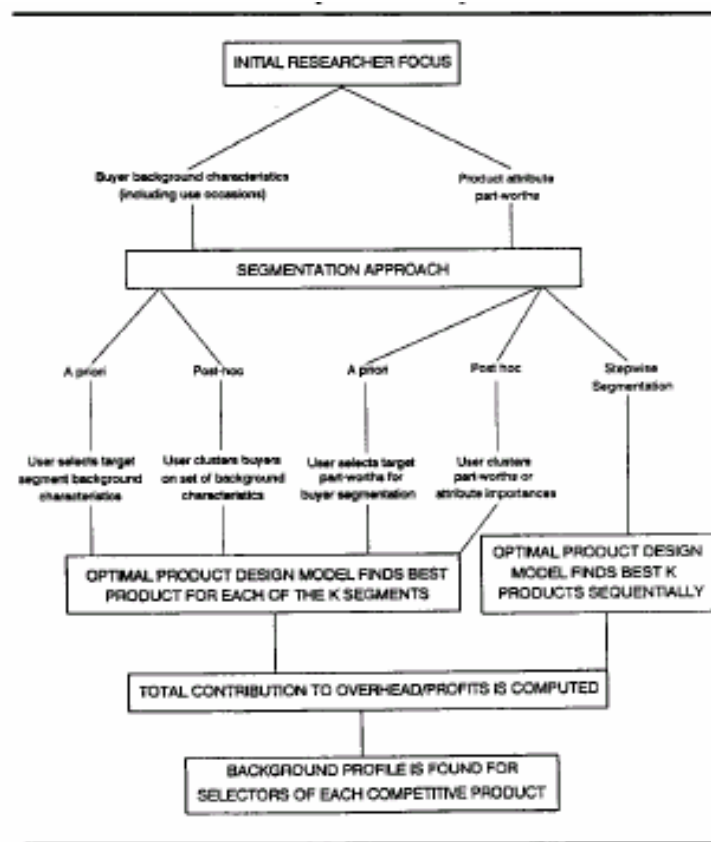


Figure 2.1: Market Segmentation in the Context of Conjoint Analysis

(i) Background characteristics

The researcher either defines a set of a priori target segments or clusters the battery of background characteristics to find segments.

(ii) Product attribute part-worths

In the a priori approach, the researcher may segment buyers in terms of their part-worths for one (or one) product attributes. However, in the post hoc approach, it is the part-worths (or some function of them) that are clustered to obtain buyer segments having preference similarities across the full set of attributes. (Green and Krieger, 1991, p. 20-31)

2.6.4 Cluster Analysis

Cluster analysis always is used to do post hoc or cluster-based segmentation.

Cluster analysis can be employed to group respondents with similar "importance" (i.e. part worth) or similar predicted preferences for the stimuli (Green and Srinivasan, 1978).

The basic concepts of clustering belong to the biological inheritance of humans and many other animals. It appears that the concept of "similarity" is built into the human nervous system. A human being growing up under primitive conditions, but with a reasonable set of life experiences, would doubtless form many cluster spontaneously: the cluster of people, the cluster of birds, the cluster of trees, and so forth. He or she would no doubt

perceive a cat as more similar to a squirrel than a cat to an ant. There are two main types of data used in clustering. (Green and Srinivasan, 1978)

(i) Multivariate data

Multivariate data gives the values of several variables for several individuals.

(ii) Proximity data

Proximity data consist of proximities among objects of the same kind: either proximities among individuals, proximities among variables, proximities among stimuli, or proximities among objects of any single cohesive type.

Proximity refers to a similarity, or dissimilarity, or correlation, or any other variable for measuring closeness or distance between two objects of a single type.

There are three types of clustering:

1. Agglomeration

All objects start by being alone in groups of one. Close groups are then gradually merged until finally all individuals are in a single group.

2. Division

All objects start in a single group. This is then split into two groups; the two groups are then split, and so on until all objects are in groups of their own.

3. Partitioning

Objects are allowed to move in and out of groups at different stages of the analysis.

2.7 Market Simulation

Market simulation models are then conducted by first computing product utilities to determine which product is the most preferred of all those simulated.

The product utility is simply the sum of all the utilities that define a product.

Test market simulation (TMS) can provide a valid framework for evaluating new products and can establish realistic expectations for them-if the proper model is used. Simulations can answer important questions about whether the core strategic concept, advertising program, packaging, name, and product work together to produce the trial and repeat satisfaction levels necessary to meet business goals. Also, test market simulation has established an impressive track record. The primary application of TMS is the assessment of a new product's survivability. It is also useful in evaluating such strategic marketing plan elements as: 1. price, 2. positioning, 3. packaging, 4. formulation, 5. source of volume, 6. sampling effectiveness, and 7. shelf location. If TMS is used with early test markets, it will provide time to react to projections of trial, repeat, and buying rates. TMS is a good tool, but it should not be used in isolation; its strength lies in its ability to evaluate elements in combination (Anonymous, 1982, p.10).

Market simulation is conducted using a form of the Bradley-Terry-Luce (BTL) probability model. This model assigns a probability of purchase to each product being simulated for each respondent.

The probability of purchasing Product 1, $P(1)$, is computer by:

$$(1.2) P(1) = U(1) / \sum U(i)$$

Where $U(1)$ is equal to the product utility for Product 1 and $\sum U(i)$ is the sum of all the product utilities in the simulation (McCollough).

Chapter 3

Methodology

Chapter 3 Methodology

In this part, we will talk about the design of our research and the questionnaire.

Our research will be divided into two stages: Exploratory Research and Descriptive Research.

3.1 Exploratory Research

Exploratory research can help us to understand what consumers concern with when choosing PDA. It is used when one is seeking insights into the general nature of a problem, the possible decision alternatives, and relevant variables that need to be considered. After the exploratory research, the main features of PDA, that consumers are used to evaluate the buying decision, can be found.

(i) Primary data collection

We had conducted an in-depth interview consisting of 20 current PDA users from our schoolmates in Lingnan University. The aim of such in-depth interview was to collect the consumer consideration when they made the buying decision. What features of PDA are the most considerable?

Brand name, type of external memory interface, size, screen, operation system and price are the main feature of PDA. All the above are evaluated by the consumer when they are making buying decision. However, in the research, the last four features are used. Brand name is not used because it is affected by another feature of PDA, when the consumer decides to use Palm OS. Then, he cannot choose HP PDA. This is because HP does not introduce the PDA that is using Palm OS.

Besides, different electric manufacturer introduces different type of external memory interface. So, it cannot be compared because consumer cannot choose to use what type of external memory interface freely. If consumer chooses this model, he must use this interface as the external memory.

(ii) Secondary data collection

We collected information on history, development and the market share of PDA from the books, journals, articles, Internet and the resources of library in Lingnan University and other universities.

Above information and tentative explanation or hypothesis would work as specific guides for the design of descriptive and causal research.

3.2 Descriptive Research

Descriptive Research is the most important part of our study. We base on the result found in the exploratory research, and design a questionnaire to conduct a research on people's background information and their preferred combination of different levels of product attributes.

Sampling Method

Population As we are going to find out the consumer preference for PDA products in Hong Kong, the population of our research should be all Hong Kong citizens.

Sampling Frame Because PDA is a high technology product, not all people have experience on using PDA or even know what it is, so we must set a frame for our sample population. The sample frame usually is a list of population members used to obtain a sample (Kumar, Aaker and Day; p.371; 1999). The sampling frame of our study is the combination of current PDA users and potential PDA buyers who want to buy a PDA with 3-6 months.

Sampling Size	Under the limited resources we have, we decided to take around 200 samples for our study.
Sampling Process	We will use convenience-sampling method for our research. It means that select samples in computer shopping malls. The procedure is simply to contact sampling units that are convenient (Kumar, Aaker and Day; p.384; 1999). We planned to assign researchers to different large computer malls in different districts like Wan Chai, Mongkok etc. They will select samples beside the shops that selling PDA products. Those potential buyers or users will be selected for face-to-face interview. It is because potential buyers will go to the shop to gather information of PDA and users will go there to buy peripheral products for their PDA. Besides, we also planned to interview the potential buyers outside some large chain electric appliances shops like Fortress or Broadway. It is because potential buyers will also go to these shops to buy PDA products. Before we start to do the questionnaire, we need to ask a question to confirm the respondent that he/she decides to buy a PDA within 3-6 months. We start our interview under the respondent decides to buy a PDA in the coming half year.

3.3 Questionnaire Design

We will divide the questionnaire into two main parts; the data from the first part will be used for the conjoint analysis, segmentation and market simulation.

The data from the second part will be used to understand the consumers' attitude on buying high technology digital products.

3.3.1 Pre-Test

Before we start our data collection. Pre-test was done in order to ensure that the questionnaire met our expectations in terms of the information that will be obtained. 20 respondents completed questionnaires. We collected all questionnaires and made some corrections.

The number of card for product profiles was reduced. By using these different levels of attributes, we made total 24 (3x2x2x2) product profiles out.

We made 24 cards for the 24 product profiles. In part 1 for the questionnaire, the interviewee was required to rank the cards according to their preference.

However, after the pre-test, we reduced the number of attributes from 24 to 16 (2x2x2x2). This was because we found that the interviewees felt annoyance since the numbers of cards were too many.

Also, some questions were rewritten in order to clear the meaning of questions.

3.3.2 Questionnaire Part 1

After analyzed the result from the exploratory research, we found out some most important attributes with different levels of PDA. There are four main attributes that consumers most concern with (listed with different levels of attributes):

1. Price

- ◆ High -- above \$2,500
- ◆ Low -- \$1,000 to \$2,500

2. Operation System

- ◆ Palm OS
- ◆ Windows CE

3. Screen Display

- ◆ Color Display (16-bit)
- ◆ Monochromatic Display

4. Type of Battery

- ◆ Li-ion rechargeable battery
- ◆ AAA battery

By using these different levels of attributes, we can make total 16 (2x2x2x2) product profiles out. In this part, we will make cards for the 16 product profiles and request the interviewees to rank the cards according to their preferences. In order to increase the respondents' interest to this part, we will design a cardboard with holder number 1 to 16 and ask the interviewees put the cards into the holders by themselves.

3.3.3 Questionnaire Part 2 and Part 3

In this part, questions will be asked to the interviewees. The questions are going to collect the demographic information of the interviewees. Besides, 5 questions are used to find the consumers' attitude to high technology digital products.

3.4 Data Analysis

3.4.1 Part 1 Data

After get the ranking of the product profiles, we will input the data to the software Conjoint Analyzer to find out the results. Group utility function (part-worth) and relative importance indexes will be obtained.

Besides, we will also use the data file from Conjoint Analyzer to run the segmentation (cluster analysis) in the software Conjoint Segmenter. The number of segments and the preferences of the respondents from different segments will be obtained.

Lastly, we will use software Simgraf to do the market simulation. There are two basic types of simulation models in the software. The first type is called the First Choice model, or the maximum utility model. The second type of model is the Probabilistic model. In the data analysis part, we will use First Choice model because it does best when there is less noise in the data and Probabilistic model does better for simulating frequently purchased products. The First Choice model assumes that a respondent will choose the product with the highest utility to him.

Three products will be chosen and test the respondents preferences (i.e. part-worth) on them. We will choose two existing PDA in the market and one new product which designed by us according to the information from the exploratory research.

The three test products for market simulation are:

1. Product 1 (Sony 760C)

The price of this model is around \$3,500 in the market. It is equipped with color screen and installed with Palm OS version 4.1. This model uses Li-ion battery. Therefore the product profile is:

Price	Operation System	Screen Display	Types of Battery
Above \$2500	Palm OS	Color Display	Li-ion Battery

Table 3.1: Product 1 Profile

2. Product 2 (Palm M105)

The price of this model is around \$1,200 in the market. It is equipped with monochromatic screen and installed with Palm OS version 3.5.

This model uses AAA battery. Therefore the product profile is:

Price	Operation System	Screen Display	Types of Battery
\$1000 to \$2500	Palm OS	Monochromatic Display	AAA Battery

Table 3.2: Product 2 Profile

3. Product 3 (Self-Designed)

The price of this model will be around \$2,000 in the market. It will be equipped with color screen and installed with Win CE version Pocket CE 2002. This model will use Li-ion battery. Therefore the product profile is:

Price	Operation System	Screen Display	Types of Battery
\$1000 to \$2500	Win CE	Color Display	Li-ion Battery

Table 3.3: Product 3 Profile

We design this product for market simulation because there are no existing PDA operating with Win CE and color display which are priced in between \$1,000 and \$2,500. We only can find color PDA, which operating with Palm OS, is priced under \$2,500 in the market.

The software Simgraf will calculate out the market share of these three products.

We will write our report base on those conjoint analysis results from three software; all the three software were written by Bretton Clark.

3.4.2 Part 2 Data

We will use SPSS (Statistical Package for the Social Sciences) to do different tests and get the results for the data. We will run t-test or ANOVA test in order to find out results that are useful for us to investigate our problems. We can see the significances of the differences between two variables. In addition, we will run cross tabulation between the questions to see the frequencies distribution over different variables. Analytical reports will be written based on the information generated from the SPSS.

3.4.3 Part 3 Data

The data in part 3 of the questionnaire will be used to do analysis with the data in part 2. Part 3 data are demographic data which used to find out the attitude difference between respondents with different background.

Chapter 4

Results and Analysis

Chapter 4 Results and Analysis

4.1 Respondents Profile

In the research, we had finished 200 completed questionnaires. Since we need to do the conjoint analysis, we needed our respondent to help us to rank the card of the product in part 1, so our success rate was 100%. The follows were results and analysis of the research.

Factors	Variables	Frequency	Valid Percentage
Gender	Female	59	29.5
	Male	141	70.5
Age	16-22	48	24.1
	23-29	98	49.2
	30-37	34	17.1
	38-44	14	7.0
	45 or above	5	2.5
Monthly Income	\$10,000 or below	54	27.6
	\$10,001 - \$20,000	64	32.7
	\$20,001 - \$30,000	45	23.0
	\$30,001 - \$40,000	15	7.7
	\$40,001 or above	18	9.2
Occupation	Student	28	14.1
	Blue Collar	22	11.1
	Clerical	64	32.2
	Management	38	19.1
	Self-employed	21	10.6
	Housewife	5	2.5
	Others	21	10.6

Table 4.1: Demographic Information of Total Respondents

(i) Gender distribution

Around 70% of the respondents were male; the proportion of male and female had a great difference.

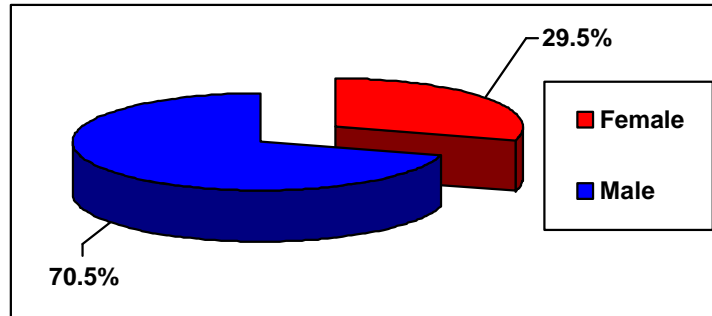


Figure 4.1: Gender Distribution

(ii) Age distribution

Age group was divided into five categories. A great majority of the respondents were aged between 23-29 and the second largest group aged 16-22 accounted for 24.1%. Only 5 respondents were aged 45 or above.

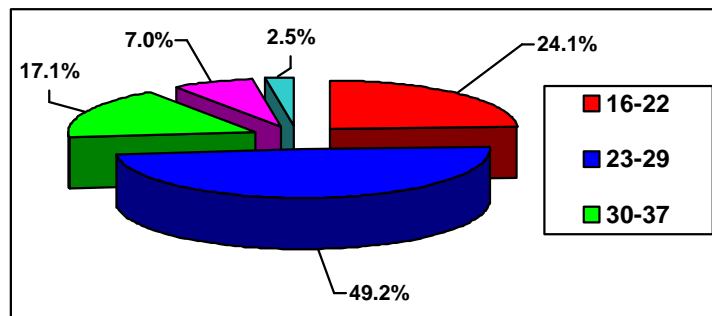


Figure 4.2: Age Distribution

(iii) Monthly income level

There were 5 monthly income categories. Almost four of five of our respondents earned less than \$30,000 per month. The largest monthly income group of the respondents earned \$10,001 - \$20,000. 16.9% earned more than \$30,000.

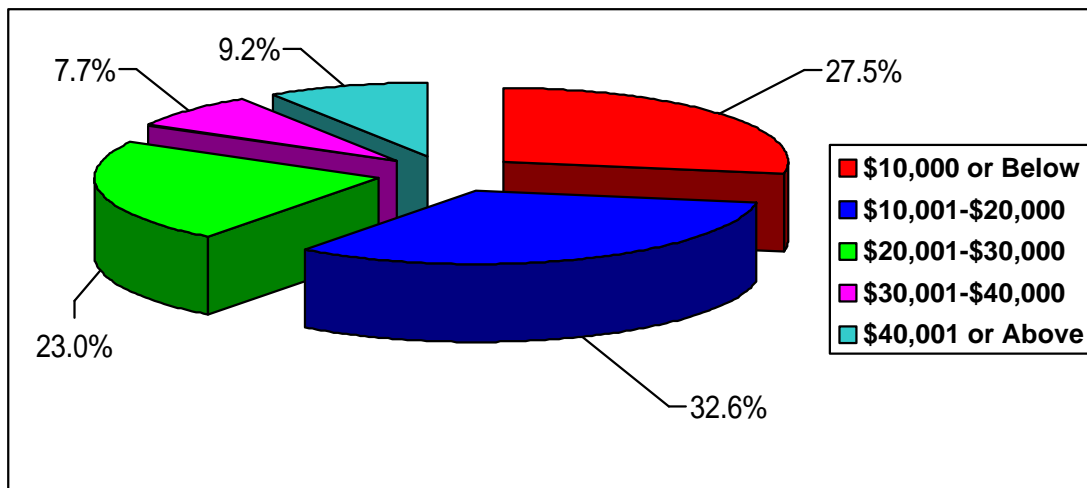


Figure 4.3: Monthly Income Level

(iv) Occupation distribution

The occupation of the respondents was classified into 7 categories. Among the respondent, most of them are clerical and management. Only 5 respondents were housewife.

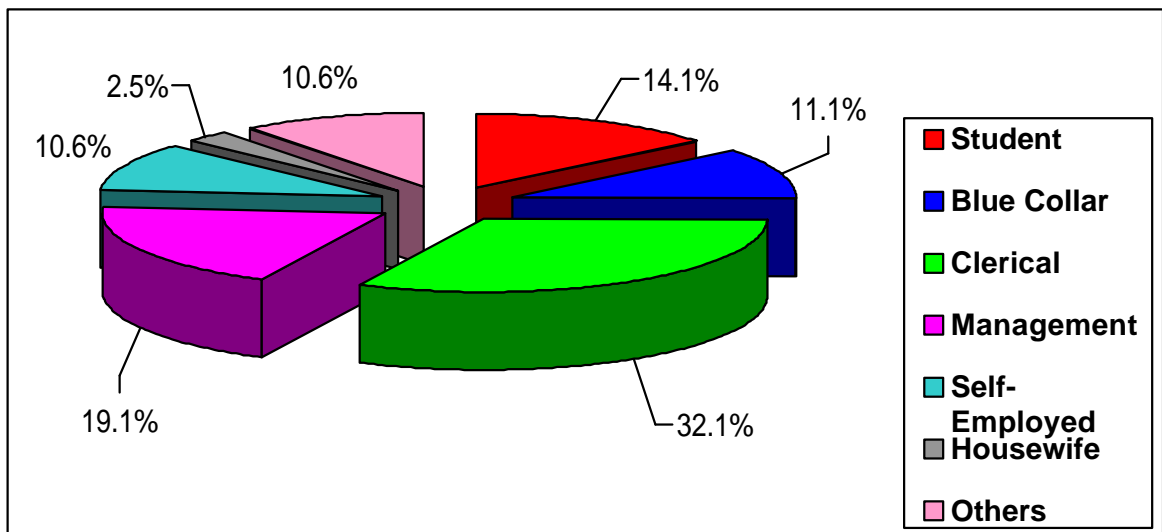


Figure 4.4: Occupation Distribution

4.2 Conjoint Analysis Results

There were three parts of finding in conjoint analysis. In our research, 200 respondents were asked to rank the 16 product profiles, which with different combinations of attributes, according to their own preferences. The data was input into three different software: Conjoint Analyzer, Conjoint Segmenter and Simgraf.

Firstly, we input the data into the software Bretton-Clark "Conjoint Analyzer", we got the group utility function (part-worth) and the relative importance indexes. Besides, we also used Bretton-Clark "Conjoint Segmenter" to find the different segments of the respondents based on cluster analysis. Lastly, Bretton-Clark "Simgraf" was also be used to do market simulations and know how each respondents would choose among alternative products.

4.2.1 Finding from Conjoint Analyzer

Respondents = 200		Average Adjusted Rsquare = 0.976%		
	Price	Operation System	Screen Display	Type of Battery
Group Utility (Part-Worth)	Above \$2500 -1.710	Win CE -0.370	Monochromatic Display -2.124	Li-ion Rechargeable Battery 0.572
	\$1000 to \$2500 1.710	Palm OS 0.370	Color Display 2.124	AAA Battery -0.572
Individual Relative Importance (%)	25.74	25.71	33.51	15.04
Group Relative Importance (%)	35.8	7.75	44.48	11.97

Table 4.2: Results of Conjoint Analysis

Table 4.2 showed the results of conjoint analysis. For the whole study sample, the average Adjusted Rsquare for the respondents was 0.976%, which indicated that the model did a good job of fitting the data (Bretton Clark, 1992).

4.2.1.1 Utility Estimation

The most positive utility score indicates the most preferred level for that attribute. But in the case if respondents in the study are heterogeneous (i.e. half the respondents strongly prefer level 1 of a attribute, while the other half equally strongly prefer level 2 of a attribute), the group utility function will be misleading. It is because the two attribute levels neutralize each other, so that the part-worth for both levels of the attribute will be zero or nearly zero. When there is heterogeneity, use of group data will lead to aggregation error (Bretton Clark, 1992).

Table 4.3 showed the distribution of preferred levels for the four attributes in our model which can be used to see the heterogeneity of the preferences of the respondents. The table displayed the percentage of respondents that “preferred” each of its level. The results suggested that respondents had very different preferences for operation systems (51.5% for Win CE and 48.5% for Palm OS) but they had similar preferences for the other three attributes (all around 90% versus 10%).

Above \$2500 4.5%	\$1000 to \$2500 95.5%
Win CE 51.5%	Palm OS 48.5%
Monochromatic Display 8.5%	Color Display 91.5%
Li-ion Rechargeable Battery 88.75%	AAA Battery 11.25%

Table 4.3: Distribution of Preferred Levels

Because of the heterogeneity on operation systems, we can ignore the group utility function of it, but we found that number of respondents preferred Win CE was almost the same as the number of respondents preferred Palm OS. For price, screen display and types of battery, respondents were homogenous; we could analyze their part-worth to know the consumer preferences on these attributes. The table 4.3 above and figure 4.5 below showed the utility functions of the levels of attributes. Firstly, respondents strongly preferred lower price (\$1000 to \$2500) in buying PDA, the part-worth of it was 1.710 and the part-worth of price above \$2500 was -1.710. This was very easy to

understand because rational consumers prefer lower prices to higher prices. Secondly, respondents preferred color display rather than monochromatic display in buying PDA, the part-worth was -2.124 for monochromatic display and 2.124 for color display. The reasons might be color display was trendier and more attractive than monochromatic display. Besides, color display could show a higher resolution than monochromatic display. Lastly, for types of battery, the part-worth of Li-ion rechargeable battery was 0.572 and the part-worth of AAA battery was -0.572 . It was because Li-ion rechargeable battery was cost-effective. In addition, Li-ion rechargeable battery could operate longer time on color display than AAA battery.

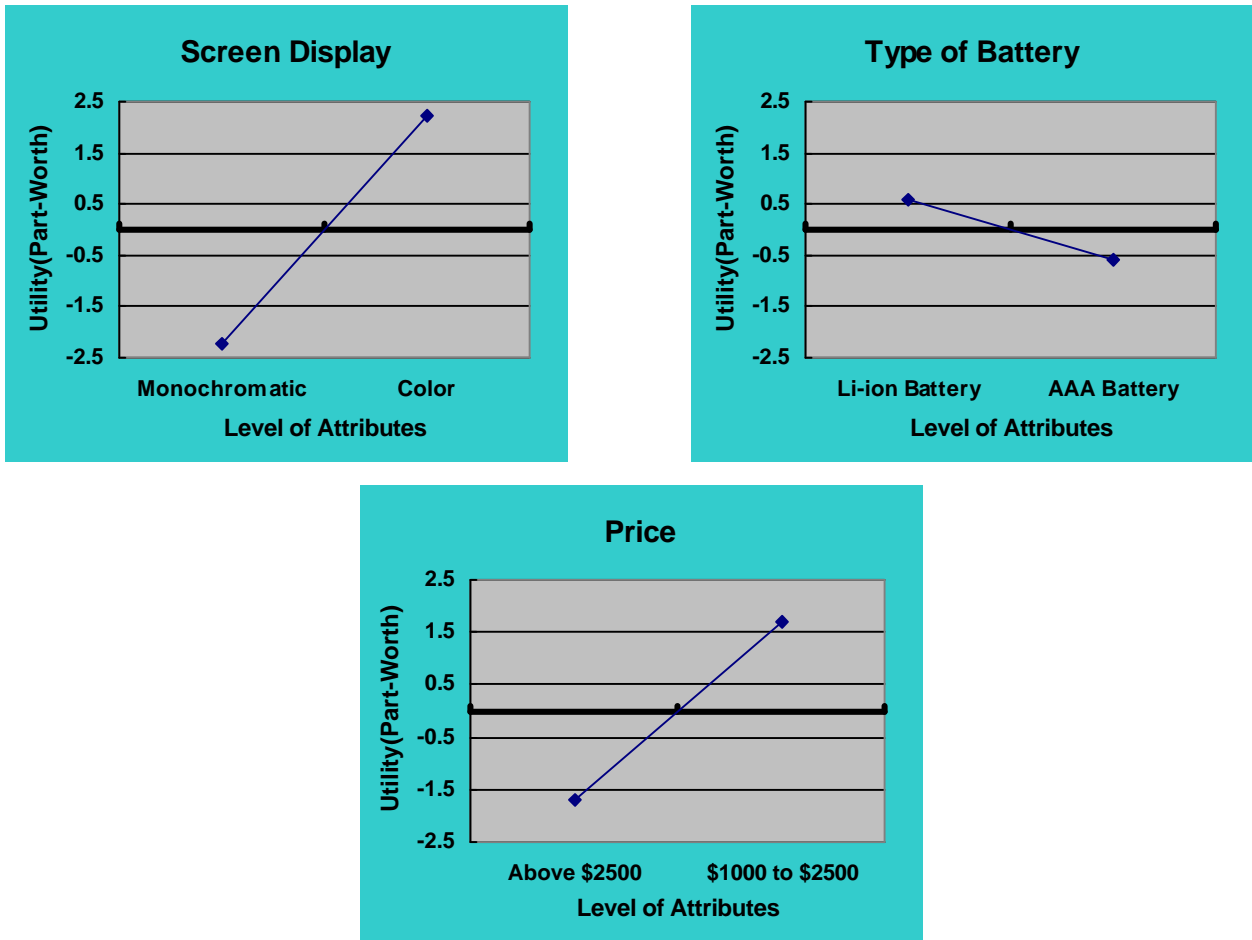


Figure 4.5: Utility Functions (Part-Worth) Based on Conjoint Analysis

4.2.1.2 Relative Importance

There were two different relative importance indexes generated from the Conjoint Analyzer, one was the individual relative importance percentage and the other one was the group relative importance percentage. The group relative importance is calculated by using the group utility function (part-worth).

In our research, the group utility function of operation system was misleading; the part-worth of both levels were nearly zero, thus the group relative importance of operation system was also nearly zero. Therefore, we would like to ignore the group relative importance indexes and analyze the individual relative importance indexes which were more reliable. The individual relative importance indexes of the four attributes were price 25.74%, operation system 25.71%, screen display 33.51% and types of battery 15.04%. The results suggested that respondents concerned with screen display as the most important attribute in buying PDA. After that, they would concern price or operation system, which with very similar relative importance.

Lastly, respondents concerned with the types of battery that the PDA used.

Respondents concerned with screen display as most important because PDA

with color screen had more multimedia functions, e.g. showing short clip movie and displaying photos, than PDA with monochromatic screen. Besides, as mentioned above, color screen was trendier than monochromatic screen. The results from the part two of our research also showed that owners bought PDA because of functions and trendy.

4.2.2 Findings from Conjoint Segmenter

Conjoint segmenter calculated the similarity of the respondents' utilities. The number of clusters and the distance were shown in the table below.

Select Number of Clusters	
# Clusters	Distance
2	2832066389148776000000.000
3	1060777551116370000.000
4	9488486847479808.000
5	58451250118656.000
6	28606931664896.000
7	6158147911680.000
8	1200496050176.000
9	43336896512.000
10	4101012736.000
11	3545212672.000
12	2041784576.000
13	223318608.000
14	41790408.000
15	5610267.500

<CANCEL>

Figure 4.6: Amount of Variability Based on Number of Clusters

The larger the distance in the above figure, the larger the variability within each cluster. As the number of clusters increased, the amount of variability within clusters decreased. Distance decreased sharply at first, and then leveled out. The place where distances started to level out was the “elbow” which indicated the appropriate number of clusters or segments (Bretton-Clark, 1992). There

were two significant “elbow” in our research, five-segment solution and nine-segment solution. We analyzed both cases and found that the nine-segment solution had many insignificant small groups which only accounted for 4.5% to 5% of the total number of respondents (please refer to appendices F). We finally chose five-segment solution for our research.

The five segments that generated by Conjoint Segmenter were listed below:

Group 1

Attributes	Utility Function (Part-Worth)		Relative Importance
Price	Above \$2500 -1.584	\$1000 to \$2500 1.584	24.44%
Operation System	Win CE 0.573	Palm OS -0.573	8.85%
Screen Display	Monochromatic Display -3.741	Color Display 3.741	57.73%
Types of Battery	Li-ion Rechargeable Battery 0.582	AAA Battery -0.582	8.98%

Table 4.4: Respondents' Preferences for Group 1

There were 58 respondents in Group 1 which accounted for 29% of total respondents. They preferred color display and Li-ion rechargeable battery in buying PDA. Besides, they liked PDA running under Win CE and cheap in price (\$1000 to \$2500). The respondents were more concerned with screen display than all other three attributes. Then they were more concerned with price than operation system and types of battery. They did not concern too much on both operation system and types of battery in buying PDA.

Group 2

Attributes	Utility Function (Part-Worth)		Relative Importance
Price	Above \$2500 -1.816	\$1000 to \$2500 1.816	39.49%
Operation System	Win CE -1.785	Palm OS 1.785	38.81%
Screen Display	Monochromatic Display -0.936	Color Display 0.936	20.35%
Types of Battery	Li-ion Rechargeable Battery -0.063	AAA Battery 0.063	1.36%

Table 4.5: Respondents' Preferences for Group 2

There were 72 respondents in Group 2 which accounted for 36% of total respondents. Respondents in Group 2 preferred PDA with Palm OS, color display and AAA battery. They also preferred PDA priced around \$1000 to \$2500. They placed more emphasis on price and operation system. They nearly not concerned with types of battery.

Group 3

Attributes	Utility Function (Part-Worth)		Relative Importance
Price	Above \$2500 -1.758	\$1000 to \$2500 1.758	24.73%
Operation System	Win CE 1.901	Palm OS -1.901	26.74%
Screen Display	Monochromatic Display -1.906	Color Display 1.906	26.81%
Types of Battery	Li-ion Rechargeable Battery 1.544	AAA Battery -1.544	21.72%

Table 4.6: Respondents' Preferences for Group 3

There were total 48 respondents in Group 3 which accounted for 24% over the 200 respondents. The respondents here again preferred Palm OS, color display and Li-ion rechargeable battery. As the same as the above two groups, respondents preferred cheaper priced PDA (\$1000 to \$2500). The respondents in Group 3 concerned almost equally on the four attributes in buying PDA; relative importance ranged from 21% to 26%.

Group 4

Attributes	Utility Function (Part-Worth)		Relative Importance
Price	Above \$2500 -2.000	\$1000 to \$2500 2.000	26.67%
Operation System	Win CE -4.000	Palm OS -4.000	53.33%
Screen Display	Monochromatic Display -1.000	Color Display 1.000	13.33%
Types of Battery	Li-ion Rechargeable Battery 0.500	AAA Battery -0.500	6.67%

Table 4.7: Respondents' Preferences for Group 4

There were 13 respondents in Group 4 which accounted for 6.5% of total respondents. Respondents preferred cheap PDA (\$1000 to \$2500) with Palm OS, color display and Li-ion rechargeable battery. They placed most emphasis on operation system. Then they more concerned with price than screen display. The types of battery is least concerned.

Group 5

Attributes	Utility Function (Part-Worth)		Relative Importance
Price	Above \$2500 -1.000	\$1000 to \$2500 1.000	13.33%
Operation System	Win CE 2.000	Palm OS -2.000	26.67%
Screen Display	Monochromatic Display -4.000	Color Display 4.000	53.33%
Types of Battery	Li-ion Rechargeable Battery 0.500	AAA Battery -0.500	6.67%

Table 4.8: Respondents' Preferences for Group 5

There were only 9 respondents in the last group which accounted for 4.5% of total respondents. The 9 respondents most concerned with screen display and least concerned with types of battery. They preferred color display, Li-ion battery, Palm OS and price at around \$1000 to \$2500.

We had an overlook on the segments of potential customers of PDA and understood their preferences through the results from Conjoint Segmenter.

4.2.3 Findings from Simgraf

After input the product profiles that we used for market simulation model (First Choice model) to the software Simgraf, it would calculate the market share of each product profile according to the respondents' highest utility option. The results from the Simgraf were list in the table below:

Product Profiles	Market Share
Product 1 (Sony 760C)	20.5%
Product 2 (Palm M105)	23.5%
Product 3 (Self Designed)	56%

Table 4.9: Market Share of the Three Product Profiles in the Market Simulation

Model (First Choice Model)

From the results, we found that Product 1 accounted for 20.5% of the market, Product 2 accounted for 23.5% of the market and Product 3 accounted for 56% of the market.

According to the results from the Conjoint Segmenter, all segments of respondents also had higher utility point for cheap (\$1,000 to \$2,500) PDA

than expensive one (Above \$2,500). It was the main reason why Product 1 only accounted for a small part of the market in the simulation model.

For Product 2, although it was cheap, it operated with monochromatic screen display which was not matched with the respondents' preferences. In the five segments generated by Conjoint Segmenter, all respondents showed that they preferred a PDA with color screen display.

For the product that designed by us (Product 3), it matched most respondents' preferences. It accounted for half of the market share.

According to these results, we had made some recommendations to the manufactures in the next chapter.

4.3 Data Analysis Results

4.3.1 The Relationship Between Gender and PDA User

According to table 4.10, the result between Female and Male had a great difference. For Female, nearly 80% female respondents were not a PDA user.

However, over half male respondents were PDA users.

		Gender		Total
		Female	Male	
Yes	Count	12	75	87
	% within Gender	20.3%	53.2%	43.5%
	% of total	6.0%	37.5%	43.5%
No	Count	47	66	113
	% within Gender	79.7%	46.8%	56.5%
	% of total	23.5%	33.0%	56.5%
Total	Count	59	141	200
	% within Gender	100.0%	100.0%	100.0%
	% of total	29.5%	70.5%	100.0%

Table 4.10: The Relationship Between Gender and PDA User

4.3.2 The Relationship Between Age and PDA User

According to the results from the respondents, the difference between PDA user and Non-PDA user in different age groups was not so significant. Only two aged groups had difference. 80% of aged 45 or above was using PDA. However, over 62% of aged 23-29 answered they were Non-PDA user.

		Age					Total
		16-22	23-29	30-37	38-44	45 or above	
Yes	Count	20	37	18	7	4	86
	% within Age	41.7%	37.8%	52.9%	50.0%	80.0%	43.2%
	% of Total	10.1%	18.6%	9.0%	3.5%	2.0%	43.2%
No	Count	28	61	16	7	1	113
	% within Age	58.3%	62.2%	47.1%	50.0%	20.0%	56.8%
	% of Total	14.1%	30.7%	8.0%	3.5%	0.5%	56.8%
Total	Count	48	98	34	14	5	199
	% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	24.1%	49.2%	17.1%	7.0%	2.5%	100.0%

Table 4.11: The Relationship Between Age and PDA User

4.3.3 The Relationship Between Monthly Income and PDA User

The trend of using PDA was clear. Higher income group had a higher percentage of using PDA. Over half respondents who monthly income was over \$30,000 answered that they was a PDA user. Respondents who monthly income below \$30,000, there were only 35-46% were a PDA user.

		Monthly Income					Total
		\$10,000 or below	\$10,001-\$20,000	\$20,001-\$30,000	\$30,001-\$40,000	\$40,001 or above	
Yes	Count	19	25	21	11	11	87
	% within Monthly Income	35.2%	39.1%	46.7%	73.3%	61.1%	44.4%
	% of Total	9.7%	12.8%	10.7%	5.6%	5.6%	44.4%
No	Count	35	39	24	4	7	109
	% within Monthly Income	64.8%	60.9%	53.3%	26.7%	38.9%	55.6%
	% of Total	17.9%	19.9%	12.2%	2.0%	3.6%	55.6%
Total	Count	54	64	45	15	18	196
	% within Monthly Income	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	27.6%	32.7%	23.0%	7.7%	9.2%	100.0%

Table 4.12: The Relationship Between Monthly Income and PDA User

4.3.4 The Relationship Between Occupation and PDA user

		Occupation							Total
		Student	Blue Collar	Clerical	Management	Self-Employed	Housewife	Others	
Yes	Count	12	9	23	25	10		8	87
	% within Occupation	42.9%	40.9%	35.9%	65.8%	47.6%		38.1%	43.7%
	% of Total	6.0%	4.5%	11.6%	12.6%	5.0%		4.0%	43.7%
No	Count	16	13	41	13	11	5	13	112
	% within Occupation	57.1%	59.1%	64.1%	34.2%	52.4%	100.0%	61.9%	56.3%
	% of Total	8.0%	6.5%	20.6%	6.5%	5.5%	2.5%	6.5%	56.3%
Total	Count	28	22	64	38	21	5	21	199
	% within Occupation	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	14.1%	11.1%	32.2%	19.1%	10.6%	2.5%	10.6%	100.0%

Table 4.13: The Relationship Between Occupation and PDA User

In table 4.13, management and self-employed were the main PDA user. 65.8% respondents who were doing management were using PDA. Nearly half of self-employed respondents were a PDA user (47.6%). However, over half of student, blue collar, clerical and housewife were a Non-PDA user with a percentage of 57.1%, 59.1%, 64.1%, 52.4% and 100% respectively.

4.3.5 The Difference Point of View About Electronic Product Among

Different Gender

Table 4.14 was showing the independent groups t-test for the difference between Male and Female about the feeling of electric product. Levene 's Test for Equality of Variances was used to classify the null hypothesis was no difference between the variances or not.

Q1: Do you agree the electric product can improve your living standard?

Q5: How likely you would buy a new model of electronic product?

According to Table 4.14, a probability of Q1 and Q5 were 0.678 and 0.175 (much greater than 0.05). It indicated that there were no variances. Using the Equal variance estimate information, the associated probabilities of support for the null hypothesis of no difference between Male and Female were 0.002 and 0.000 (2-tailed sig.). Two groups differed significantly.

Q2: Do you agree using high technology product represent high status?

Q4: How likely you search information of new electronic products?

A probability of Q2 and Q4 were 0.001 and 0.028 (much smaller than 0.05). It indicated that there were variances. Using Unequal variance estimate information, the associated probability between Male and Female were 0.001 and 0.000 (2-tailed sig.). Two groups differed significantly.

Q3: How likely you would buy a high-technology product?

A probability was 0.341 (much greater than 0.05) indicated that there was no variance. Using Equal variance estimate information, the associated probability between Male and Female was 0.052. The difference between two groups was not significant.

	Levene's Test for Equality of Variances		t-test for Equality of Means	
	F	Sig.	t	Sig. (2-tailed)
Q1	0.172	0.678	3.150	0.002
Q2	12.305	0.001	3.484	0.001
Q3	0.911	0.341	1.957	0.052
Q4	4.892	0.028	4.074	0.000
Q5	1.852	0.175	5.960	0.000

Table 4.14: Independent t-test Between Q1-Q5 and Gender

From the above findings, it could be found that Male and Female had a significant difference on the attitude to electronic products (Except Q3).

According to table 4.15, the mean of Q4 and Q5 were showing that Male scored a lower mark than Female. It showed that Male was likely to search the information of new electronic products and was willing to buy a new model of electronic product. Comparing with Male, Female was unlikely to search and buy a new model.

	Q.1	Q.2	Q.3	Q.4	Q.5
Female	2.69	4.20	3.32	3.88	3.92
Male	2.29	3.70	2.85	3.12	2.97
Total	2.41	3.85	2.99	3.35	3.25

Table 4.15: The Difference Between Mean and Gender of Q1-Q5

4.3.6 Reasons of Using PDA

According to figure 4.7, it shows that trendy, functional and convenience were the main reasons of using PDA of the respondents. There were 69% of respondents choosing Functional as the reason of using PDA. It shows that users hope the function of PDA can assist them daily in a certain level.

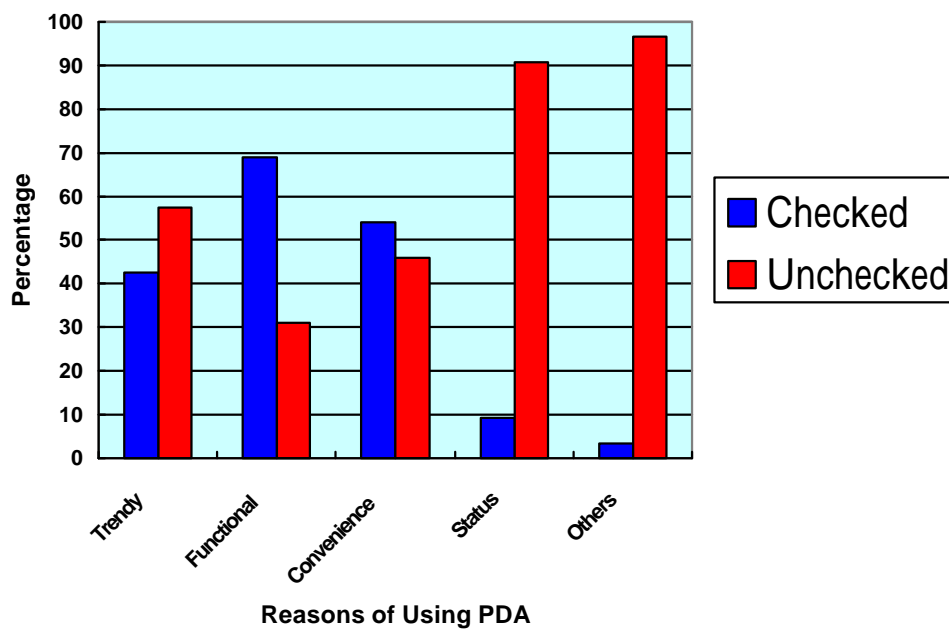


Figure 4.7: The Reasons of Using PDA

4.3.7 Sources of PDA Information

The sources of PDA information were quite narrow in figure 4.8. Respondents mainly collected information from Newspaper and Friends (34.5% and 73.6%). Also, 73.6% of respondents collected information about PDA from his/her friends directly. It indicated that Word of Mouth was a main role in the source of information of PDA.

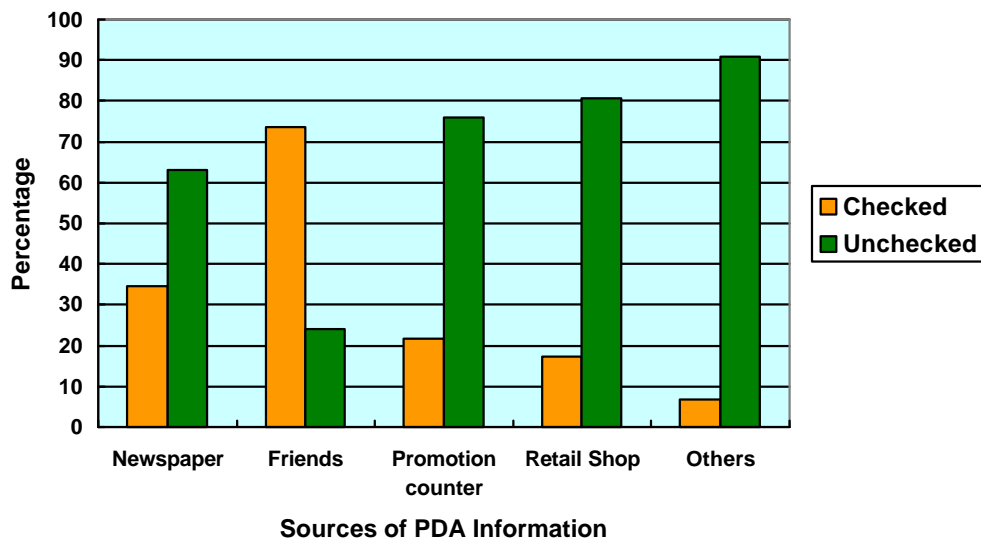


Figure 4.8: Sources of PDA Information

4.4 Other Findings

4.4.1 First Choice product profiles

According to table 4.16, the highest frequency of First choice product profile was Card No. 5 (70). Card No. 2 was in the second position among 16 cards.

There were 66 respondents chose Card No.2 as their first choice product profile. Some product profiles had not been chosen by any respondent as the first choice product profile, such as Card No.7, 9, 10, 11, 13 and 15.

	Frequency	Valid Percent	Cumulative Percent
No.1	3	1.5	1.5
No.12	3	1.5	3.0
No.14	20	10.0	13.0
No.16	9	4.5	17.5
No.2	66	33.0	50.5
No.3	12	6.0	56.5
No.4	7	3.5	60.0
No.5	70	35.0	95.0
No.6	3	1.5	96.5
No.8	7	3.5	100.0
Total	200	100.0	

Table 4.16: First Choice Frequency

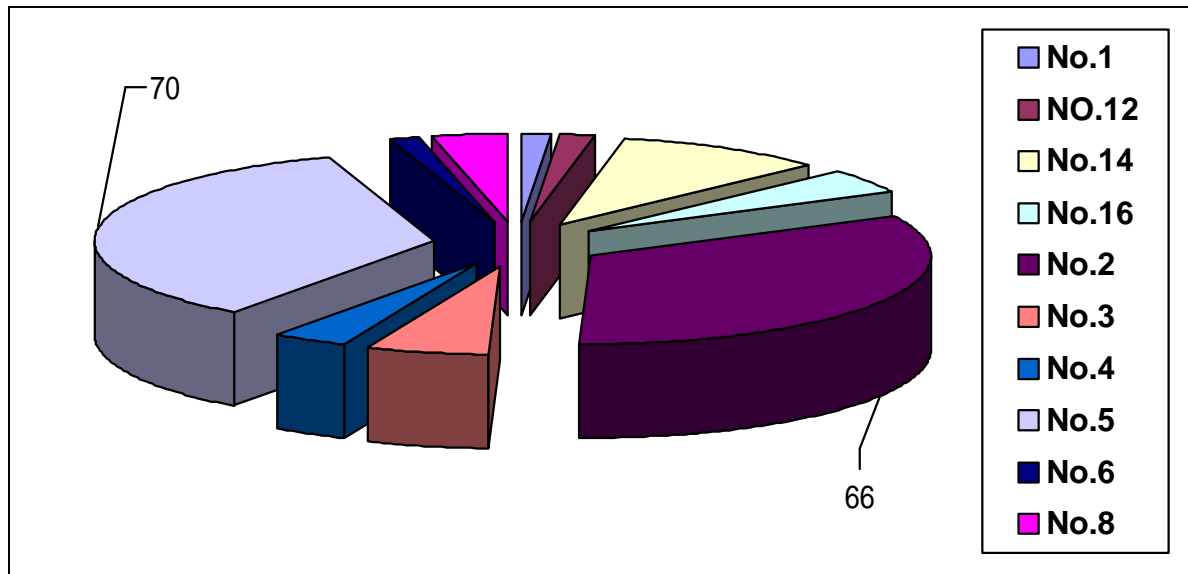


Figure 4.9: Pie Chart of First Choice Frequency

Card No.2

Price	\$1000 to \$2500
Operation System	Palm OS
Screen Display	Color Display
Type of Battery	Li-ion rechargeable battery

Card No.5

Price	\$1000 to \$2500
Operation System	Win CE
Screen Display	Color Display
Type of Battery	Li-ion rechargeable battery

Table 4.17: The Product Profile of Card No. 2 and 5

Chapter 5

Discussion

Chapter 5 Discussion

5.1 Recommendations

Base on the results found in our research, we would like to make some recommendations to the PDA manufacturers.

5.1.1 Recommendations base on Conjoint Analysis Results

The results in the conjoint analysis showed that PDA manufacturers should focus in producing models with color display because almost all respondents preferred color display in our research. Market of PDA with monochromatic display is diminishing and it may be superannuated after a few years. Besides, it also suggested that Palm OS no longer monopolize the PDA market and more and more consumers choose Win CE.

Most consumers are more concern with the screen display, price and operation system. Manufacturers must carefully choose the right operation system for their new models of PDA, besides, rational pricing for their new product is also very important for the success.

From the Conjoint Segmenter outputs, the largest segment was only accounted for 36% in the research; it showed that there is no specific model of PDA can attract most consumers. The consumer preferences still have great variation. It is not similar to computer market that Microsoft Windows and Intel Pentium Processor are monopolizing the market. Manufacturers can build in some new special functions to their new models of PDA, which solely provided by them, in order to attract more customers. A product which combined PDA with mobile phones manufactured by Motorola is a very good example.

In the current PDA market, all PDA which operating under Win CE and with color screen display are very expensive (above \$3,000). On the other hand, there are many PDA which operating under Palm OS and also with color screen display selling at a low price (around \$2000). As we mentioned above, market for Win CE is enlarging, manufacturers can target the low price market with the Win CE PDA. This suggestion can be supported by the results from the market simulation part.

5.1.2 Recommendation base on results generated from the questions

The results showed that around 80% of the female respondents were not PDA users. This suggested that the female market of PDA products has not yet been developed. Manufacturers can produce some PDA models which mainly target the female market. They can follow the strategies that mobile phone manufacturers using. The Queen phone produced by Samsung is a very good example. PDA manufacturers can design some “female PDA”, e.g. use Hello Kitty pattern printing on the case of the PDA for the female customers.

High technology digital products are always being thought as trendy and must buy products by the youngsters and young bachelors. From the results in the last chapter, we found that only half of the young respondents (aged 16 - 29) had bought PDA. It showed that the market of PDA had not yet been well developed. Manufacturers should put more effort on promotion and increase people’s awareness of PDA.

PDA was always being regarded as luxurious product in two years ago and only be used by rich people and high executives. As the price of PDA has

reduced these years, more and more people also buy PDA, but most of the users were still managers and boss (refer to the results of our research). Therefore, manufacturers should change people's perception on PDA. This can greatly increase the number of customers.

Male and female always have different attitudes to some products; PDA is one of these products. In our research, we found that female and male had significantly difference in the following issues:

1. Impact of high technology products on living standard.
2. Agree level to high technology products represent high status.
3. Attitude to searching information of new electronic product.
4. Attitude to buying high technology products frequently.

The results suggested that manufacturers of PDA should use different strategies to promote their products to male and female customers.

Lastly, we can summarize the reasons why people used PDA and where they got the information about PDA. In our research, we found most existing users of PDA thought that PDA was functional, convenience and trendy.

They got the information of PDA mainly from their friends and newspaper.

The manufacturers of PDA should emphasize these characteristics of PDA when promoting their PDA products. Besides, most respondents knew PDA from their friends showed that promotion of PDA products is not enough and couldn't stimuli consumers' consumption intension. Manufacturers should improve their marketing strategies.

5.2 Limitations

5.2.1 Sampling Method

Convenient sampling has an advantage that it is quickly and inexpensively.

However, on the other hand, it carries the negative effect at the same time.

Convenient sampling is prone to bias and influences which are beyond your control, as the cases only appear in the sample because of the ease of obtaining them (Saunders, Lewis and Thornhill, p 147). It has a problem that the interviewee does not give the real answer in the interview. They may feel that the interview is wasting their time.

Also, there are external factors affecting the answer of interviewee, such as location of interview, the attitude of interviewee and the skill of interviewer.

Moreover, convenient sampling is not systematic to collect the data from the real world. It is not a random to find the interviewee. It may not reflect the real situation. Besides, it is no way to know if the respondents included are representative of the target population due to the usage of convenience samples. It is one type of non-probability sampling techniques.

Besides, field experiment means that the situation cannot be controlled by the

interviewer. The interviewee answers the question under the natural situation. However, it carries out the problem that there is much external effect. These external effects affect the answer of interviewee directly.

5.2.2 Sample Size

Conjoint analysis is quite time consuming of each questionnaire. Respondent needs to spend around 5-10 minutes to finish the card ranking. Owing to the manpower and time constraint, the sample size of our research project was 200. If more resources are available, more information and ideas could be generated for this research.

5.2.3 Limitation of Conjoint Analysis

1. It is not always clear that the constructed segments can be meaningfully pursued in the marketplace.
2. The number of product profiles to be rated is very large and each individual product description may be very complex. With more than six to eight attributes, respondents can become overloaded with information, and the reliability of their answers may diminish.

3. A conjoint study gives us only half the picture – the demand side. There are also cost, capacity, and other implications of implementing a particular product strategy. In the real situation of buying PDA, consumers would consider several factors more than just features of PDA, such as the design of PDA and brand name. Although elimination of other factors would allow the research focuses on the desired factor, it have ignored the importance of other elements in the decision making process. Decisions need to be based on interplay between what a market wants and what a company can afford to offer.

4. There is a problem that the situation for the respondent is analogous to a paired product test in which it is assumed that one product will be chosen. The respondent may like none of what is offered or like and purchase more than one of what is offered.

5. There are so many models of a product in the market. We cannot input all the models of a product into the simulation model for calculation of market share. The real picture of the market may not be shown in the results.

6. Again in the simulation model, market share is calculated base on the product profiles with limited number attributes. In the real case, some special attributes (e.g. MP3 function) may greatly affect the market share of the product.

Chapter 6

Conclusion

Chapter 6 Conclusion

PDA is more popular in the market. More people buy PDA for different purpose. There is a large market potential. Under the keen competition of the PDA market, every manufacturers hope to understand the customer preference in order to produce the most suitable product to the consumer. Using the Conjoint Analysis, we try to understand more about the consumer preference of PDA. Moreover, we investigate different segments of the consumer in the market in order to collect more useful information from the research.

From our research, we found many information of PDA. Firstly, different gender had significant different preference of PDA. Male was likely to search a new product, such as PDA, and bought an electronic product. Secondly, the trend of the development of PDA could be found. Color display, Li-ion rechargeable battery and Window CE started to replace monochromatic display, AAA battery and Palm OS. Thirdly, the price still was the payoff factor to affect consumers to make the buying decision.

There are some recommendations for those PDA manufacturers, such as PDA manufacturers must use different strategies to promote their products to different gender. Also, PDA manufacturers can design some “female PDA” in order to develop the female PDA user because there is a potential market from the results of research. Moreover, PDA manufacturers must put more effort on promotion in order to increase the market size. Word of mouth and newspaper are the main source of information for the PDA user. PDA manufacturers can concern this situation.

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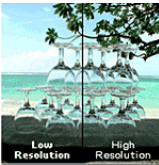

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Appendixes

Appendix A Card Samples

No. 11

Price		Above \$2500
Operation System		Palm OS
Screen Display		Color Display
Type of Battery		AAA battery

No.6

Price		\$1000 to \$2500
Operation System	Windows® CE	Win CE
Screen Display		Monochromatic Display
Type of Battery		Li-ion rechargeable battery

Appendix B Cardboard



Appendix C Sample Questionnaire for Pre-test

Questionnaire for Pre-test

We are the final year students of Department of Marketing and International Business of Lingnan University. We are now collecting the information for our final year project. This questionnaire is designed to investigate the consumer preference and opinions towards selecting Personal Digital Assistant (PDA). All information collected will be for academic purpose only and will be kept in strict confidence.

Part 1

Which combination of product features of PDA is the most favorable to you? There are total 24 cards. Please rank your preference in the descending order (most favorite to least favorite).

Part 2

1. Have you bought a PDA before?

- Yes (Please go to Question 2)
- No (Please go to Question 3)

2. Why do you use PDA? (You can tick more than one option)

- Trendy
- Functional
- Convenience
- Status
- Others (Please specify _____)

3. From which source(s) do you know about PDA. (You can tick more than one option)

- Newspaper or magazine advertisement
- Friends
- Promotion counter at shopping hall
- Retail shop
- Others (Please specify _____)

Part 3

- Gender : Female (please answer questions in part 4)
 Male
- Age : 16-25 26-35 36 or above
- Monthly Income : \$10,000 or below
 \$10,001 - \$20,000
 \$20,001 - \$30,000
 \$30,001 - \$40,000
 \$40,000 or above
- Occupation : Student
 Blue Collar
 Clerical
 Management
 Self-employed
 Housewife
 Others (Please specify _____)

Part 4

1. Did you seek opinions from your friends (male) when purchasing high technology products e.g. Computers, PDA, Camera, Cars etc.
 Yes, I did
 No, I didn't
2. Did their opinions significantly affect your purchase decision?

Very Significantly				Slightly Significantly					Not Significantly
1	2	3	4	5	6	7	8	9	10

End of Questionnaire

Thank you for your cooperation!

Appendix D Sample Questionnaire for Survey

Ref. No. _____

Questionnaire for Survey

We are the final year students of Department of Marketing and International Business of Lingnan University. We are now collecting the information for our final year project. This questionnaire is designed to investigate the consumer preference and opinions towards selecting Personal Digital Assistant (PDA). All information collected will be for academic purpose only and will be kept in strict confidence.

Part 1

Which combination of product features of PDA is the most favorable to you? There are total 24 cards. Please rank your preference in the descending order (most favorite to least favorite).

1.	3.	5.	7.	9.	11.	13.	15.
2.	4.	6.	8.	10.	12.	14.	16.

Part 2

	Strongly Agree						Strongly Disagree
1. Do you agree the electronic product can improve your living standard?	1	2	3	4	5	6	7
2. Do you agree using high technology product represent high status?	1	2	3	4	5	6	7

	Extremely Likely						Extremely Unlikely
3. How likely you would buy a high-technology product?	1	2	3	4	5	6	7
4. How likely you search information of new electronic products?	1	2	3	4	5	6	7
5. How likely you would buy a new model of electronic product?	1	2	3	4	5	6	7

6. Have you ever bought a PDA?

- Yes (Please go to question 7)
 No (Please go to Part 3)

7. Why do you use PDA? (You can tick more than one option)

- Trendy
 Functional
 Convenience
 Status
 Others (Please specify_____)

8. From which source(s) do you know about PDA? (You can tick more than one option)

- Newspaper or magazine advertisement
 Friends
 Promotion counter at shopping hall
 Retail shop
 Others (Please specify_____)

Part 3

9. Gender : Female
 Male

10. Age : 16-22 23-29 30-37 38-44 45 or above

11. Monthly Income : \$10,000 or below
 \$10,001 - \$20,000
 \$20,001 - \$30,000
 \$30,001 - \$40,000
 \$40,001 or above

12. Occupation : Student
 Blue Collar
 Clerical
 Management
 Self-employed
 Housewife
 Others (Please specify_____)

End of Questionnaire

Thank you for your cooperation!

Appendix E Questionnaire for Exploratory Research

Question 1:

What features of PDA will you concern when you buy a PDA? (Please List Out)

Question 2:

What features of PDA are the most considerable?

Question 3:

Why you think that these features are the most considerable?

Question 4:

In your opinion, what features should a good PDA include?

Question 5:

What features of PDA are useless when you considering a PDA?

Appendix F The Result from Conjoint Segmenter -**Nine-segment solution**

GROUP 1 (N=29)		
Price	Above \$250	\$1000 to \$
Rel. Imp. = 28.63%	-1.966	1.966
Operation System	Win CE	Palm OS
Rel. Imp. = 16.45%	1.129	-1.129
Screen Display	Monochroma	Color Disp
Rel. Imp. = 50.72%	-3.483	3.483
Type of Battery	Li-ion Rec	AAA Batter
Rel. Imp. = 4.21%	0.289	-0.289
GROUP 2 (N=37)		
Price	Above \$250	\$1000 to \$
Rel. Imp. = 11.43%	-0.635	0.635
Operation System	Win CE	Palm OS
Rel. Imp. = 56.35%	-3.132	3.132
Screen Display	Monochroma	Color Disp
Rel. Imp. = 19.76%	-1.098	1.098
Type of Battery	Li-ion Rec	AAA Batter
Rel. Imp. = 12.46%	0.693	-0.693
GROUP 3 (N=40)		
Price	Above \$250	\$1000 to \$
Rel. Imp. = 27.16%	-1.909	1.909
Operation System	Win CE	Palm OS
Rel. Imp. = 21.07%	1.481	-1.481
Screen Display	Monochroma	Color Disp
Rel. Imp. = 26.84%	-1.888	1.888
Type of Battery	Li-ion Rec	AAA Batter
Rel. Imp. = 24.93%	1.753	-1.753
GROUP 4 (N=28)		
Price	Above \$250	\$1000 to \$
Rel. Imp. = 60.38%	-2.830	2.830
Operation System	Win CE	Palm OS
Rel. Imp. = 4.29%	-0.201	0.201
Screen Display	Monochroma	Color Disp
Rel. Imp. = 9.71%	-0.455	0.455
Type of Battery	Li-ion Rec	AAA Batter
Rel. Imp. = 25.62%	-1.201	1.201

GROUP 5 (N=29)		
Price	Above \$250	\$1000 to \$
Rel. Imp. = 19.73%	-1.203	1.203
Operation System	Win CE	Palm OS
Rel. Imp. = 0.28%	0.017	-0.017
Screen Display	Monochroma	Color Disp
Rel. Imp. = 65.63%	-4.000	4.000
Type of Battery	Li-ion Rec	AAA Batter
Rel. Imp. = 14.36%	0.875	-0.875
GROUP 6 (N=13)		
Price	Above \$250	\$1000 to \$
Rel. Imp. = 26.67%	-2.000	2.000
Operation System	Win CE	Palm OS
Rel. Imp. = 53.33%	-4.000	4.000
Screen Display	Monochroma	Color Disp
Rel. Imp. = 13.33%	-1.000	1.000
Type of Battery	Li-ion Rec	AAA Batter
Rel. Imp. = 6.67%	0.500	-0.500

GROUP 7 (N=8)		
Price	Above \$250	\$1000 to \$
Rel. Imp. = 13.33%	-1.000	1.000
Operation System	Win CE	Palm OS
Rel. Imp. = 53.33%	4.000	-4.000
Screen Display	Monochroma	Color Disp
Rel. Imp. = 26.67%	-2.000	2.000
Type of Battery	Li-ion Rec	AAA Batter
Rel. Imp. = 6.67%	0.500	-0.500
GROUP 8 (N=7)		
Price	Above \$250	\$1000 to \$
Rel. Imp. = 53.33%	-4.000	4.000
Operation System	Win CE	Palm OS
Rel. Imp. = 13.33%	-1.000	1.000
Screen Display	Monochroma	Color Disp
Rel. Imp. = 26.67%	-2.000	2.000
Type of Battery	Li-ion Rec	AAA Batter
Rel. Imp. = 6.67%	0.500	-0.500

GROUP 9 (N=9)		
Price	Above \$250	\$1000 to \$
Rel. Imp. = 13.33%	-1.000	1.000
Operation System	Win CE	Palm OS
Rel. Imp. = 26.67%	-2.000	2.000
Screen Display	Monochroma	Color Disp
Rel. Imp. = 53.33%	-4.000	4.000
Type of Battery	Li-ion Rec	AAA Batter
Rel. Imp. = 6.67%	0.500	-0.500