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Effects of Background Music, Voice Cues, Earcons and Gender on Psychological Ratings and Heart Rates During Product Selection on a Gift and a Mobile Phone Web Stores

By

ZENG JING

A Thesis Submitted to

The Hong Kong University of Science and Technology

in Partial Fulfillment of the Requirements for

the Degree of Master of Philosophy

in Industrial Engineering and Engineering Management

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Zeng Jing

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By

ZENG JING

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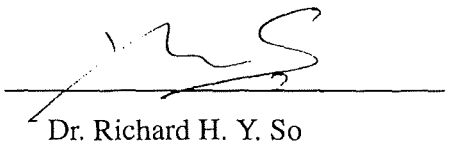

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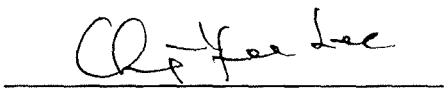

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Effects of Background Music, Voice Cues, Earcons and Gender on Psychological Ratings and Heart Rates During Product Selection on a Gift and a Mobile Phone Web Stores

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Abstract

The paradigm of product selection on Web stores was used to investigate the psychological and physiological responses of participants of both genders to background sound effects over the Internet. The purposes of this research were to determine whether music, voice cues, and earcons (i.e. non-music, non-verbal audio messages) can influence the level of shopping time, individual time perception, heart rate elevation and rated emotional responses when shopping on two different business-to-consumer (B2C) Web stores. One of those stores sells gifts and the other sells mobile phones. In the first experiment, results of 96 participants indicated that on the Web store selling gifts, music showed significantly positive effects only on male participants ($p<0.05$), while earcons significantly increased levels of pleasure with only female participants ($p<0.05$). Similar results were not found on the mobile phone Web store. Results also indicated the effects of music, voice, earcons and

gender had significant interactions with one another ($p<0.05$). A second experiment using think-aloud technique was conducted to explore possible reasons for the significant interactions between the effect of music and the type of Web stores with male participants. Results showed that male participants spent more percentages of time in examining the appearance of products on the gift Web store and than on the mobile phone Web store ($p<0.001$). On the other hand, male participants spent significantly more percentages of time in examining the functions of products on the mobile phone Web store than on the gift Web store ($p<0.001$). Together with the results of open questions, possible generic reasons for the differential effects of music on the two Web stores were suggested. Potential and actual applications of this research include the design of commercial Web stores and other Web-based services.

Chapter 1

Introduction

1.1 Background

1.1.1 Recent development of electronic commerce

Electronic commerce (EC) has experienced a rapid growth over past few years. A survey carried out by Wharton Economic Forecasting Associates (WEFA www.wefa.com) in 1999 revealed that the worldwide market for commercial electronic commerce was expected to exceed US$1 trillion by 2003, representing a compound annual growth of 69 percent over next several years. In 1998, approximately US$77 billion was spent through commercial trading over Internet (source: News releases from Visa International, http://www.visa.com/av/news/). Although EC is experiencing some problems now, it is still expected that this growth will keep on due to continuous advances in technology and potential economic benefits (Choi & Whinston, 2000). For example, Boston Consulting Group (BCG) reported 100 percent growth of online Business-to-Consumer revenues in Asia-Pacific in year 2001, reaching close to U.S.$14 billion. (http://www.bcg.com/media_center/)

1.1.2 Potential applications of sound on Business-to-Consumer (B2C) Web stores

With the study of optical networking technologies, the bandwidth of Internet

connections is expected to increase rapidly (Mukherjee, 2000). Consequently, real time streaming of audio data over Internet is a reality.

More and more Web sites, especially commercial Web stores, are adding multimedia applications not only to enhance attractiveness but to increase consumers' satisfaction. Web stores will not be silent anymore. When customers shop on these stores, they could have both visual and audio experience.

1.1.3 Present research involving sound effects

Marketing researchers have studied the effects of music on consumers' shopping in retailing stores for many years. Meanwhile, computer science specialists have also investigated the effects of audio icons on computer interface upon users' performance and satisfaction for a long time. Recently, with the emergence of calling center on some Web sites, on-line voice communication appears.

However, to our knowledge, no study so far has been done on these three sound effects, i.e. music, human voice and non-music, non-voice audio message on commercial Web stores either individually or collectively.

1.2 Purpose and organization of this thesis

Motivated by the lack of study on sound effects upon Web stores and promising applications of multimedia for electronic commerce, we conducted this research to examine individual and interacting effects of background music, pre-recorded human

voice and earcons i.e. non-music, non-voice audio message on B2C Web-based stores.

The organization of the thesis is summarized as follows with outline shown in figure 1.1.

Chapter 1 – Introduction to the background of this research together with explanation of purposes and organization of this thesis.

Chapter 2 – A review of the literature concerning past studies on sound effects and gender. The objectives were to explain foundation for hypotheses.

Chapter 3 – A review of the literature on modeling consumers in Web store environment. Based on the model used in this research, corresponding measurements were applied in experiments.

Chapter 4 – An introduction to the program of experiments, including a description of apparatus, Web stores implementation and measurements used in experiments.

Chapter 5 – Report of an experiment to investigate whether these sound effects have significant influence on consumers shopping upon Web stores.

Chapter 6 – Report of a think-aloud experiment to explore the possible reasons for the significant interactions between the effect of music and the type of Web stores (the gift and mobile phone) with male participants

Chapter 7 – A summary of major findings and contributions of this research together with recommendations for further study.

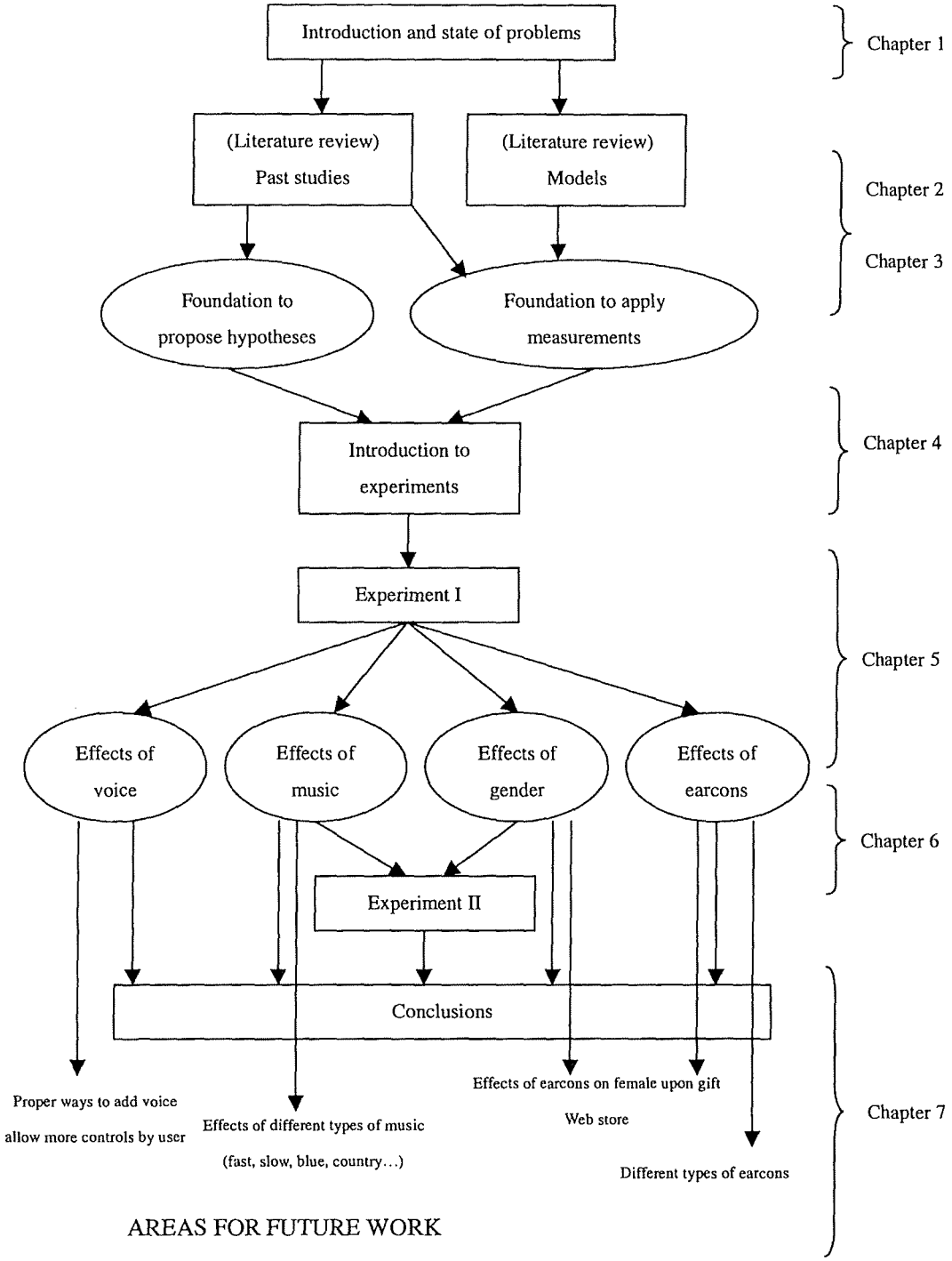

Figure 1.1 Outline of the thesis

Chapter 2

Past studies on sound effects and gender (literature review)

2.1 Introduction

This chapter reviews published literature concerning effects of music (section 2.2), human voice (section 2.3) and earcons, i.e. non-music, non-voice audio message, (section 2.4) on people's shopping experience and usage satisfaction. Section 2.5 also indicates different effects of sound upon both genders.

2.2 Effects of music

The effect of music has been studied in fields of cognitive sciences and marketing researches for many years. Bruner (1990) pointed out three primary dimensions of musical composition: a physical dimension (volume, pitch, tempo, rhythm), an emotional tone (sad, pleasant), and a preferential dimension (the degree to which a person likes the music).

Cognitive researchers, Hatta and Nakamura (1991), reported that listening to either classical such as piano pieces by Chopin and harp pieces by Liszt, or natural sound such as water murmuring, or popular music such as songs by the Beatles, Simon and Garfunkel, etc, can produce a significantly lower self-reported levels of mental stress than no music condition. Rauscher, Shaw, and Ky (1993) studied effects of classical music on the performance of spatial intelligence quotient (IQ) tasks. In their study,

thirty-six college students participated to all three conditions, which were listening to Mozart's sonota for two pianos in D major, K488, listening to a relaxation tape and silence. The student's spatial reasoning skills were tested using the Standord-Binet intelligence scale. They reported that listening to a 10-minute clip of Mozart's sonata for two pianos in D major, K488, appeared a significant increase in abstract/spatial reasoning tests score. However, the enhancing effect of the music condition was temporal and didn't extend beyond the 10-15 minutes period during which subjects were engaged in each spatial task. They also measured pulse rates before and after each condition. However, no significant effect was found. In 1997, Cockerton and his colleagues compared the performance of IQ tests between two groups of undergraduate students: one group in complete silence and the other with background music created using the software package Koan Plus and based on Japanese Buddhist philosophy which encouraged meditation in quest for understanding. The Koan music was described as possessing a harmonious quality, which may ease the listener into a state of relaxation. They reported that the group with background music performed significantly better (Cockerton et al., 1997).

In addition to above studies, marketing researchers have investigated the impact of music on consumers' emotion and shopping behavior (e.g., Alpert, 1988; Kellaris & Kent, 1991; Kellaris, 1992; Holbrook & Gardner, 1993). These studies show that music has a significant effect on consumers' emotion-related response such as pleasure and arousal; and also behavior-related responses such as shopping time and expenditure. Milliman (1982) indicated that in-store traffic flow of a supermarket was significantly slower with slow music (72 BPM (beats per minute) or less) than that with fast music (94 BPM or more). Significant influences of background music on shopping time were also reported in other studies (e.g., Baker et. al., 1992 and

Sherman et. al., 1997). Yalch and Spangenberg (1988) and Kellaris and Moses (1992) reported that perceived shopping time could also be affected by background music. A recent study by Yalch and Spangenberg (2000) shows listening unfamiliar background music could prolong shopping time and increase levels of arousal. They concluded that the prolong shopping time was not a direct effect of music but was due to the increases in arousal. Vanderark and Ely (1993) reported fast-tempo music could increase levels of physiological arousal as measured by subjects' galvanic skin responses and plasma cortisol levels. Besides the association between arousal and shopping time, effects of music on expenditure was also been examined. Milliman (1986) reported customers in a restaurant took more time to eat their meals than those in fast-music treatment. Likewise, there was a significantly longer waiting time for tables in slow-music treatment. Customer bar bills were found to be much greater in the slow-music condition. In another study, playing classical music instead of popular music from the top 40 UK chart in a wine cellar resulted in more consumption of expensive wine (Areni & Kim, 1993). Possible reasons include changes in spending patterns or changes in customers. The latter can also be interpreted as changes in shopping time with specific groups of customers. In the case reported in Areni and Kim (1993), it could be that customers who like expensive wine were encouraged to stay longer. In 2001, Wirtz and Mattila showed that background music could positively influence consumer emotion, approach behavior, perception of the store environment, and satisfaction with shopping experiences.

In summary, music is capable of evoking complex affective and behavioral responses in consumers and has significant effects on rated levels of arousal, satisfaction, shopping time as well as expenditure. Based on these past studies, a simple conceptual model on effects of background music is proposed and shown in figure

2.1. This model predicts that changes of behavior are results of changes of psychological status (Yalch & Spangenberg, 2000). Examples of possible changes of psychological status include arousal (Vanderark & Ely, 1993; Yalch & Spangenberg, 2000), perception of shopping time (Kellaris & Moses, 1992; Yalch & Spangenberg, 1988), and satisfaction (Wirtz & Mattila, 2001). Examples of possible changes of buying behavior include shopping time (Areni & Kim, 1993; Baker et al., 1992; Sherman et al., 1997; Yalch & Spangenberg, 2000), pace of shopping (Milliman, 1982), spending patterns (Areni & Kim, 1993; Milliman, 1986).

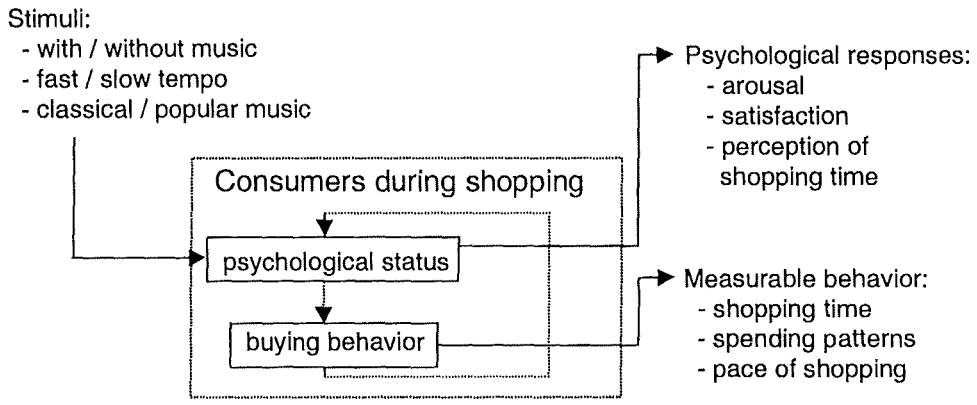

Figure 2.1 A simple conceptual model on the effects of background music

2.3 Effects of voice cues

There are few studies done on effects of human voice upon the Web. However, people seem to much prefer verbal communication instead of text input/output when they need access information on Web (Aberg & Shahmehri, 2000). This is understandable since verbal communication can release the load of visual processor of a human and more natural as well.

2.4 Effects of earcons

Earcons was defined as "non-verbal audio messages that are used in the computer/user interface to provide information to the user about some computer object, operation or interaction" (Brewster et al 1993). Here we extend this definition to all non-verbal and non-background music audio messages in human-computer interaction (HCI).

In 1989, Gaver developed an interface that uses auditory icons at Apple Computer Inc. called "SonicFinder" (Gaver 1989) He stated a number of reasons for using sound in Human-Computer-Interaction (HCI) as follows:

- Hearing is a largely untapped modality for people and sound production is a seldom-exploited resource of computers, i.e. it is an available resource.
- Many people rely on sound for information in their everyday lives. For example, they listen to the gurgle of pouring liquid to know if a container is almost full.
- Sound is the complementary information mode of vision, which can provide information that is either unavailable on a visual display or hard to discern visually, and thus extends the consistency of the model world with result of increment of user's feelings of direct engagement (Hutchins et al 1986). For example, mechanician listen to automobile engines, and doctors to heartbeats, both with the aim of getting information about mechanisms that are not visually accessible.

A typical sound effect on SonicFinder is that copying a file is indicated by the sound of pouring water; the frequency of the sound is continuously increased to indicate its process by analogy with the sound a container makes as it is being filled. The author concluded that these sounds increase feelings of direct engagement, provide flexibility in interacting with the model world of the computer, supply some additional or necessary information, and add significantly to the satisfaction of using the interface.

Besides, research has shown some other benefits for adding earcons in HCI. Brewster (1992) revealed psychological evidence to suggest that sharing information across different sensory modalities can actually improve task performance. In 1995, Rauterberg et al. did two experiments, operating an assembly line simulator through computers and defining queries in database search, to estimate the effects of sound feedback in HCI. The first experiment showed that additional sound feedback significantly improves user performance and positively increases some mood aspects. Although the second experiment failed to show significant effects of sound feedback on the improvement of user performance, they reported that significant improvement was still found if they differentiated between users, who preferred sound, and those, who did not. Accordingly they concluded sound feedback is necessary, but must be eligible.

2.5 Effects of gender

Traditional research of HCI indicates gender often plays a significant role in many aspects. As for sound effects, although there is not much work done specifically on gender issue, some work also shows it does have some influences. For instance,

Kellaris and Altsech (1992) did an experiment of music on time perception. Individuals listened to original music composed in a light popular style, lasting 180 seconds. Its loudness varied from being either loud or soft. Results displayed no differences in perceived duration for males but that females perceived the loud music as lasting much longer than the soft music.

2.6 Summary

Reported studies in this chapter present that the three sound effects of music, voice and earcons have significant effects on human beings. Music can influence consumers' emotional states, satisfaction, shopping time and expenditure in traditional retailing stores. Voice is preferred for communication on Web. Earcons affects users' performance and some mood aspects. These effects on different gender may not be same.

Further studies are needed to examine how these three sound effects influence consumers' shopping on Web stores.

Chapter 3

Modeling consumers in Web store environment (literature review)

3.1 Introduction

This chapter reviews models used by researchers to study people in Web environment. A model for human factors research in electronic commerce is described firstly. Then the Mehrabian-Russell model, which is used in experiments, is stated in detail. Section 3.5 further explains how to apply the modified Mehrabian-Russell model to our B2C Web store environment.

3.2 A systems model for human factors research in electronic commerce (EC)

With the growth of electronic commerce, related studies become popular too. Below is a model proposed by (Helander and Khalid 2000) for human factors research in EC.

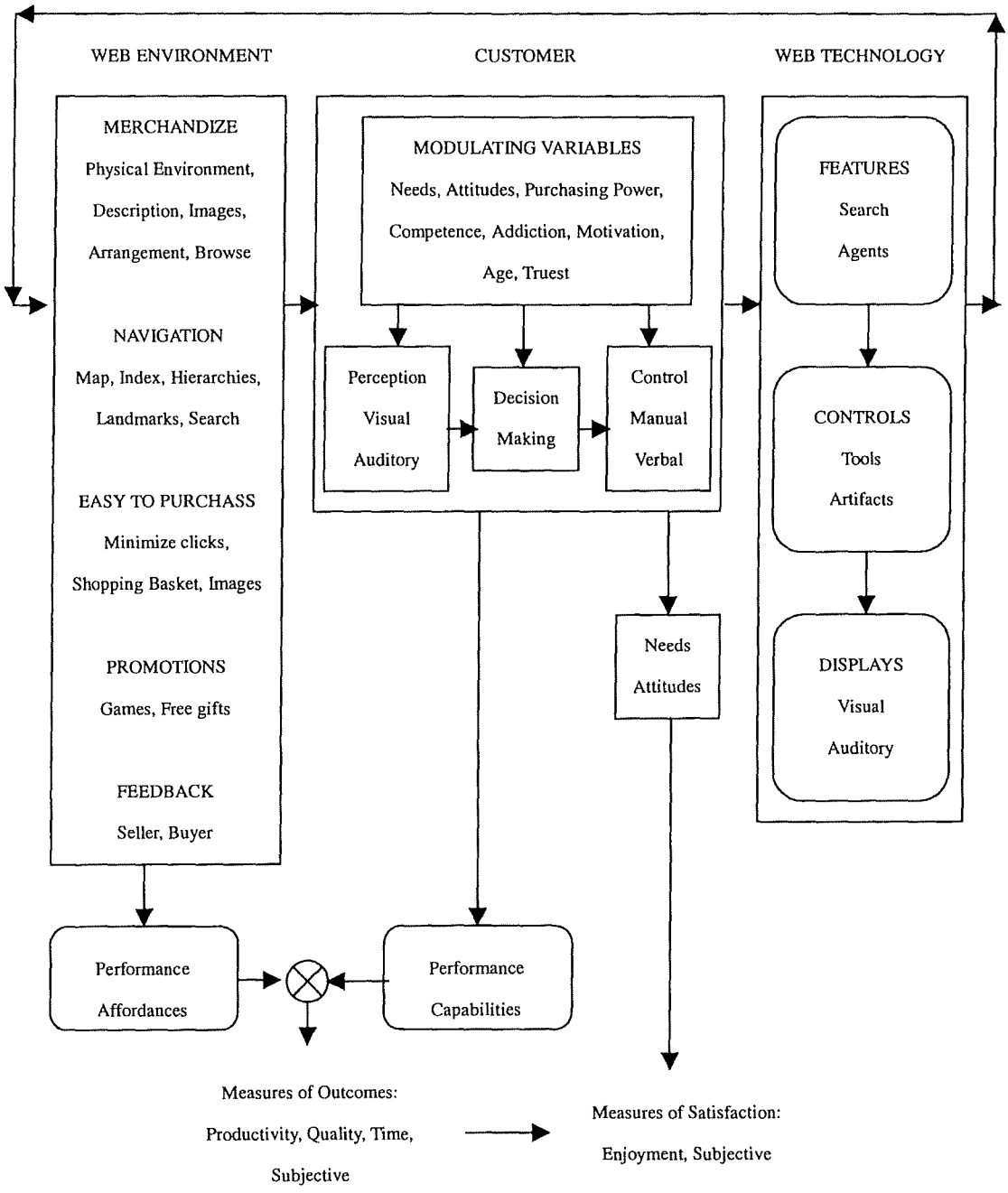

Figure 3.1 A systems model for human factor research in e-commerce (Helander & Khalid, 2000)

This model is used to conceptualize research and design issues in presenting a productive and useful store environment. It contains three subsystems: store environment, customer, and Web technology. The arrows in the figure show the

direction of information flow.

In this model, the customer is of central interest and consists of the three phases in human information processing: perception, decision-making and control (action). Customers' willingness to purchase is affected by the design of the store environment. Important design features include: product information, navigation facilities, ease of purchasing, promotions and feedback information. These design features constitute the so-called "affordance".

The remaining system, Web technology refers to technological features both in browsers and in the store environment.

In addition to this model, there are other models proposed by researchers to study EC or human-Web-interaction. However, most of them are too broad and more qualitative rather than quantitative, i.e. focusing on description instead of stating how to conduct measurements due to the novelty of EC, for our study.

Therefore, in this preliminary study of sound effects in Web store environment, we applied a general model, the Mehrabian-Russell model for studying human beings in Web environment instead of using specific models of EC. The benefits of this model are that it contains standard questionnaires and has been widely used by marketing researchers studying consumers for many years.

3.3 The Mehrabian-Russell model

3.3.1 Environmental psychology

Landscapers, architects, interior designers, and retailers have acknowledged manipulating environmental elements to achieve desired emotion and behavior on customers for a long time. The environmental elements can be roughly categorized as ambient cues (e.g., temperature, music), aesthetic-design cues (e.g., color, décor), functional-design cues (e.g., layout, signage) and social cues (e.g., customer-employee interactions) (Baker 1996).

Many psychologists have studied these environment-emotion-behavior relationships, which produced a new discipline known as "environmental psychology". In 1974, environmental psychologists, Mehrabian and Russell presented a valuable theoretical model for studying the effects of environmental atmosphere on human behavior by using a Stimulus-Organism-Response (S-O-R) paradigm.

An adequate S-O-R model requires: a stimulus taxonomy, a set of intervening or mediating variables, and a taxonomy of responses. Stimulus, intervening, and response variables should be conceptually clear, and operationally measurable. There should be a well-specified expression of the relationship between stimuli and responses via the intervening variables.

The Mehrabian-Russell model is particularly strong in the intervening variable and

response areas, but leaves the problem of an appropriate stimulus taxonomy largely untouched because of the environmental complexity in various conditions.

3.3.2 Response taxonomy

Mehrabian and Russell postulated that all responses to an environment could be considered as approach or avoidance behaviors (Mehrabian & Russell 1974). Approach-avoidance behaviors are considered to have four aspects:

1 A desire physically to stay in (approach) or to get out of (avoid) the environment.

2 A desire or willingness to look around and to explore the environment (approach) versus a tendency to avoid moving through or interacting with the environment or a tendency to remain inanimate in the environment (avoidance).

3 A desire or willingness to communicate with others in the environment (approach) as opposed to a tendency to avoid interacting with others or to ignore communication attempts from others (avoidance).

4 The degree of enhancement (approach) or hindrance (avoidance) of performance and satisfaction with task performance.

Donvan and Rossiter pointed that all these aspects can be quite appropriate for describing behaviors in a retail environment (Donovan & Rossiter, 1982). Physical approach and avoidance (1) can be related to store patronage intentions at a basic level. Exploratory approach and avoidance (2) can be related to in-store search and exposure to a broad or narrow range of retail offerings. Communication approach and avoidance (3) can be related to interaction with sales personnel and floor staff. Performance and satisfaction approach and avoidance (4) can be related to

repeat-shopping frequency as well as reinforcement of time and money expenditures in the store.

Since our study concerns business-to-consumer (B2C) Web shopping environment instead of a physical retailing store, the appropriateness can be described as the following.

Physical approach and avoidance (1) can also be related to store patronage intentions at a basic level, i.e. whether consumers prefer staying surfing on this web store, link away or close the window. Exploratory approach and avoidance (2) can be related to on-the-Web search and exposure to a broad or narrow range of Web shop offerings. Although most of present B2C Web sites don't have the on-line communication function that allows customers to communicate with sales assistants of Web stores or even one another, there is a growing approach to add Web helpers or sales assistants in B2C Web sites that help customers to choose products and make decisions. (Rosewitz 1998, Aberg & Shahmehri 1999, 2000, Miles & Howes 2000) Accordingly, communication approach and avoidance (3) can be related to interaction with Web sales assistants. However, since this study is merely a preliminary work on sound effects upon B2C Web stores, the two Web stores used in experiments don't have the function to allow customers to communicate. The last one, performance and satisfaction approach and avoidance (4) can be related to repeat-shopping frequency as well as reinforcement of time and money expenditures on the Web store as well.

3.3.3 Emotional states as intervening variables

Mehrabian and Russell proposed that three basic emotional states mediate approach-avoidance behaviors in environmental situations. These emotional responses, known by the acronym PAD, are:

Pleasure — Displeasure

Arousal — Nonarousal

Dominance — Submissiveness

Their model states that any environment will produce an emotional state on an individual that can be characterized in terms of the three PAD dimensions, which are factorially orthogonal. Pleasure-displeasure refers to the degree to which a person feels good, joyful, happy, or satisfied in the situation; arousal-nonarousal refers to the degree to which a person feels excited, stimulated, alert, or active in the situation; and dominance-submissiveness refers to the extend to which an individual feels in control of, or free to act, in the situation. (Donovan & Rossiter 1982)

The PAD dimensions are orthogonal. However, the Mehrabian-Russell model specifies a conditional interaction between pleasure and arousal in determining approach-avoidance. In a neutral (i.e., neither pleasing nor displeasing) environment, moderate arousal enhances approach behaviors, whereas very low or very high arousal leads to avoidance behaviors. In a pleasant environment, the higher the arousal, the greater the approach behavior. In an unpleasant environment, the higher the arousal, the greater the avoidance behavior. Thus, although the PAD dimensions are factorially orthogonal, pleasure and arousal are hypothesized to interact in this specified manner.

3.3.4 Summary of the Mehrabian-Russell model

Behaviors toward and within an environment can be classified as either approach or avoidance behaviors. Approach behaviors relate to willingness or desire to move towards, stay in, explore, interact supportively in, perform well in, and return to the environment. Avoidance behaviors relate to the opposites of the above: deteriorated performance and dissatisfaction; feelings of anxiety or boredom; unfriendliness to others; and a desire to leave the environment and not to return.

Such behaviors are a result of the emotional states, which an individual experiences within the environment. All emotional states, according to the Mehrabian-Russell model, can be represented by some combination of two major dimensions, pleasure and arousal, and to some extent, a third, dominance. Pleasure and arousal are hypothesized to interact in such a way that arousal amplifies approach behaviors in pleasant environments and avoidance behaviors in unpleasant environments.

An appropriate stimulus taxonomy of the physical features of the environment that arouse these emotions is not available in the M-R model.

Figure 3.2 summarizes the Mehrabian-Russell model. In general retail terms, the model predicts that persons will enjoy spending longer time and perhaps more money in those retail stores where they feel pleasure and a moderate to high degree of arousal.

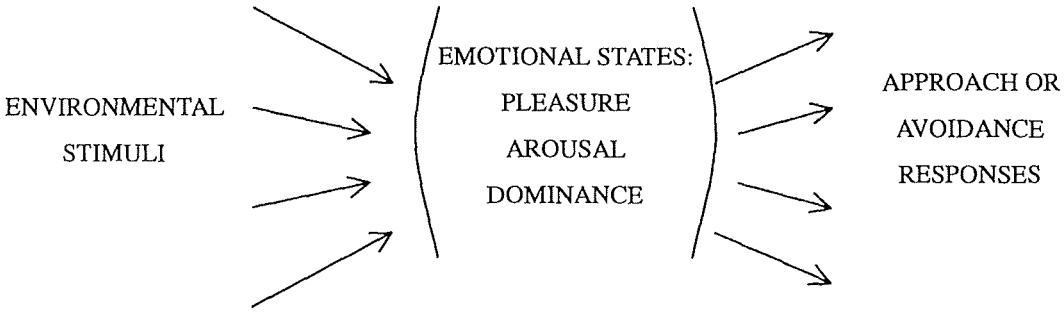

Figure 3.2 The Mehrabian-Russell model (adapted from Donovan & Rossiter 1982)

3.4 Modified Mehrabian-Russell model

Russell and Pratt (1980) proposed a modification of the Mehrabian-Russell theory that deletes the dominance dimension because evidence for this is more tenuous. In Russell's later work, he has argued that dominance requires a cognitive interpretation by the person and is therefore not purely applicable in situations calling for affective responses. Russell and Pratt (1980) found that the two orthogonal dimensions of pleasure and arousal (pleasant-unpleasant, arousing-sleepy) were adequate to represent people's emotional of affective responses to a wide range of environments. In our study, the modified M-R model is applied and shown in figure 3.3.

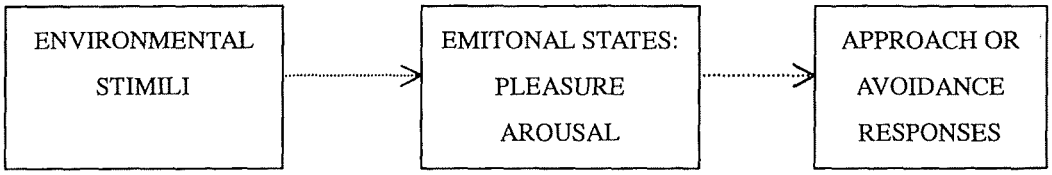

Figure3.3, Modified Mehrabian-Russell model (adapted from Donovan et al 1994)

3.5 Appling Modified Mehrabian-Russell model to B2C

Web store environment

As postulated by Mehrabian and Russell that all responses to any environment could be considered as approach or avoidance behaviors (Mehrabian & Russell 1974), in this preliminary research we applied the modified Mehrabian-Russell model to B2C Web store environment and illustrated it in figure 3.4.

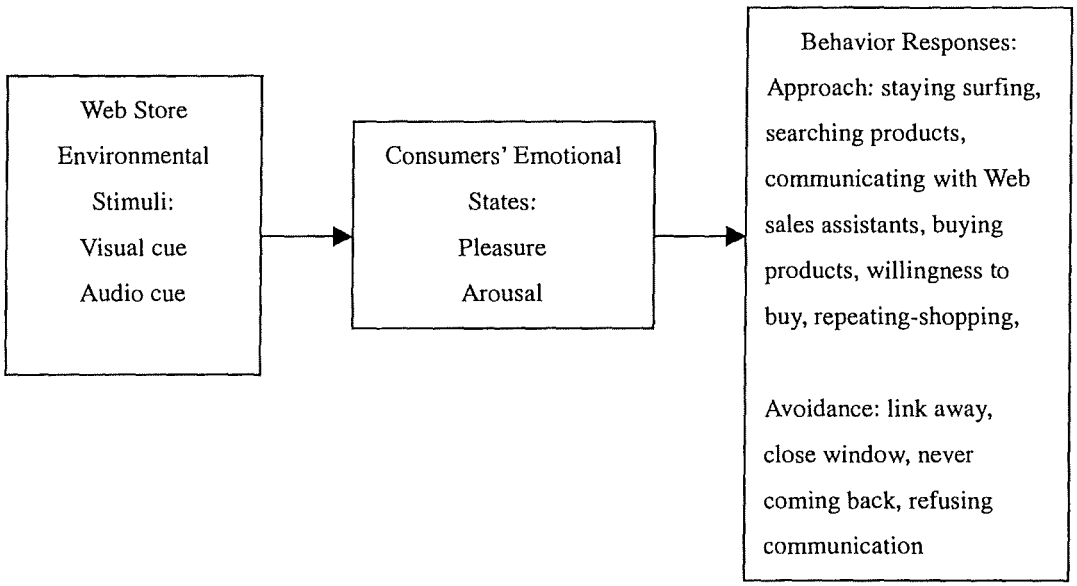

Figure 3.4 Appling the modified Mehrabian-Russell model to B2C Web store environment

3.6 Summary

Although there are some models specifically describing consumers in electronic commerce, most of them are more qualitative than quantitative, without providing standard measurements. Some of them are also too broad, which is not suitable to conducting a preliminary research on our topic. Accordingly, the Mehrabian-Russell

model is introduced in detail and we illustrated how to apply its modified version to our B2C Web store environment as well.

Chapter 4

Introduction to experiments

4.1 Introduction

The main purposes of this research are to investigate whether sound effects, background music, human voice together with earcons, and gender could show some significant influence on consumers' shopping upon B2C Web stores and how these effects interact with one another.

This chapter introduces the experimental programs that were conducted to achieve the above purposes.

4.2 Overview of experiments

Totally two experiments were conducted. The second one is a further study based on the results and analyses of the first one.

4.2.1 Experiment I

In this experiment, three sound effects i.e. music, voice together with earcons and gender were regarded as four factors. A full factorial design experiment, with 96 participants and 16 conditions, was conducted. Two B2C Web stores, a gift one and a mobile phone one were applied. Results show music and earcons generally have different significant effects upon these two B2C Web stores.

4.2.2 Experiment II

Results and analyses of the first experiment indicate that on the gift Web store music displays a significantly positive effect on males in terms of pleasure, evaluation and bipolar ratings of general feeling. Similar effects were not found on the mobile phone Web store.

In consequence, a second experiment was conducted to investigate possible reasons for this dissimilarity. Results show that participants mainly examined the appearance of products on the gift Web store and price and function of products on the mobile phone Web store ($p<0.001$) and spent significantly more percentage of time in examining the functions of products on the mobile phone Web store than on the gift Web store ($p<0.001$).

4.3 Design and development of two Web stores

Two B2C Web stores were implemented by the author for this study. One sells gifts and the other sells mobile phones.

The gift Web store was built based on seven commercial gift Web sites while the mobile phone Web store was built based on nine commercial mobile phone Web sites. Both of these two stores are in traditional Chinese. The screen shots of these two Web stores' first index page are shown in figure 4.1 and 4.2. Screen shots of other pages are listed in appendix A4.1

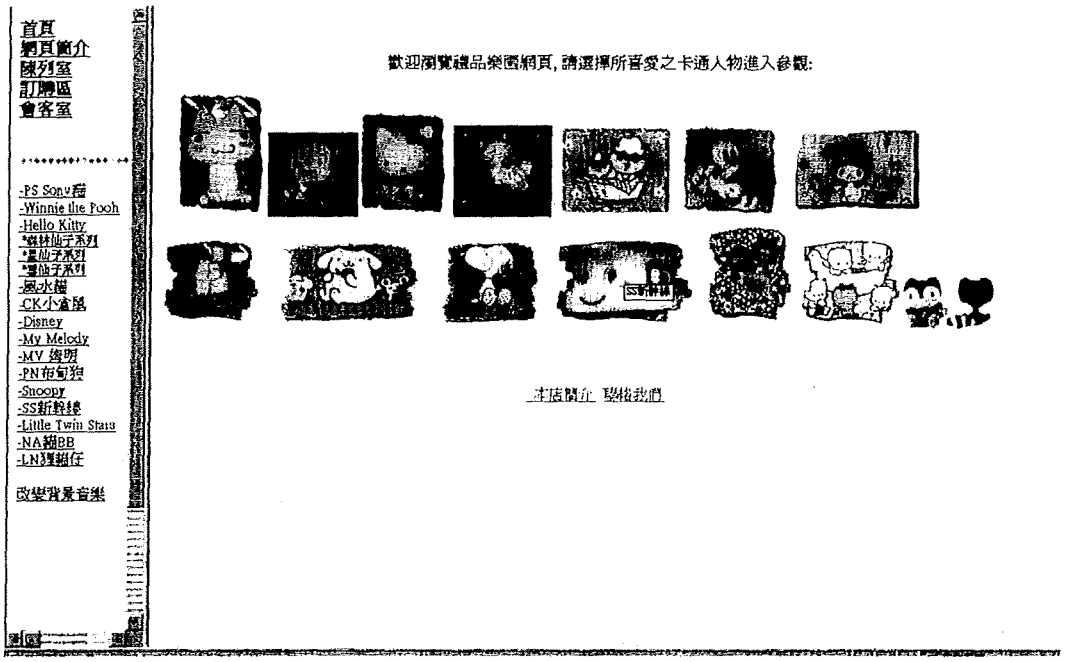

Figure 4.1, Screen shot of gift Web store's index page

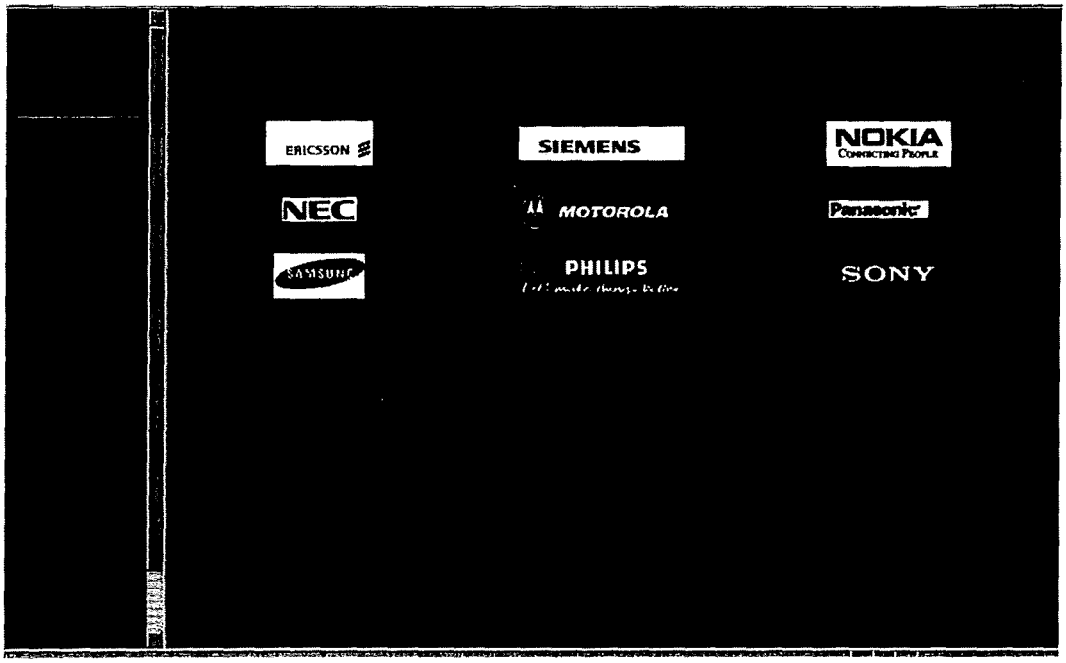

Figure 4.2, Screen shot of Mobile phone Web store's index page

The reasons to choose these particular two types of Web stores are mainly because

- The Customer-Decision-Making-Process (CDMP) on these two Web stores is

different. Customers make decisions more seriously for buying mobile phones than gifts due to high expenditure of the former. In our two Web stores, the price mainly ranges from hk$10 to hk$ 200 for gifts and hk$1,000 to hk$4,000 for mobile phones.

- The thinking effort needed for customers' shopping on these two Web stores is different. Thinking effort here simply refers to the effort of thinking for customers to shop. The mobile phone Web store contains much text information. Customers need spend more mental effort to read information to compare products in detail. Moreover, the high expenditure of mobile phones makes customers shop more seriously, which increases their thinking effort as well.

Although there are other types of products with large difference on expenditure and thinking effort needed for customers' shopping, we finally choose gifts and mobile phones since our prospective participants, university students, are familiar to these two types of products.

The gift Web store has seventeen categories with 532 products and the mobile phone store has nine categories with 76 products.

4.4 Apparatuses and measurements

4.4.1 Equipment

The following apparatuses were used in our two experiments.

Computer: Pentium III 866 MHz, Creative SB Live! Value sound card, Sony

CPD-E220 monitor, NVIDIA RIVA TNT2 Model 64 video card, LEMEL speaker;

Heart rate monitor: OXYPLETH Pulse Oximeter Model 520A

Video Camera: JVC Compact VHS Videomovie Camcorder (two sets)

TV set: SHARP 14" with 4-HEAD VHS video recorder (two sets)

4.4.2 Measurements

The measurements we applied are pre-questionnaire, emotional state questionnaire including pleasure questionnaire and arousal questionnaire, behavior response questionnaire, overall evaluation questionnaire, satisfaction questionnaire, heart rate elevation, measured shopping time, individual time perception error, bipolar ratings of general feeling and open questions. All these measurements are stated below.

Pre-questionnaire: A pre-questionnaire adapted from Sears et al 2000, Fang and Salvendy 1999 and Park and Kim 2000 was used to gather some basic information of subjects' computer, Internet and electronic commerce experience.

Emotional and behavior responses: Mehrabian and Russell's (1974) twelve-item semantic differential scale was used to measure emotional responses (pleasure and arousal) to environment. A seven-item seven-point Likert-type scale, adapted from Donovan and Rossiter 1982, was used to assess the behavioral responses to the Web store environment. Some words have been modified in order to suit for B2C Web-retailing stores instead of physical ones.

Overall evaluation and satisfaction: a seven-item scale was used to obtain respondent's evaluation of the Web store environment (adapted from Wirtz & Mattila

2001), and three seven-point Likert scale items taken from Westbrook & Oliver 1981 were used to measure the overall satisfaction with the shopping experience.

Heart rate elevation is the average heart rate during the experiment minus the lowest heart rate in 5-minute relaxation. Heart rate is measured by OXYPLETH Pulse Oximeter Model 520A continuously.

Measured shopping time is counted from the time subjects came to the first index page of a Web store to the time they clicked the submission button of the buying form.

Individual time perception error means individual time perception minus their measured shopping time. Individual time perception is the subjects' personal estimation of their shopping time.

We suspect that some feelings like the feeling of novelty may change with time. Accordingly, we intend to find a way to ask the subjects to indicate their degrees of positive or negative feelings, named by bipolar ratings of general feeling (BR), by replying an ICQ message sent by the experimenter from another computer in another booth during the experiment. The scale is from negative 5 to positive 5. The larger the absolute value, the higher degree that feeling is (shown as figure 4.3).

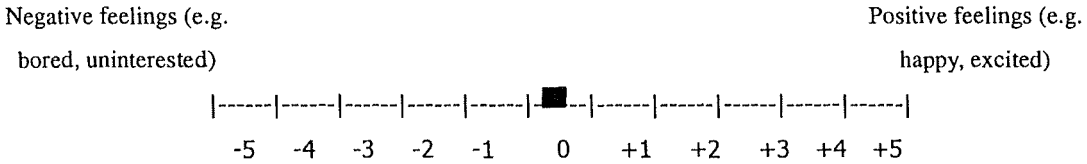

Figure 4.3, Bipolar ratings of general feeling indicator

Subjects were asked to state their BRs at time of 1min, 5min, 10min, 15min, and 20min (marked as BR1, BR5, BR10, BR15 and BR20) since their surfing started.
The open questions were asked and answered in Cantonese by experimenter and subjects verbally.

Questionnaires used are listed in appendix A4.2.

4.5 Summary

A brief introduction to two experiments is stated in this chapter. The design and implementation of two Web stores, apparatuses and measurements we used are explained in detail. In next chapter, we will present the first experiment with more detailed content.

Chapter 5

Experiment I

5.1 Introduction

This chapter states the first experiment conducted to study sound effects upon consumers' shopping on Web stores. A full factorial design was applied in order to attain the whole picture of all potential effects.

5.2 Method

5.2.1 Objectives and hypotheses

The first experiment is aiming to investigate whether sound effects including music, voice together with earcons and gender show some significant influence on consumers' shopping upon two B2C Web stores and how these effects interact with one another.

For these purposes and with the literature review of past studies on sound effects in chapter 2, we proposed the following hypotheses.

Hypothesis 1: The shopping time in the presence of background music will be significantly different to that in the absence of background music.

Hypothesis 2: Background music will significantly affect the accuracy of time

perception.

Hypothesis 3: The effects of sound on females' a) shopping time, b) time perception error, and scores of c) pleasure, d) arousal, e) behavior, f) evaluation, g) satisfaction questionnaires will be significantly different to these on males.

Hypothesis 4: The presence of background music will significantly affect the scores of a) pleasure, b) arousal, c) behavior, d) evaluation and e) satisfaction questionnaires.

Hypothesis 5: The presence of earcons will significantly affect the scores of a) pleasure, b) arousal, c) behavior, d) evaluation and e) satisfaction questionnaires.

Hypothesis 6: The presence of human voice will significantly affect the scores of a) pleasure, b) arousal, c) behavior, d) evaluation and e) satisfaction questionnaires.

These hypotheses are based on the review of the similar work mentioned before. I.e. the background music has significant influence on shopping time, time perception, consumer emotions and shopping behavior in retailing stores (Milliman 1982, 1986, Baker et al 1992, Sherman et al 1997, Yalch & Spangenberg 1988,2000, Kellaris & Moses 1992, Areni & Kim 1993, Vanderark & Ely 1993, Wirtz & Mattila 2001); different genders' subjective reports of effects are different (Kellaris & Altsech 1992). Earcons induces positive feelings and satisfaction (Gaver 1989, Brewster 1992, Brewster et al 1993). Although less research has been done on the effects of human voice on Web, human voice is quite emotional. Accordingly we also believe it may have effect on consumers' emotion and shopping behavior.

Besides those hypotheses, we would also like to investigate some other interesting issues.

Since, to our knowledge, few studies have been down on the effects of three types of sounds, background music, voice and earcons together, we would also like to see whether these sounds interact with one another, and If so, how.

In the experiment, we have two different Web stores. We would like to see whether those effects on the two different Web stores are same or different, and why.

5.2.2 Participants

Ninety-six students of the Hong Kong University of Science and Technology (HKUST), with forty-eight males and females, took part in the experiment. The participants were all local Hong Kong people and Cantonese native speakers. All participants were familiar with using computers and surfing Webs and none of them had any neurological problems in hearing and suffers any maladaptation problems either psychologically or physically.

5.2.3 Apparatuses and Web stores

The apparatuses used in this experiment are stated in section 4.4.1. The implemented gift and the mobile phone Web stores are used. Each store has eight editions: no sound, with music only, with voice only, with earcons only, with music and voice, with music and earcons, with voice and earcons, with music, voice and earcons.

5.2.4 Independent variables

The independent variables and their two levels are listed below:
Gender (female, male), background music (without, with), human voice (without, with), and earcons (without, with).

The human voice is pre-recorded in female Cantonese.

Five kinds of earcons were added on the Web stores, which respond to the mouse over a picture, clicking a picture, the mouse over a link, clicking a link and page change.

Ten clips of music, with five slow tempo (75 BPM or less) and five fast tempo (102 BPM or more) ones, were chosen for background music. The music are from the "Today's Easy Listening Favourites" music collection issued by Readers Digest in early 2001.

5.2.5 Dependent variables

Dependent variables are stated as measurements in section 4.4.2.

5.2.6 Task

The task was mainly to buy products on Web stores. Participants were asked to buy one or two gifts with the budget of hk$200 either for themselves or their friends on

the gift Web store and one or two mobile phones with the budget of hk$3,500 for themselves on the mobile phone Web store.

Participants were asked to surf at least ten minutes to make purchase decision. This was to exclude some participants who had no interests in the experiment itself and only wanted to get payment by participating.

5.2.7 Experimental design

The statistical design for the experiment was four factors with two levels full factorial between subjects design.

Totally there are 16 conditions (8 editions of Web stores times 2 genders). In each condition, participants shopped on both two Web stores. Accordingly, in each condition Web stores are within subject design variables.

5.2.8 Procedure

When participants came, they were firstly asked to take several minutes to relax. Meantime, the experimenter explained the procedures of experiments and subjects were asked to fulfill a consent form to confirm their willingness for participating in experiments and their rights as well as responsibilities.

The pre-questionnaire was then asked.

Then they were put into two Web stores in turn. The order of two Web stores was

randomized. A brief guide on surfing the two Web stores was taught in advance.

After participants finished surfing the first store and made buying decision, i.e. submitting buying form, questionnaires were asked specifically for that Web store. Then they took two minutes relax before going to the second Web store. After they finished shopping on the second store, same questionnaires were applied again for the second Web store. At the end, participants were asked to take 5-minute rest.

The heart rate was measured continuously and bipolar ratings of general feeling were answered by ICQ messages during experiments.

5.3 Results

Normality test showed that responses of arousal, behavior questionnaire score and time perception error for the gift Web store and pleasure, arousal, behavior, evaluation questionnaire score, time perception error and heart rate elevation for the mobile phone Web store, were normal ($p>0.05$) and corresponding ANOVA analyses were applied to them. For non-normal data, some data transformations were firstly applied to them. Results showed that the transformed data were still non-normal ($p<0.05$). Correspondingly, we applied both nonparametric tests and ANOVA analyses to these responses (See in appendix A5.2)

The main reason for us to still apply ANOVA analyses to non-normal responses was that ANOVA analyses could show us the interactions among factors, which may be good references for our analyses. From data, we can see all the significant main

effects indicated by non-parametric tests were also reported significantly by corresponding ANOVA analyses. In this study, for non-normal data, we mainly discussed the effects that were proven to be significant by both non-parametric tests and ANOVA analyses.

As we stated before, this research was merely a preliminary study. The main objective was to investigate the most significant effects instead of all details. Consequently, in this thesis all factor interactions analyses were up to two-way.

5.3.1 Analyses of pre-exposure measurement

An 8-item questionnaire as listed in appendix A4.2.2.1 was used to gather basic information about subjects' computer, Internet and EC experience.

Normality test shows subjects normally distributed in the 16 conditions. ($P>0.05$)

In appendix A5.4, we listed the mean values for each question of the pre-questionnaire in all 16 conditions. Each mean value was the mean of 6 participants' scores for that question. This was mainly to see whether there was a bias among our participants in those aspects tested in the pre-questionnaire. Form the table, we can see no obvious bias among our participants. This may be because our participants were from a specific group, local Hong Kong Chinese HKUST students, and they were randomized into all 16 conditions.

5.3.2 Analyses of post-exposure measurements

5.3.2.1 Pleasure questionnaire (PQ)

Test of reliability

Cronbach's Alpha test was applied for all post-exposure questionnaires. (See in appendix A5.1) Results showed that the reliability coefficient (alpha value) of pleasure questionnaire for the gift Web store is 0.8951 and 0.8954 for mobile phone one.

Analyses of main effects and their interactions

For the gift Web store:

Nonparametric test, Mann-Whitney U test was applied for pleasure questionnaire score on the gift Web store with results shown in table 5.1. –Median standed for the median calculated at low level of one factor while +median meant the median calculated at high level of the factor. This notation was same in following sections.

Table5.1 Main effects of pleasure questionnaire score on gift Web store
(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	13.5	10	0.002
Music	11	12	0.002

Voice	11	11	0.092
Earcons	11	11	0.384

Figures below showed two-way interactions. The significant level (p value) was calculated by Mann-Whiney U test and marked between the pair compared. Only those figures that contained significant p value ($p<0.05$) were reported here. The mean values were marked in the parentheses.

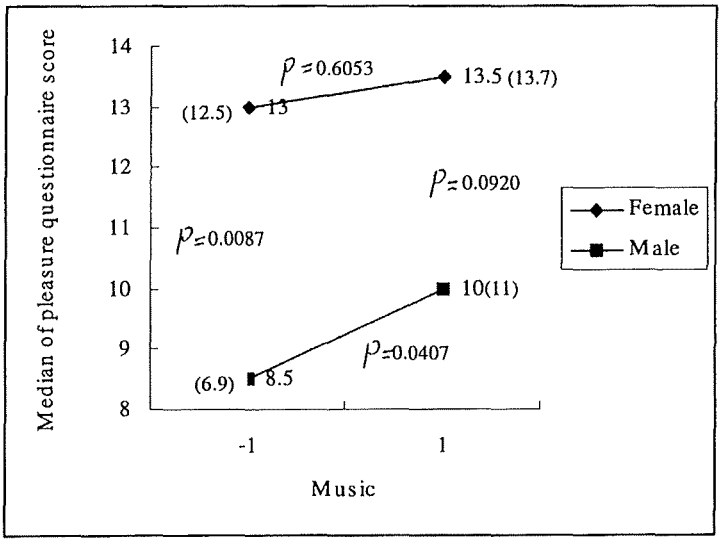

Figure 5.1 Two-way interactions between effects of gender and effects of music for pleasure questionnaire score on gift Web store

(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)

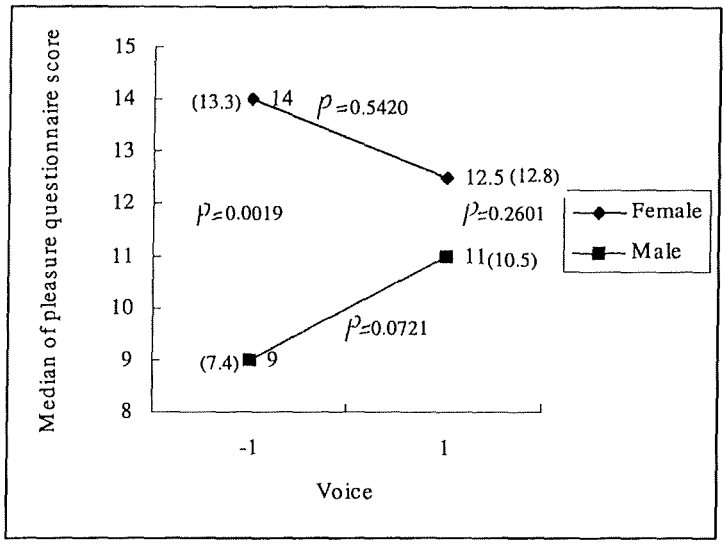

Figure 5.2 Two-way interactions between effects of gender and effects of voice for pleasure questionnaire score on gift Web store

(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)

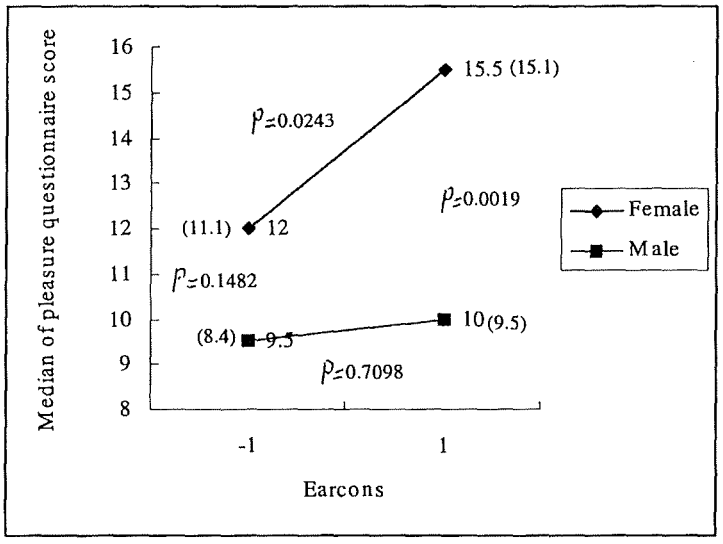

Figure 5.3 Two-way interactions between effects of gender and effects of earcons for pleasure questionnaire score on gift Web store

(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)

Results showed in the absence of music or the absence of voice, female scores are significantly higher than male ($p<0.001$). Music had significantly more positive effect on male scores ($p<0.05$) while earcons on female scores ($p<0.05$). In the presence of earcons, female scores were significantly higher than male scores ($p<0.001$).

For the mobile phone Web store:

The pleasure questionnaire score on the mobile phone Web store was normal and its ANOVA table was listed in appendix A5.4. No significant main effects were found. For the interactions, only the one between music and earcons appeared significant ($p<0.05$). Detailed analyses by Mann-Whitney U test showed that in the presence of music condition, earcons had significantly more positive effect ($p<0.01$), while in the absence of earcons, music had significantly lower negative effect ($p<0.01$).

5.3.2.2 Arousal questionnaire (AQ)

Test of reliability

The alpha was 0.6189 for the gift web store and 0.6449 for mobile phone one. However, if we deleted the first item, which was relaxed — stimulated, the reliability coefficient will increase to 0.7347 and 0.7482 individually.

In our later analyses on arousal in this chapter, we deleted the item No.1 in the arousal questionnaire in order to increase the reliability coefficient above 0.7 since Nunnaly (1978) had indicated 0.7 to be an acceptable reliability coefficient.

Analyses of main effects and their interactions

For the gift Web store:

ANOVA table was listed in A5.4. Females reported significantly higher arousal score than male ($p<0.01$).

For the mobile phone Web store:

ANOVA table was listed in A5.4. Results showed music significantly lowered participants' arousal score ($p<0.05$). However, music interacted with voice ($p<0.05$) and detailed analyses showed that in the absence of voice, music lowered participants arousal score significantly ($p<0.01$).

5.3.2.3 Behavior questionnaire

Test of reliability

The alpha was 0.7985 for the gift Web store and 0.7557 for the mobile phone one.

Analyses of main effects and their interactions

For the gift Web store:

ANOVA table was listed in A5.4. Females reported significantly higher behavior score than male ($p<0.05$).

For the mobile phone Web store:

ANOVA table was listed in A5.4. Earcons showed significantly positive effect ($p<0.05$).

5.3.2.4 Evaluation questionnaire

Test of reliability

The alpha was 0.9414 for the gift Web store and 0.9265 for the mobile phone one.

Analyses of main effects and their interactions

For the gift Web store:

Table 5.2 Main effects of evaluation questionnaire score on gift Web store (–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	13	10	0.048
Music	9.5	13	0.048
Voice	11.5	12.5	0.059
Earcons	9.5	13	0.284

Table 5.2 showed the main effects of gender and music was significant. Two-way interaction analyses were listed below in figures.

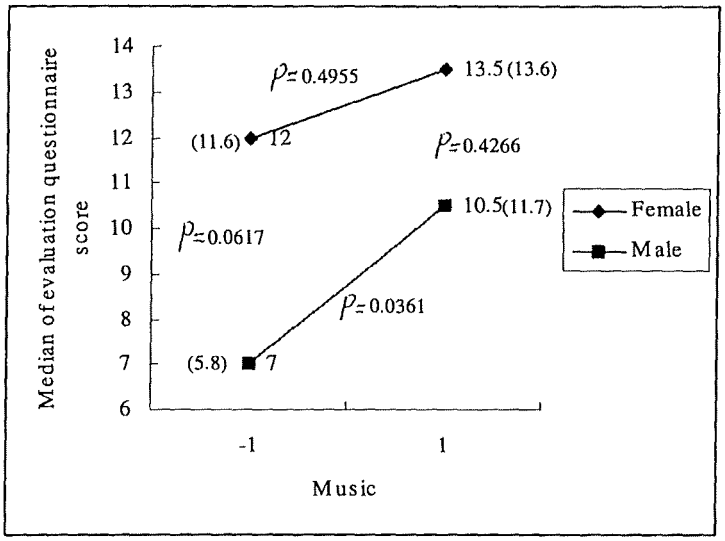

Figure 5.4 Two-way interactions between effects of gender and effects of music for evaluation questionnaire score on gift Web store

(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)

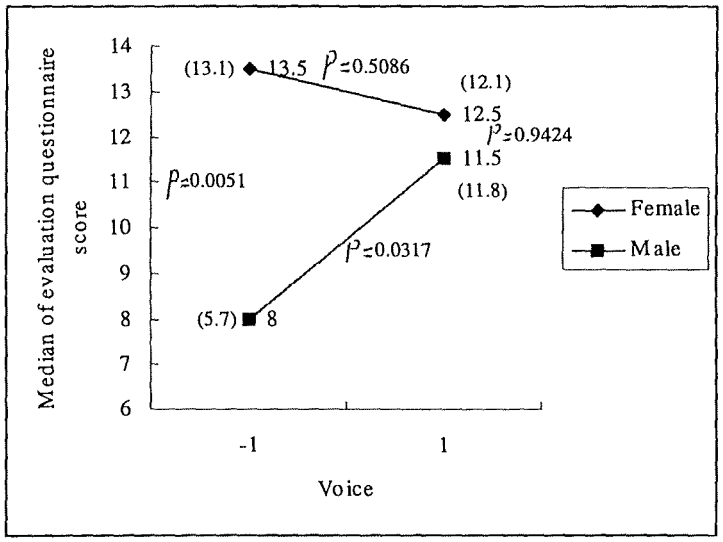

Figure 5.5 Two-way interactions between effects of gender and effects of voice for

evaluation questionnaire score on gift Web store

(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)

Results showed in the absence of voice, female scores were significantly higher than males' ($p<0.01$). Music and voice had significantly positive effect on males' scores ($p<0.05$).

For the mobile phone Web store:

ANOVA table was listed in A5.4. Earcons was reported with significantly positive effect ($p<0.05$). Results also showed music interacted with voice ($p<0.05$) but Mann-Whitney test didn't detect any significance.

5.3.2.5 Satisfaction questionnaire (SQ)

Test of reliability

The alpha was 0.9330 for the gift Web store and 0.9141 for mobile phone one.

Analyses of main effects and their interactions

For the gift Web store:

Main effects table was in A5.4. No significant effects were found.

For the mobile phone Web store:

Main effects table was in A5.4. No significant effects were found.

5.3.2.6 Open questionnaire (OQ)

Below were some findings obtained from open questions and observations during experiment.

1, Subjects had different expectation for the two different Web stores. For the gift Web store, they highlighted whether it was interesting, attractive, containing nice pictures and cute products. For the mobile phone Web store, although they also valued the attributes above mentioned, they stressed more whether the store contained detailed information, professional opinions and function to easy compare products.

2, Subjects reported different thinking effort on two Web stores. They claimed they put more thinking effort for shopping upon the mobile phone Web store since they need read much information and compare products' function and price in detail.

3, Subjects had a desire to control the sound they heard on Web stores. For example, they would like to hear the voice introduction only when they clicked on some button; they would like to change, play or stop music whenever they wanted to.

4, Subjects expected product related sound such as phone rings for the mobile phone

Web store, music for music box, cartoon music or cartoon voice for the gift Web store.

5, Subjects preferred Chinese and Cantonese environment to English one.

5.3.2.7 Bipolar ratings of general feeling measured at regular intervals (BR)

We introduced the measurement of BR because we doubted some feelings like the feeling of novelty may change versus time. Accordingly, Kruskal-Wallis test was applied to BRs versus time on two Web stores. No significant results were found ($p>0.1$).

The Kruskal-Wallis test results were shown in appendix A5.5.

For the gift Web store:

Effects tables were listed in appendix A5.4. Results showed that gender and music had significant main effects for BR at all 5 time points measured.

Their two-way interaction plots were listed in A5.3. Plots showed that music had significantly positive effect on males for BR1, BR5, BR10 ($p<0.05$) and earcons had significantly positive effect on females for BR1, BR5, BR10, BR15 and BR20 ($p<0.05$). In the absence of music, or the presence of earcons, females reported significant higher BR1, BR2, BR10, BR15 and BR20 ($p<0.05$).

However, since not all participants shopped longer than 20 minutes, the data for BRs

were not balanced. The numbers of participants, named N, for each BR were 96, 94, 72, 42 and 25.

For the mobile phone Web store:

Effects tables were listed in appendix A5.4. No significant effects were found. The numbers of participants, named N, for each BR were 96, 93, 70, 45 and 26.

5.3.2.8 Heart rate elevation (HR)

For the gift Web store:

Main effects were listed in table 5.3. Results showed music lowered participants' hear rate elevation significantly ($p<0.05$).

Table 5.3 Main effects of heart rate elevation on gift Web store

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	6.5	7	0.8624
Music	8	6	0.0480
Voice	6	7	0.2637
Earcons	6	7	0.1818

For the mobile phone Web store:

ANOVA table was in A5.4. No significant effects were found.

5.3.2.9 Measured shopping time (MT)

For the gift Web store:

Effects table was listed in Appendix A5.4. No significant effects were found.

For the mobile phone Web store:

Effects table was listed in Appendix A5.4. No significant effects were found.

5.3.2.10 Time perception error (TE)

For the gift Web store:

Effects table was listed in Appendix A5.4. Results showed earcons lowered participants' time perception error significantly. ($P<0.05$)

For the mobile phone Web store:

Effects table was listed in Appendix A5.4. No significant effects were found.

5.4 Discussion

Significant findings about effects of music, voice, earcons and gender were

summarized as flows with possible reasons stated.

5.4.1 Effects of music

Music showed different effects on our two B2C Web stores.

On the gift Web store, music showed significantly more positive effects on male participants in terms of rated pleasure scores ($p<0.05$) and rated evaluation scores ($p<0.05$) as well as bipolar ratings on emotional feeling towards the shopping experience ($p<0.05$ for ratings taken at 1, 5, 10 minutes into the shopping). The significant effects of music only on the males may be due to music has more strong influence on males in essence. However, more types of music should be investigated to test that.

In the absence of music, male participants on the gift Web store reported significantly lower scores of pleasure ($p<0.01$) and bipolar ratings of positive emotional feelings ($p<0.05$) than female participants. Most of products on the real commercial gift Web stores we found were kind of feminine such as dolls and mobile phone chains. Since our gift Web stores were implemented based on these real Web sites, products on our gift Web store were sort of feminine too. Accordingly, females might be more interested in shopping on the gift Web store and reported higher rated emotional feelings than males. However the presence of sounds may have different influence on females and males. That may explain why only in the absence of music, females' reported scores were significantly higher than males. We also noticed that females' reported emotional scores were generally higher than those of males in each condition, though most of the gaps were not significant ($p>0.05$).

Music significantly lowered both male and female participants' heart rate elevation when shopping at the gift Web store ($p<0.05$). This may be due to most of participants chose slow- tempo music as stated later.

On the mobile phone Web store, music significantly lowered the arousal scores ($p<0.05$) and showed significant interactions with the effects of voice ($p<0.05$). This may be also due to most of participants chose slow- tempo music on the mobile phone Web store too.

Totally there were 16 conditions with half in the presence of music. Participants' choices of music had been recorded and shown in table 5.4. On each Web store, about 90% of participants stuck to their choices of music throughout their shopping.

Table 5.4 Number of participants versus their choices of music on the two Web stores.

(-G: female, +G: male, +M: presence of music, -V: absence of voice, +V: presence of voice, -E: absence of earcons, +E: presence of earcons, Slow: slow-tempo music, Mixed: change from slow to fast or fast to slow-tempo music, Fast: fast-tempo music)

Conditions	Gift Web store			Mobile phone Web store		
	Slow	Mixed	Fast	Slow	Mixed	Fast
-G+M-V-E	3	1	2	4	1	1
-G+M-V+E	4	0	2	4	0	2
-G+M+V-E	5	0	1	5	0	1
-G+M+V+E	4	0	2	4	0	2
+G+M-V-E	4	1	1	4	0	2

+G+M-V+E	5	1	0	4	2	0
+G+M+V-E	5	0	1	4	0	2
+G+M+V+E	5	0	1	4	1	1

Regarding hypotheses, we could see the hypothesis 1, the shopping time in the presence of background music will be different to that in the absence of background music, and hypothesis 2, background music will affect the accuracy of time perception, were not indicated by our results. This may be because that previous results were based on experiments done in physical retailing stores and participants were not able to choose and change the music in those environments, while our one was conducted on Web stores and participants can choose and change music whenever they wanted.

The hypothesis 4, the presence of background music will significantly affect the scores of a) pleasure, b) arousal, c) behavior, d) evaluation and e) satisfaction questionnaires, was partially proved. Results did show some significant effects on pleasure, arousal, and evaluation questionnaire scores but not on behavior and satisfaction questionnaire scores. Potential reasons for this may be related to essence of questionnaires, such as design of the questionnaires and essence of music such as types of music.

5.4.2 Effects of voice

Voice didn't show any significant main effects on two Web stores. Correspondingly, there was no strong evidence for the hypothesis 6, the presence of human voice will significantly affect the scores of a) pleasure, b) arousal, c) behavior, d) evaluation

and e) satisfaction questionnaires.

The lack of significant effects of voice may be due to the way voice added. From open questions, we found participants had a strong desire to control the sound especially voice they heard. They wanted to hear the voice introduction of a product only if they chose to play this sound. They also wanted the voice to be interactive i.e. they could ask questions and get verbal answers like the way they communicated with salesmen in real retail store.

5.4.3 Effects of earcons

Like music, earcons demonstrated different effects on two Web stores.

On the gift Web store, earcons had significantly positive effects on female participants in terms of pleasure scores ($p<0.05$) and bipolar ratings of emotional feelings take at 1, 5, 10, 15 and 20 minute into the shopping experience ($p<0.05$). The significant effects of earcons only on the females may be due to earcons has more strong influence on females in essence. However, more types and usages of earcons should be studied further.

In the presence of earcons, female participants shopping on the gift Web store reported significantly higher score of pleasure ($p<0.01$) and bipolar ratings of positive emotional feelings taken at 1, 5, 10, 15 and 20 minute into the shopping experience ($p<0.05$) than male participants. This may be also due to the essential effects of earcons as stated before.

Earcons also lowered participants' time perception error significantly ($p<0.05$, the time perception error = perceived shopping time – measured shopping time.) As stated in the literature review, computer scientists found earcons could improve participants' performance. That may include the accuracy of their perceived time.

In the presence of earcons, both behavior scores and evaluation scores reported by participants shopping on the mobile phone store significantly increased ($p<0.05$). The mobile phone Web store was kind of neutral unlike the femininity of the gift Web store. That may be why the positive effects of earcons could be found on both genders.

Accordingly, we could see the hypothesis 5, the presence of earcons will significantly affect the scores of a) pleasure, b) arousal, c) behavior, d) evaluation and e) satisfaction questionnaires, was partially proved. Results did show some significant effects on these questionnaire scores except satisfaction questionnaire scores. Potential reasons for this may be related to essence of questionnaires such as design of questionnaires and essence of earcons, such as types and usages of earcons.

5.4.4 Effects of gender

Gender only showed significant effect on the gift Web store in this experiment. This may be due to the femininity of the gift Web store.

In addition to the different effects of music and earcons on males and females stated in section 5.4.1 and 5.4.3, females also reported significantly higher arousal scores ($p<0.01$) and behavior scores ($p<0.05$) than males on the gift Web store.

Therefore, our hypothesis 3, which stated that the effects of sound on females' a) shopping time, b) time perception error, and scores of c) pleasure, d) arousal, e) behavior, f) evaluation, g) satisfaction questionnaires will be significantly different to these on males, was partially proved. That was evidence was found only for hypothesis 3c, 3d, 3e and 3f but not for the rest. Results did show that on the gift Web store, music and earcons showed significantly different effects on males' and females' reported pleasure and evaluation questionnaire scores. Possible reasons for these phenomenon may be related to the essence of sound such as types and usages of music, voice and earcons, the nature of Web stores such as different types of Web stores and the nature of gender itself.

5.4.5 Factor analysis

In this experiment, totally there were 29 questions from pleasure, arousal, evaluation and satisfaction questionnaires. Based on the data obtained from this experiment, we could apply factor analysis for removing data redundancy. This was aiming to provide people an alternative for later study on similar topic. Researchers could use the original questionnaire or choose the abbreviated one we offered based on their purposes.

Because one question from arousal questionnaire had been deleted to improve its questionnaire reliability above 0.7 in our analysis, the factor analysis focused on the resting 28 questions in this section.

Principal component analysis was used for data extraction. The total variance

explained and component matrix table are listed in table 5.5 and 5.6.

Table 5.5 Total variance explained

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.286	51.023	51.023	14.286	51.023	51.023
2	1.736	6.199	57.222	1.736	6.199	57.222
3	1.356	4.841	62.063	1.356	4.841	62.063
4	1.181	4.218	66.282	1.181	4.218	66.282
5	.942	3.364	69.646	.942	3.364	69.646
6	.874	3.121	72.767	.874	3.121	72.767
7	.863	3.083	75.850	.863	3.083	75.850
8	.651	2.327	78.177	.651	2.327	78.177
9	.610	2.178	80.355	.610	2.178	80.355
10	.560	1.999	82.354	.560	1.999	82.354
11	.496	1.772	84.126	.496	1.772	84.126
12	.484	1.728	85.854	.484	1.728	85.854
13	.398	1.422	87.275	.398	1.422	87.275
14	.378	1.351	88.626	.378	1.351	88.626
15	.360	1.286	89.912	.360	1.286	89.912
16	.344	1.230	91.142	.344	1.230	91.142
17	.301	1.077	92.219			
18	.291	1.038	93.256			
19	.287	1.024	94.280			
20	.247	.884	95.164			
21	.229	.818	95.982			
22	.209	.747	96.729			
23	.185	.660	97.389			
24	.178	.635	98.024			
25	.162	.578	98.602			
26	.149	.531	99.133			
27	.132	.471	99.604			
28	.111	.396	100.000			

Extraction Method: Principal Component Analysis.

Table 5.6 Component Matrix

	1	2	3	4	5	6	7
P_Q1	.745	.151	-.177	-.296	.112	-.120	8.840E-02
P_Q2	.708	.251	-.258	-.176	-5.167E-02	7.982E-02	4.929E-02
P_Q3	.696	-.145	-.210	-.290	.134	1.356E-02	-.155
P_Q4	.761	.178	-.249	-.178	2.305E-02	.146	-2.075E-02
P_Q5	.736	.222	-.236	-.253	-1.685E-02	-6.307E-02	.146
P_Q6	.751	.190	-.170	-4.650E-02	-1.849E-02	-.102	5.987E-02
A_Q2	.271	.583	.420	-.101	.192	-.205	9.232E-02
A_Q3	.563	.322	-.340	.226	-.103	.122	-.318
A_Q4	.573	.358	.379	.323	-5.790E-02	2.196E-02	-.229
A_Q5	.699	.274	-.256	.242	-9.227E-02	9.478E-02	-.100
A_Q6	.585	.474	4.541E-02	.366	4.301E-02	-.153	-.120
B_Q1	.793	6.248E-02	8.243E-02	-.217	8.814E-02	2.275E-02	-2.627E-02
B_Q2	.754	-.146	9.847E-02	-.174	.281	-.165	-.217
B_Q3	.684	-.152	-7.269E-02	.279	-6.820E-02	.320	2.025E-02
B_Q4	.751	-3.921E-02	6.059E-02	-.102	.153	-.181	-.295
B_Q5	.750	-.163	9.799E-02	.182	-.109	.168	1.034E-02
B_Q6	.158	-.229	-.265	.497	.722	-.117	.204
B_Q7	.302	.288	.391	-.158	.309	.630	.250
E_Q1	.791	-.225	.298	7.448E-02	-.131	-.126	.108
E_Q2	.820	-5.056E-02	.197	8.230E-02	-.124	-.201	.159
E_Q3	.828	-.251	.123	-9.545E-02	-2.363E-02	-5.965E-02	-8.317E-03
E_Q4	.842	-1.501E-02	3.117E-03	6.810E-02	-8.273E-02	-9.568E-02	.267
E_Q5	.805	-.103	.204	9.636E-02	-.182	-.119	.194
E_Q6	.736	-.173	-.245	7.819E-02	-.128	7.293E-02	.219
E_Q7	.839	-1.685E-02	-.124	8.115E-02	-8.550E-02	-5.035E-02	.294
S_Q1	.870	-.221	.157	-5.920E-02	1.051E-03	4.082E-02	-.119
S_Q2	.762	-.368	.135	2.185E-04	2.272E-02	.126	-.205
S_Q3	.825	-.295	6.914E-02	1.504E-03	7.346E-02	.131	-.201

Extraction Method: Principal Component Analysis.

a. 16 components extracted.

From table 5.5, we could see it took 16 factors to explain cumulative percentage variance above 90%. Table 5.6 showed that factor loadings for first factor were relatively high and for resting 15 factors were very low. Correspondingly, we merely focused on the first factor for removing data redundancy. In the table 5.6, variables were questions from questionnaires. The first letter stated the questionnaire. For example, P standed for pleasure questionnaire, A for arousal questionnaire, B for behavior questionnaire, E for evaluation questionnaire, S for satisfaction questionnaire. The second letter stated the question in that questionnaire. For instance, B_Q7 standed for the seventh question of behavior questionnaire. All the questionnaires were listed in appendix 4.2.2.

If we took 0.8 as the critical value to decide which variable was considered as a

defining variable for that factor, we could see from table 5.6 that questions of E_Q2, E_Q3, E_Q4, E_Q5, E_Q7, S_Q1 and S_Q3 could be replaced by one question. Therefore, the total questions would be 22 instead of original 28.

If we took 0.7 as the critical value to decide which variable was considered as a defining variable for that factor, we could see from table 5.6 that questions of P_Q1, P_Q2, P_Q4, P_Q5, P_Q6, B_Q1, B_Q2, B_Q4, B_Q5, E_Q1, E_Q2, E_Q3, E_Q4, E_Q5, E_Q6, E_Q7, S_Q1, S_Q3 and S_Q3 can be replaced by one question. Therefore, the total questions would be 10 instead of original 28.

As stated previously, this factor analysis aimed to provide an alternative for researchers to study similar topics. Researchers decided to choose the original questionnaires with 28 questions or our abbreviated ones. However, if they chose ours, they should keep in mind that our modified questionnaires were abbreviated from data obtained in our experiment I, which may be subject to some limitations such as the two Web stores we used.

5.5 Summary

This experiment proved that sounds do have some significant effects on consumers' shopping upon Web stores. Moreover, results also showed sound effects and gender interacted with one another.

A very interesting phenomenon was that effects of sound on our two B2C Web stores were different. For example, music and earcons have more strong influence on the

gift Web store instead of mobile phone one in terms of pleasure and evaluation questionnaire score and bipolar ratings. Our next experiment focused on the potential reasons for this phenomenon.

Chapter 6

Experiment II

6.1 Introduction

Our first experiment disclosed that sound effects on the two Web stores used were quite different. For example, music demonstrated significantly positive effect on male participants' pleasure, evaluation scores and bipolar ratings only on the gift Web store not on the mobile phone Web store. Earcons showed significantly positive effect on female subjects' pleasure scores and bipolar ratings only on the gift Web store not on the mobile phone Web store. These phenomena indicated that sounds showed different effects on different types of Web stores. Accordingly, more work to explain these phenomena for the suitability of different sounds on various types of Web stores seemed quite important. Therefore, we conducted another experiment, experiment II, to contribute to the exploring of potential reasons.

Due to the limited time and resources we had, this experiment specifically focused on music sound effect and male participants.

6.2 Method

6.2.1 Objective

The main objective for the second experiment was to explore potential reasons for music's significant influence on male participants rated pleasure and evaluation

scores only on the gift Web store not on the mobile phone Web store.

In order to attain more information about participants' feeling and thinking during experiment, we applied think-aloud technique i.e. asking participants to speak out their mind during experiment.

6.2.2 Participants

16 HKUST male students participated in this experiment. Participants were all Hong Kong local people and Cantonese native speaker. All participants had been familiar with using computers and surfing Webs and none of them had any neurological problems in hearing and suffers any maladaptation problems either psychologically or physically.

6.2.3 Apparatuses and Web stores

Equipment used was described already in section 4.4.1. However, heart rate monitor was not used this time since we didn't focus on heart rate in this experiment.

The same gift and the mobile phone Web store used in experiment I were applied with only two editions, the one with music only and the one with no sound.

6.2.4 Independent variables

The independent variable was music with two levels, with or without.

6.2.5 Dependent variables

Dependent variables included think-aloud results, open questions, pleasure questionnaire score, and evaluation questionnaire score.

The pleasure and evaluation questionnaire were as same as ones used in experiment I and described in section 4.4.2

New open questions questionnaires were made. There are two versions for two different conditions.

All the questionnaires above-mentioned were listed in appendix A4.2.2.

6.2.6 Task

The shopping task was as same as the one in experiment I and explained in section 5.2.6.

6.2.7 Experiment design

The statistical experiment design was one factor, two conditions (with and without music), between subjects design, 8 male participants in each condition

Each participant would shop on both gift and the mobile phone Web stores, so the store variables (gift and phone stores) were within-subject variables.

The order of visiting the 2 stores was randomized.

6.2.8 Procedure

When participants came, they were firstly asked to take several minutes to relax. Meantime, the experimenter explained the aim and procedures of the experiment and participants were asked to fulfill a consent form to confirm their willingness to participant in experiments and their rights as well as responsibilities.

The pre-questionnaire was then asked.

Because we used think-aloud technique this time and participants may not be used to speak out their mind while their shopping, we trained participants on shopping upon amazon.com for 10 to 15 minutes.

Then they were put into two Web stores in turn. The order of two Web stores was decided randomly. A brief guide on surfing the two Web stores was also taught in advance.

Participants shopped on these two Web stores and also spoke out their mind meanwhile. In with music condition, some open questions were asked during their shopping.

After participants finished surfing the first store and made buying decision, pleasure, evaluation questionnaires and open questions were asked specifically for that Web

store. Then they would take two minutes relax before going to the second Web store. After they finished shopping on the second store, questionnaires were applied again for the second Web store.

6.3 Results

Like the first experiment, Cronbach's Alpha test was also applied for pleasure and evaluation questionnaires. Alpha values for both questionnaires on both Web stores were above 0.7. (See in appendix A6.1)

Normality test showed that only response of pleasure questionnaire score on the gift Web store was not normal (See in appendix A6.2). Mann-Whitney test was applied for this measurement and AVOVA analyses were used for others.

6.3.1 Analyses of pre-exposure measurement

Normality test of pre-questionnaire score showed subjects normally distributes in the 2 conditions. ($P>0.05$)

6.3.2 Analyses of other measurements

6.3.2.1 Pleasure questionnaire

Music showed significantly positive effect only on the gift Web store ($p<0.05$) as shown in table 6.1. The ANOVA table for the mobile phone Web store was in

appendix A6.4.

Table 6.1 Main effects of pleasure questionnaire score on gift Web store

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Music	8	10	0.038

6.3.2.2 Evaluation questionnaire

ANOVA analyses showed music had significantly positive influence only on the gift Web store ($p<0.05$) not on the mobile phone Web store ($p>0.1$)

The ANOVA table of evaluation questionnaire score on the gift Web store was shown in table 6.1.

Table 6.2 AVOVA table of evaluation questionnaire score on gift Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Music	1	100.00	100.00	4.78	0.046
Error	14	293.00	20.93		
Total	15	393.00			

Other ANOVA tables were listed in A6.4

6.3.2.3 Think-aloud results

In the experiment, participants were asked to speak out their mind during their shopping. Their voice had been recorded by two video cameras and formed the following two think-aloud results.

Word-occurrence percentage score:

All the participants' verbal information of products they selected can be categorized into three types. (In our experiments, participants spoke their mother tongue, Cantonese. All the verbal information we attained was in Cantonese. In this thesis, the author translated them into English.)

Words related to the description of products' appearance, such as attractive, cute, nice, beautiful, pretty. (Appearance)

Words related to the price of products, such as expensive, inexpensive, cheap, over budget, or speaking the price out. (Price)

Words related to description of products' function. For example, to describe what a product could be used for, to read the function information of a product (typically on the mobile phone Web store). (Function)

Correspondingly, we could say participants were examining the three aspects of a product when they spoke words belonging to appearance, price or function.

Therefore, a scoring method can be used to extract the occurrence of each type of examination methods for each participant per Web store:

Whenever a product was examined by its 'appearance', i.e. participants' verbal information about a product belonged to 'appearance'; the 'examined-by-appearance' score added one.

Whenever a product was examined by its 'price', i.e. participants' verbal information about a product belonged to 'price'; the 'examined-by-price' score added one.

Whenever a product was examined by its 'function', i.e. participants' verbal information about a product belonged to 'function'; the 'examined-by-function' score added one.

Then the three score were converted to a word-occurrence percentage score by the following formula:

Percentage examined-by-appearance = (examined-by-appearance score)/(total examination times)

Percentage examined-by-price = (examined-by-price score)/(total examination times)

Percentage examined-by-function = (examined-by-function score)/(total examination times)

Total examination times = examined-by-appearance score + examined-by-price score + examined-by-function score

Mann-Whitney U test was used to compare the three word-occurrence percentage scores between two Web stores. Results were shown in table 6.3.

Table 6.3 Mann-Whitney U test on three word-occurrence percentage scores between two Web stores

	Percentage examined-by-appearance	Percentage examined-by-price	Percentage examined-by-function
	Median (%)	Median (%)	Median (%)
Gift Web store	90.5	7.5	1
Mobile phone Web store	1	4.5	94
Significant level (p value)	<0.001	0.2644	<0.001

From table 6.3, we could see that percentage examined-by-function score on the mobile phone Web store was significantly higher than that on the gift Web store ($p<0.001$) while percentage examined-by-appearance score on the gift Web store is significantly higher than that on the mobile phone Web store ($p<0.001$), which indicated that participants mainly examined the appearance of products on the gift Web store and function of products on the mobile phone Web store.

Time-percentage score:

The time for participants examining products in the three above-mentioned aspects, i.e. appearance, price and function, were calculated and named time-examined-by-appearance, time-examined-by-price and time-examined-by-function. Besides the three, the total shopping time also included the time for participants'

browsing (i.e. to change pages, scroll pages), named time-by-browse and the time for them to answer questions asked by the experimenter.

Four time-percentage score could be calculated by the following formula:

Percentage time-examined-by-appearance = (time-examined-by-appearance) / (modified total time)

Percentage time-examined-by-price = (time-examined-by-price) / (modified total time)

Percentage time-examined-by-function = (time-examined-by-function) / (modified total time)

Percentage time-by-browse = (time-by-browse) / (modified total time)

Modified total time = total time – the time for participants' answering questions = time-by-browse + time-examined-by-appearance + time-examined-by-price + time-examined-by-function

Mann-Whitney U test was used to compare the four time-percentage scores between two Web stores. Results were shown in table 6.4.

Table 6.4 Mann-Whitney U test on four time-percentage scores between two Web stores

	Percentage	Percentage	Percentage	Percentage

	time-examined -by-appearance	time-examined -by-price	time-examined -by-function	time-by-browse
	Median (%)	Median (%)	Median (%)	Median (%)
Gift Web store	43	1	1.5	54
Mobile phone Web store	2	4	65.5	29
Significant level (p value)	<0.001	<0.001	<0.001	<0.001

From table 6.4, we could see that Percentage time-examined-by-function score on the mobile phone Web store were significantly higher than that on the gift Web store ($p<0.001$), which implies that participants spent significantly more percentage of time in examining the functions of products on the mobile phone Web store than on the gift Web store.

6.3.2.4 Open questions

The questions used in this experiment were listed in appendix A4.2.2.6.

Results showed:

1, Participants preferred slow temp music. They said slow temp music was suitable to Web surfing. Fast music made them anxious. In our case, only two of eight subjects chose fast temp music while they shopping on the gift Web store. One reported he personally always like fast tempo music and the other reported that he

used to listen to fast temp music in morning to awake him quickly.

2, Most of participants showed more positive opinions on music upon the gift Web store. In no sound condition, seven participants expressed that they would like the gift Web store added with background music, one said no need, while two participants expressed this wish on the mobile phone Web store. In with music condition, seven participants said music made the gift Web store better, one reported no change; while three participants said music made the mobile phone Web store better, two reported no change and three thought worse.

3, Participants reported two general related reasons for their preference of music on the gift Web store instead of the mobile phone Web store. One is music was more suitable to the nature of the gift Web store because making customers delightful, pleasing or cheerful was more important to this Web store. Music could enhance customers' pleasant feeling and also made this store more interesting and attractive. On the mobile phone Web store participants expected the feeling of professional, trustful and easy to compare rather than pleasant feeling but the music didn't help those much. (Reported by five participants in no sound condition, three participants in with music condition.) The other reason was participants reported they tended to ignore or feel annoyed or distracted by music, while they shopping on the mobile phone Web store because they put more thinking effort to read much information and compare products. The high expenditure also made them shop serious and correspondingly, put more thinking effort to compare products in detail. (Reported by four participants in with music condition while shopping on the mobile phone Web store.)

6.4 Discussion

The significance of pleasure and evaluation questionnaires scores only on the gift Web store was consistent with results of experiment I.

Think-aloud results indicated that participants mainly examined the appearance of products on the gift Web store and function of products on the mobile phone Web store ($p<0.001$) and spent significantly more percentages of time in examining the functions of products on the mobile phone Web store than on the gift Web store ($p<0.001$). These suggested possible associations between the significant effects of music and the main aspects of products participants examined on the gift Web store; and the absent effects of music and the significantly higher percentages of time spent on examining products by function.

The rationales behind the possible associations were that music can enhance participants' pleasure and overall Web store evaluation score on a Web store selling products on which participants mainly examined the appearance aspect of those products; and the music may become a distraction and a burden to reduce participants' concentration when they need to spend time in examining detailed functions of those products.

The rationales were also consistent with the findings of open questionnaire, which were reported by participants that music was more suitable to the nature of the gift Web store (reported by five of eight participants in the absence of music, three of eight participants in the presence of music) and they tended to feel annoyed or

distracted by music, while they shopping on the mobile phone Web store (reported by four participants in the presence of music while shopping on the mobile phone Web store).

6.5 Summary

Our second experiment showed that music could significantly increase the pleasure and evaluation scores of a Web store selling gifts but not on a Web store selling mobile phone ($p<0.05$). Using 'think-aloud' technique, results showed participants mainly examined the appearance of products on the gift Web store and function of products on the mobile phone Web store ($p<0.001$) and spent significantly more percentages of time in examining the functions of products on the mobile phone Web store than on the gift Web store ($p<0.001$).

Chapter 7

Conclusions

7.1 Summary of experimental findings

7.1.1 Findings of experiment I – Combined and individual effects of background music, voice and earcons

Sound demonstrated different significant effects on the two Web stores.

On the gift Web store, music showed significantly more positive effects on male participants in terms of rated pleasure scores ($p<0.05$) and rated evaluation scores ($p<0.05$) as well as bipolar ratings on emotional feeling towards the shopping experience ($p<0.05$ for ratings taken at 1, 5, 10 minutes into the shopping).

In the absence of music, male participants on the gift Web store reported significantly lower scores of pleasure ($p<0.01$) and bipolar ratings of positive emotional feelings ($p<0.05$) than female participants.

Music significantly lowered both male and female participants' heart rate elevation when shopping at the gift Web store ($p<0.05$).

Earcons had significantly positive effects on female participants in terms of pleasure scores ($p<0.05$) and bipolar ratings of emotional feelings taken at 1, 5, 10, 15 and 20 minute into the shopping experience ($p<0.05$).

In the presence of earcons, female participants shopping on the gift Web store reported significantly higher score of pleasure ($p<0.01$) and bipolar ratings of positive emotional feelings taken at 1, 5, 10, 15 and 20 minute into the shopping experience ($p<0.05$) than male participants.

Earcons also lowered participants' time perception error significantly ($p<0.05$, the time perception error = perceived shopping time – measured shopping time.)

Female participants reported significantly higher rated arousal scores ($p<0.01$) and behavior scores ($p<0.05$) than male participants.

On the mobile phone Web store, music significantly lowered the arousal scores ($p<0.05$) and showed significant interactions with the effects of voice ($p<0.05$).

In the presence of earcons, both behavior scores and evaluation scores reported by participants shopping on the mobile phone store significantly increased ($p<0.05$).

7.1.2 Findings of experiment II - A ' think-aloud' experiment to explore the reasons for the differential effects of music on males shoppers on a gift Web store and on a mobile phone Web store

Participants mainly examined the appearance of products on the gift Web store and function of products on the mobile phone Web store ($p<0.001$).

The percentages of time spent in examining products by functions were significantly

higher on the mobile phone Web store than on the gift Web store ($p<0.001$). On the other hand, the percentages of shopping time spent in examining products by appearance were significantly higher on the gift store than on the mobile phone store ($p<0.001$).

Music significantly increased the rated pleasure scores ($p<0.05$) and evaluation scores ($p<0.05$) only on the gift Web store and not on the mobile phone Web store. This confirmed the results in experiment I. The rationales between the significant effects of music and the main aspects of products participants examined on the gift Web store; and the absent effects of music and the significantly higher percentages of time spent on examining products by function were that music can enhance participants' pleasure and overall Web store evaluation score on a Web store selling products on which participants mainly examined the appearance aspect of those products; and the music may become a distraction and a burden to reduce participants' concentration when they need to spend time in examining detailed functions of those products.

The rationales were also consistent with the findings of open questionnaire, which were reported by participants that music was more suitable to the nature of the gift Web store (reported by five of eight participants in the absence of music, three of eight participants in the presence of music) and they tended to feel annoyed or distracted by music, while their shopping on the mobile phone Web store (reported by four participants in the presence of music while shopping on the mobile phone Web store).

7.2 Contributions

7.2.1 Contributions to academics

As a preliminary study of sound effects upon consumers' shopping on B2C Web stores, we reported some significant effects of three sound types, background music, human voice and earcons as well as gender, and also their interactions. These may become a new field for further research.

In addition, we also indicated the rationales behind the possible associations of the significant effects of music on pleasure and evaluation scores and the main aspects of products participants examined and the percentages of time participant spent in examining detailed functions, are that music could enhance participants' pleasure and overall Web store evaluation score on a Web store selling products on which participants mainly examined the appearance aspect of those products, and the music may become a distraction and a burden to reduce participants' concentration when they need to spend time in examining detailed functions of those products.

7.2.2 Contributions to commerce

Based on our findings we could provide some general suggestions for people applying sound effects to B2C Web stores and even to common Web sites.

1. Music could significantly enhance the pleasant shopping feeling for customers and significantly increase their general evaluation of a Web site, which doesn't

need much thinking effort of consumers, and sells products whose appearance are the most important.

2. If a Web site applies some sound effects, it should allow people to control the sound effects on a Web site. For example, allow people to choose different music; to play or stop music, earcons or voice whenever they want;

3. Voice should be more intelligent and interactive. For example, play different voice introduction to a product based on people's different surfing behaviors.

4. Customers more prefer slow tempo music while surfing Web sites.

5. Sound effects should be more product-related. For instance, a tourism Web site applies different countries' folk music to introduction pages of different tours to those corresponding countries.

7.3 Limitations

As a preliminary laboratory study in field of sound effects on Web, our research was mainly subject to the following limitations.

1. We were unable to use real commercial Web stores in our experiment for lack of commercial supports.

2. Because Web stores contain many different aspects such as types of products,

number of products, price of products, color of each page and others, there might be confounding effects on the two Web stores we used. We acknowledged that besides the difference in the types of products, some other aspects of the two Web stores used such as the color, layout, and the number of pictures that were not exactly same. Correspondingly, there was a possibility that the difference of sound effects found on the two Web stores may have been due to some other aspects such as color of the two Web stores. In this study, the designs of the two Web stores (e.g. layout, color, price) were based on relevant real related commercial Web sites. Further works concerning the influence of other aspects can be found in the section on future work.

3. Participants were recruited from a special population i.e. local Hong Kong Chinese. More study should be done to achieve generalized results.

4. The specific music and earcons used were chosen by the experimenter. Ideally participants should be able to choose their favorite.

5. The recorded voice used in experiment I was only in female Cantonese. It may be confounded with gender or language. More work should be done by using male voice and in non mother tongue language of participants.

6. More types of Web stores should be tested to obtain generalized results.

7.4 Recommended areas for future research

Since this was merely a preliminary study, there are many further areas of investigation that can be studied further.

In our second experiment we only tested music on male participants due to time constraint; further study could be done on earcons upon female participants.

More work should be done to reduce or eliminate the confounding effects upon Web stores used in experiments. Ideally, experimenters should keep one aspect such as types of products different and others such as color, layout as same as possible among the Web stores tested.

More work should be done about the suitability and influence of different sound effects on consumers' shopping upon different Web stores. For example,

The field of different sound effects may include more types of music such as blue, jazz, folk, country music and so on; different kinds of earcons used on different locations or objects on a Web site; male or female voice in English or other languages;

The field of more types of commercial Web stores may include more stores selling different products such as a bookstore or computer store.

The field of customers' shopping may include customers' expenditure, shopping time, emotions and behaviors or even customers themselves such as customers of different countries, ages, salaries, interests and so on.

Another study could also be the interaction between a surfer's sound perception and visual perception i.e. how sound cues interacting with visual cues.

7.5 Final conclusions

The original objectives of this thesis were to investigate whether sound effects, background music, human voice together with earcons, and gender could show some significant influence on consumers' shopping upon B2C Web stores and how these effects interact with one another. It is considered that through the experimental program, which has been reported herein, these objectives have been met. The results of the above studies show that background music and earcons do have some significant main effects and interactions upon consumers' shopping on a gift and a mobile phone B2C Web stores. Gender also states significant effects and interactions with these sounds on the gift Web store. Further study also indicates the rationales behind the possible associations of the significant effects of music on pleasure and evaluation scores, and the main aspects of products participants examined together with the percentages of time participant spent in examining detailed functions, are that music can enhance participants' pleasure and overall Web store evaluation score on a Web store selling products on which participants mainly examined the appearance aspect of those products, and the music may become a distraction and a burden to reduce participants' concentration when they need to spend time in examining detailed functions of those products.

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Appendix To Chapter 4

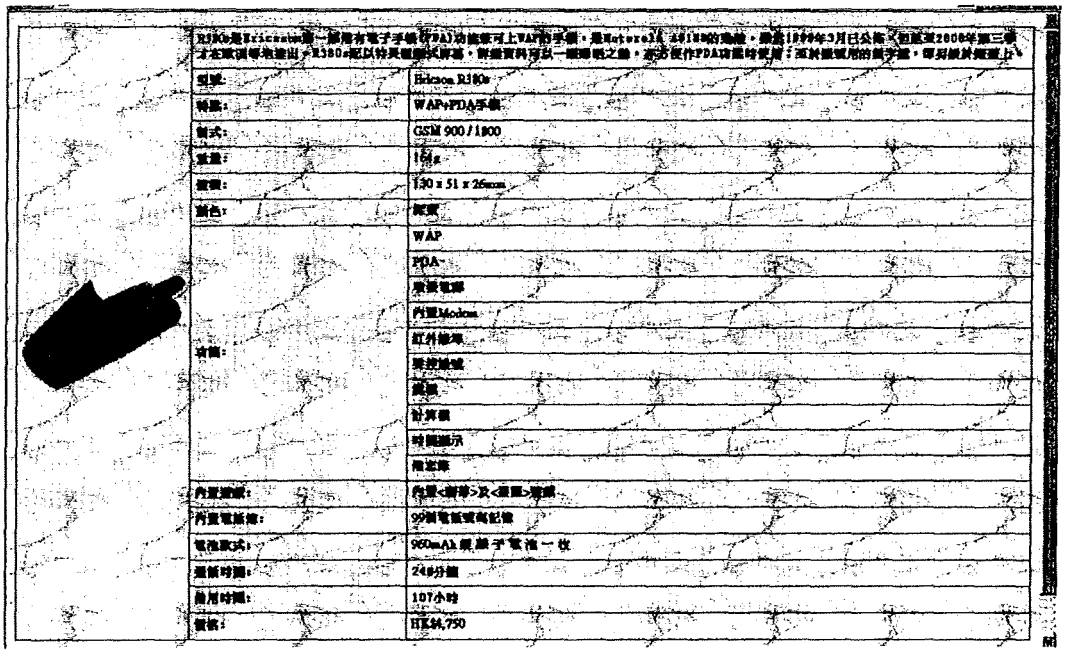
A4.1 Screen shots of two Web stores

Gift Web store

Hello Kitty Category

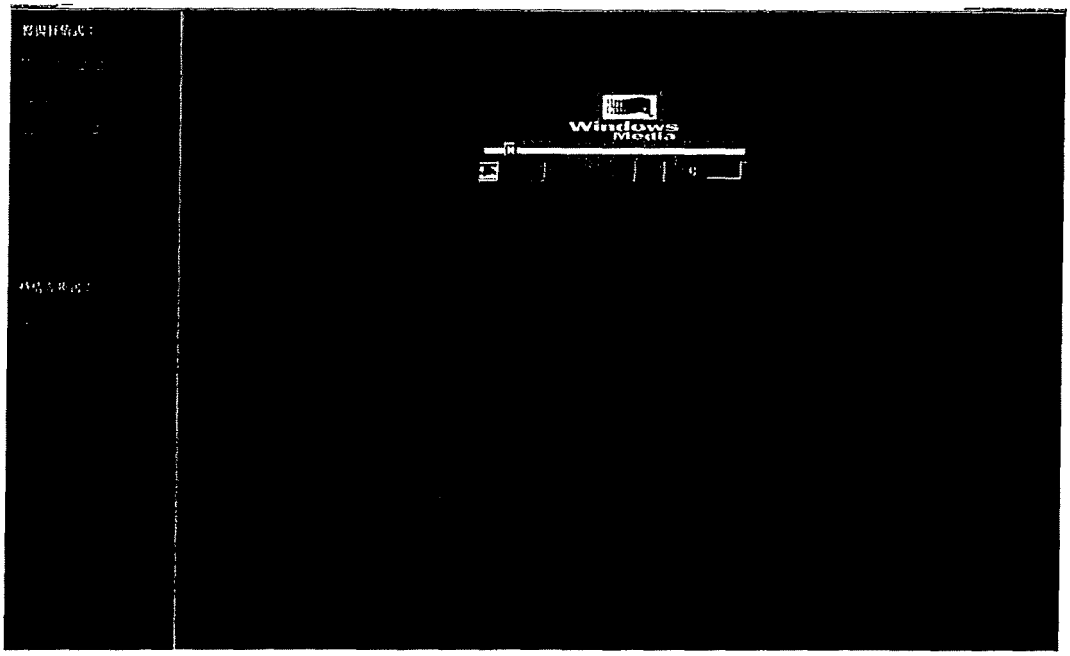
Mobile phone Web store

Motorola Category



型號:	Ericsson R380s
特點:	WAP+PDA手機
制式:	GSM 900 / 1800
重量:	164g
體積:	130 x 51 x 26mm
顏色:	銀灰
功能:	WAP
	PDA
	掌上電腦
	內置Modem
	紅外線埠
	手寫輸入
	鬧鐘
	計算機
	時間顯示
	震動器
內置鈴聲:	內置<鈴聲>及<振鈴>鈴聲
內置電話簿:	99個電話號碼記憶
電池款式:	960mAh 鋰離子電池一枚
通話時間:	240分鐘
備用時間:	107小時
價錢:	HK$4,750

One product's detailed information page



Page to change background music

A4.2 Questionnaires

A.4.2.1 Consent form

A.4.2.1.1 Consent form for experiment I

Consent Form For Participating the Experiments

1. Name _____

2. Are you feeling uncomfortable in any way? Yes/No

3. Do you suffer from hearing loss or constant ringing in your ears? Yes/No

4. Have you ever suffered from any serious disease such as heart disease? Yes/No

If your answer is "Yes" to question (2), (3), (4) please give details to the Experimenter.

DECLARATION

I consent to take part in the experiment. My replies to the above questions are correct to the best of my belief, and I understand that they will be treated as confidential by the experimenter.

I understand that I may at anytime withdraw from the experiment and that I am under no obligation to give reasons for withdrawing declared above.

I undertake to obey the regulations of the laboratory and instructions of the experimenter regarding safety only to my right to withdraw declared above.

The purpose and methods of the experiment have been explained to me and I have had the opportunity to ask questions.

Signature of Subject _____ Date _____

This experiment conforms to the requirement of the University Research Ethic Committee.

Signature of Experimenter _____Date _____

(When completed this form should be filed in the Exposure Archive).

A4.2.1.2 Consent form for experiment II

Consent Form For Participating the Experiments

1. Name _____
2. Are you feeling uncomfortable in any way? Yes/No
3. Do you suffer from hearing loss or constant ringing in your ears? Yes/No

If your answer is "Yes" to question (2), (3), please give details to the Experimenter.

DECLARATION

I consent to take part in the experiment. My replies to the above questions are correct to the best of my belief, and I understand that they will be treated as confidential by

the experimenter.

I understand that I may at anytime withdraw from the experiment and that I am under no obligation to give reasons for withdrawing declared above.

I undertake to obey the regulations of the laboratory and instructions of the experimenter regarding safety only to my right to withdraw declared above.

The purpose and methods of the experiment have been explained to me and I have had the opportunity to ask questions.

Signature of Subject _____ Date _____

This experiment conforms to the requirement of the University Research Ethic Committee.

Signature of Experimenter _____Date _____

(When completed this form should be filed in the Exposure Archive).

A4.2.2 Questionnaires

A4.2.2.1 Pre-questionnaire

Name: Gender: Age: Email:

Instruction: Please answer the following questions by ticking the appropriate answer.

Q1, How long have you been using computers?

One year, two years, three years, four years, five years or more

Q2, How many hours do you spend using computers on average per week for last year?

1 hour or less, 2-10 hours, 11-20 hours, 21-30 hours, 31 hours or more

Q3, How long have you been surfing the Internet?

One year, two years, three years, four years, five years or more

Q4, How many hours do you spend surfing the Internet per week for last year?

1 hour or less, 2-10 hours, 11-20 hours, 21-30 hours, 31 hours or more

Q5a, Have you ever visited some on-line Web shopping sites before? (If you choose Never, you may skip Q5b and Q5c)

Never, 1 - 3 times, 4 - 7 times, 8-12 times, 13 times or more

Q5b, If so, please give the names of the Web sites (as close as possible) or you can verbally describe to the experimenter. (If not, leave this question unanswered.)

Q5c, Please verbally describe the types of products that are on sale on your example Web sites.

Q6a, Have you ever bought anything over Internet before?

Never, one time, two times, three times, four times or more

Q6b, If so, give an example of Web sites you shopped on and what types of products you bought. (you can also verbally describe to the experimenter)

Q7, How would you evaluate yourself: "I am skilled at using the Internet."

Strongly disagree, disagree, slightly disagree, neutral, slightly agree, agree, strongly agree,

Q8, How would you evaluate yourself: "I am familiar with electronic commerce shopping."

Strongly disagree, disagree, slightly disagree, neutral, slightly agree, agree, strongly agree,

A4.2.2.2 Emotional state questionnaire (pleasure and arousal questionnaire)

ISTRUCTIONS:

Please rate your feelings in the situation with the adjective pairs blow. Some of the pairs might seem unusual, but you' ll probably feel more one way than the other. So,

for each pair, put a check mark (example: -----|-- √ --|-----) close to the adjective which you believe to describe your feelings better. The more appropriate that adjective seems, the closer you put your check mark to it.

Hopeful |------|------|------|------|------|------|------|------|------| Despairing
+4 +3 +2 +1 0 -1 -2 -3 -4

Relaxed |------|------|------|------|------|------|------|------|------| Stimulated
-4 -3 -2 -1 0 +1 +2 +3 +4

Annoyed |------|------|------|------|------|------|------|------|------| Pleased
-4 -3 -2 -1 0 +1 +2 +3 +4

Excited |------|------|------|------|------|------|------|------|------| Calm
+4 +3 +2 +1 0 -1 -2 -3 -4

Unsatisfied |------|------|------|------|------|------|------|------|------| Satisfied
-4 -3 -2 -1 0 +1 +2 +3 +4

Aroused |------|------|------|------|------|------|------|------|------| Unaroused
+4 +3 +2 +1 0 -1 -2 -3 -4

Depressed |------|------|------|------|------|------|------|------|------| Contented
-4 -3 -2 -1 0 +1 +2 +3 +4

Dull |------|------|------|------|------|------|------|------|------| Jittery
-4 -3 -2 -1 0 +1 +2 +3 +4

Happy |------|------|------|------|------|------|------|------|------| Unhappy
+4 +3 +2 +1 0 -1 -2 -3 -4

Sleepy |------|------|------|------|------|------|------|------|------| Wide-awake
-4 -3 -2 -1 0 +1 +2 +3 +4

Relaxed |------|------|------|------|------|------|------|------|------| Bored

+4 +3 +2 +1 0 -1 -2 -3 -4

Frenzied |------|------|------|------|------|------|------|------|------| Sluggish

+4 +3 +2 +1 0 -1 -2 -3 -4

A4.2.2.3 Behavior questionnaire

Instructions: Please answer the following questions by ticking the appropriate answer.

Q1, Did you enjoy shopping on this Web store?

not at all , very slightly, slightly, moderate, much, very much, extremely so,

Q2, Would you avoid ever having to go to this Web store again?

not at all , very slightly, slightly, moderate, much, very much, extremely so,

Q3, Is this a Web store in which you would feel friendly and are willing to respond to an ICQ request from the sale assistant of this Web store during your shopping?

not at all , very slightly, slightly, moderate, much, very much, extremely so,

Q4, Would you want to avoid looking further or exploring this Web store?

not at all , very slightly, slightly, moderate, much, very much, extremely so,

Q5, Do you like this Web store environment?

not at all , very slightly, slightly, moderate, much, very much, extremely so,

Q6, If you have an option to communicate on line with the sales assistants of this

Web store, will you try to avoid using this option, i.e. try to avoid communicating with sales assistant?

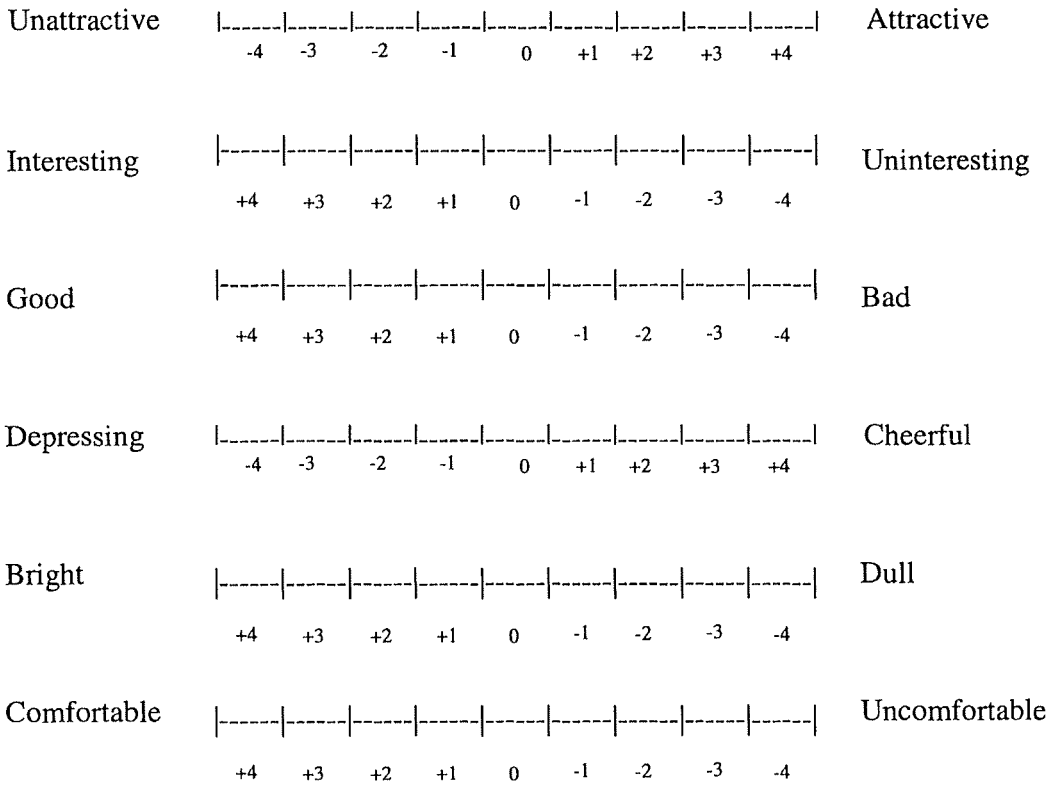
not at all , very slightly, slightly, moderate, much, very much, extremely so,

Q7, Is this the sort of Web store where you might end up spending more money than you originally set out to spend?

not at all , very slightly, slightly, moderate, much, very much, extremely so,

A4.2.2.4 Evaluation questionnaire

How would you evaluate this Web site's store environment?



Unpleasant |------|------|------|------|------|------|------|------|------| Pleasant
-4 -3 -2 -1 0 +1 +2 +3 +4

A4.2.2.5 Satisfaction questionnaire

Please mark the following sentences according to your feeling

1) I truly enjoyed coming to this Web store. (Just this specific Web store NOT the experiment)

Strongly disagree, disagree, slightly disagree, neutral, slightly agree, agree, strongly agree,

2) I satisfied with this Web store.

Strongly disagree, disagree, slightly disagree, neutral, slightly agree, agree, strongly agree,

3) I think the choice to come to this Web store was a good one.

Strongly disagree, disagree, slightly disagree, neutral, slightly agree, agree, strongly agree,

A4.2.2.6 Open questions questionnaire

These open questions were asked and answered in Cantonese. Original questions are written in Chinese. The author translated them in English here.

Open questions questionnaire for Experiment I

Q1, What products did you buy? Why did you choose these products?

Q2, How do you evaluate sound effects on this Web store? How do they influence your shopping? Please state your opinion (positive, negative, neutral) individually for

these sound effects. (Only asked when stores surfed by participants have sound)

Q3, Do you expect sound on this Web store? If so, what kind effect do you anticipate?

Q4, Which Web stores do you prefer? Why? (Only asked at the end of the second Web store)

Open questions questionnaires for Experiment II

Two editions of open questions questionnaires were used for each condition in the second experiment.

Open questions questionnaire for no sound condition:

Q1, What products did you buy? Why did you choose these products?

Q2, What areas do you think this Web store need to be improved?

Q3, Would you like this Web store added with background music?

Q4, Which Web stores do you prefer? Why? (Asked only after participants shopping on the second Web store)

Open questions questionnaire for with music condition:

Part I, questions asked during participants' shopping.

Q1, Why do you choose this music? What kind of music do you like? What kind of music do you think suitable to this Web store? (Asked just after participants chose background music and started shopping.)

Q2, How does music influence your shopping now? How do you feel about the music? Is the effect as same as that on previous Web store? (The last part only asked during participants shopping on the second Web store.)

Q3, Why do you change to another music? (Asked only if participants changed

music during shopping.)

Part II, questions asked after participants' shopping.

Q1, In general, music makes the Web store better, worse, no effect? Why?

Q2, What products did you buy? Why did you choose these products?

Q3, What areas do you think this Web store need to be improved?

Q4, Is the effect of music on the two Web stores same? (Asked only after participants shopping on the second Web store.)

Q5, Which Web stores do you prefer? Why? (Asked only after participants shopping on the second Web store)

A4.3 Approval of Human Subject Experiment

This section includes the approval of Human Subject Experiment according to the regulations of the university. The inapplicable content has been deleted in the application form.

The Hong Kong University of Science & Technology

Committee on Research Practices Review Form

INSTRUCTIONS :
(i) **Parts A & E** must be completed. Complete **Parts B, C & D,** if appropriate.
(ii) Please use additional pages where deemed necessary.

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20 JUL 2001
UPRDO-HKUST.

Part A: General Project Information

1. Project title:
Sound effects on interaction between customers and Web based Business to Consumer stores

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26 JUL 2001
H.K.U.S.T
O.C.G.A.

2. Principal Investigator(s), department(s), and contact telephone number(s):
Dr. Richard So. Industrial Engineering and Engineering Department, 2358 7105.

3. Names of staff/students involved in experiments & types of licences/endorsements held:
Zeng Jing, (Postgraduate, Mphil student, IEEM)

4. Funding agency:
RGC (Earmark grant)

Part B: Animal Research

Note: **If the animal work will involve hazardous material, please also complete the appropriate sections of Part C.**

1. Explanation of how the project advances scientific knowledge and confirmation that alternatives to experiments on live animals have been considered but are not appropriate:

2. Species/strain and number of animals to be used:
3. Proposed location where animals are to be kept:
4. Place in which experiments will be carried out:
5. The likely duration of the experiments:
6. Outline of procedures with special reference to procedure likely to cause suffering or injury:

7. Measures to be taken to minimize animal suffering/injury, including details of anaesthetics, analyses and method of euthanasia, etc., to be used:

8. Post-experiment care of animals:
9. Other information:

Part C1: **Safety – Chemical Hazards Risk Assessment**

1. Location where experiments will be carried out:

2. Hazardous materials involved:

Hazard type (pls. check)	Name of compound and maximum amount used in operation	Amount in storage and location
___ Asphyxiant		
___ Carcinogenic		
___ Corrosive		
___ Flammable		
___ Irritant		
___ Mutagenic		
___ Reactive/Explosive		
___ Sensitizer		
___ Teratogenic		
___ Toxic		
___ Others _____		

3. Description of work processes involving hazardous materials:

4. Proposed controls:

   a. Engineering control:

   ___ Local exhaust ventilation ___ Fume cupboard ___ Minimize quantity
   ___ Substitution for less hazardous materials ___ Others _____

   b. Administrative control:

   ___ Safety training ___ Warning & label ___ Access control
   ___ Approved operating procedures ___ Proper waste management practice
   ___ Others _____

   c. Personal protective equipment:

   ___ Safety glasses ___ Face shield ___ Lab coat
   ___ Mask ___ Respirator
   ___ Appropriate gloves ___ Others _____
   Specify: _____ Specify: _____
   _____ _____

Part C.2: **Safety – Biological Hazards Risk Assessment**

1. Location where experiments will be carried out:

2. Hazardous materials involved:

Hazard type (pls. check)	Name of agent and maximum amount used in operation	Amount in storage and location
___ Biological toxins		
___ Human bodily fluids (e.g blood or tissues)		
___ Infectious microbes		
___ Lab animals		
___ Others _____		

3. Description of work processes involving hazardous materials:

4. Proposed controls:

   a. Engineering control:

   ___ Biosafety cabinet ___ Facility containment ___ Others _____

   b. Administrative control:

   ___ Safety training ___ Access Control ___ Medical Surveillance
   ___ Approved operating procedures ___ Proper waste management practice
   ___ Others _____

   c. Personal protective equipment:

   ___ Safety glasses ___ Face shield ___ Lab coat
   ___ Mask ___ Respirator
   ___ Appropriate gloves ___ Others _____
   Specify: _____ Specify: _____
   _____ _____

5. FOR RECOMBINANT DNA WORK ONLY

   a. The source(s) of DNA:

   b. The nature of the inserted DNA sequences:

   c. The hosts and vectors to be used:

   d. Whether a deliberate attempt will be made to obtain expression of a foreign gene, and if so, what protein will be produced:

   e. The containment conditions:

Part C.3: Safety – Physical Hazards Risk Assessment

1. Location where experiments will be carried out:

2. Hazardous materials/operations involved:

___ High voltage equipment (> 600V AC or 1.0 KV DC)
___ High pressure/vacuum condition
___ High temperature
___ Laser (Class III or above)
___ Ionizing radiation (e.g. isotopes, X-ray). Please list isotopes _____
___ Non-ionizing radiation (e.g. UV, microwave, other EM fields)
___ Others _____

3. Description of work processes involving hazardous operations, including the type of operation, operating conditions, maximum quantity, duration, and other relevant information:

4. Proposed controls:

a. Engineering control:

___ Proper shielding/enclose
___ Proper guarding
___ Others _____
___ Proper relief devices
___ Proper insulation

b. Administrative control:

___ Safety training ___ Approved operating procedures ___ RUA no. _____
___ Laser hazard control plan no. _____ ___ Access control
___ Proper waste management practice ___ Others _____

c. Personal protective equipment:

___ Safety glasses ___ Face shield ___ Lab coat
___ Mask ___ Respirator
___ Appropriate gloves ___ Others _____
Specify: _____ Specify: _____
_____ _____

Part D: Human Subject Research

Note: If the research work will involve handling biological specimens of human subjects, pleas complete the appropriate sections of Part C.

1. Details of procedures to be used in the Research:

   Participants firstly surf experimental Web stores to buy products and then fulfil some questionnaires. In some conditions, background music will be played and in the rest of them, no music will be played. The music is NOT loud and participants can freely adjust the volume.

2. Subject(s) involved in the research (describe the characteristics of the subject population, including anticipated number, age, sex, health status, identify the criteria for inclusion or exclusion, explain the rationale for the involvement of special classes of subjects, if any, such as fetuses, pregnant women, children, human in vitro fertilization, prisoners, and others.):

   All participants would be Hong Kong local people and Cantonese native speaker since one of the sound effects, human voice, we applied in the experiments is in Cantonese. They will be around 18-30 years old. Participants in both genders are welcome. They should have normal hearing.

3. Identify sources of research material obtained from individually identifiable living human subjects in the form of specimens, records or data, etc.:

   Name*, Gender, Age, Email*

   *: The name and email will be kept in separation from the data. The email and name will only be used in contacting the participants and will not be disclosed to a third party.

4. Answer each of the following questions by circling "Yes" or "No":
   Do your procedures expose your subjects to any risk of:

   a. physical harm .....Yes/(No)
   b. pain .....Yes/(No)
   c. stress .....Yes/(No)
   d. fatigue .....Yes/(No)
   e. noxious stimulation .....Yes/(No)
   f. emotional distress .....Yes/(No)
   g. invasion of privacy .....Yes/(No)
   h. any other form of physical or psychological discomfort .....Yes/(No)
   i. any other potential risks such as social and legal .....Yes/(No)

5. Estimate the degree of risk involved in your subjects:

   There is NO risk.

   a. Describe the steps you will take to minimize the risk and to protect your subjects from it, including risks of confidentially, if necessary discuss provisions of ensuring medical or professional intervention in the event of adverse effects to the subject. Also when appropriate, describe provisions for monitoring the data collected to ensure the safety of subjects.

      As explained above, name and email will be kept in separation from the data. Also, name and email will NOT be disclosed to a third party.

   b. How will you explain the risk to your subjects?

There is NO risk. However, the full procedure of the experiment will be explained to the participants.

c. How will you obtain their consent to take part in the research?

All volunteer participants will be asked to read and sign a content form (attached with this from).

6. Will you collect names, addresses or any other details which would make it possible to identify your subjects? .....Yes/No. If "Yes":

a. Describe the identifying data you will collect

Name and Email
As explained above, name and email will be kept in separation from the data. Also, name and email will NOT be disclosed to a third party.

b. How will you use these data?

Just in case that I need contact them if missing some data.

c. How will you dispose of these data?

It will NOT be disclosed to any other third party. After the results are analysed and published, the data of name and email will be deleted.

d. What procedures will you follow to make sure that your subjects cannot be identified?

Keep all personal data in a confidential file.

Part E: **Declaration**

The information supplied above is to the best of my/our knowledge and believed to be accurate and feasible. I/We shall take all possible precautions to ensure that the proposed research is (are) conducted in such a manner as described above in order to safeguard the welfare of, and minimize the pain suffered by, the human and animal subjects involved in the study. Also, the procedures described, and material used in the research, are designed to minimize hazard and harmful results to the research workers, subjects, and the natural environment.

Zeng Jing — June 11th 2001

Signature (Student) — Date

(Dr. Richard So) — 12/6/2001

Signature (Principal Investigator) — Date

To be completed by Head of Department

I hereby endorse this application and confirm that the Principal Investigator/Supervisor is appropriately qualified and the Department has adequate facilities for the experiment(s) to be conducted in such a way as to safeguard the welfare of the research workers, subjects and the natural environment.

June 14. 2001

Signature (Head) — Date

Project title: Some Effects on Interaction between Customers and Web based Business To Consumer Stores

To be completed by Human Subject Research Panel:

(√) Approved ( ) Not Approved

Comments: _____

_____

_____

_____

David Lawrence
Signature

17 July 2001
Date

David Lawrence
Name

RECEIVED
21 JUL 2001
VPRDO-HKUST

Appendix To Chapter 5

A5.1 Reliability test on questionnaires

Reliability test on pleasure questionnaire upon gift Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
G_P_Q1	8.9688	30.3464	.7525	.8739
G_P_Q2	9.2083	29.9351	.6310	.8900
G_P_Q3	9.5625	28.4382	.6929	.8812
G_P_Q4	9.3021	28.2762	.7894	.8656
G_P_Q5	9.0104	28.4104	.7683	.8689
G_P_Q6	9.1042	28.1996	.7001	.8802

Reliability Coefficients

N of Cases = 96.0 N of Items = 6

Alpha = .8951

Reliability test on pleasure questionnaire upon mobile phone Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
P_P_Q1	6.8125	33.9645	.7253	.8774
P_P_Q2	7.1875	30.8697	.7552	.8712
P_P_Q3	7.2083	31.9982	.6544	.8884
P_P_Q4	7.1458	31.3680	.7511	.8718
P_P_Q5	7.0521	33.9236	.7760	.8719
P_P_Q6	7.3021	31.6657	.6946	.8813

Reliability Coefficients

N of Cases = 96.0 N of Items = 6

Alpha = .8954

Reliability test on arousal questionnaire upon gift Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
G_A_Q1	3.6979	26.2552	.0026	.7347
G_A_Q2	2.1146	18.7341	.4210	.5468
G_A_Q3	.5417	22.5246	.4027	.5563
G_A_Q4	2.0417	23.1140	.5603	.5256
G_A_Q5	.2708	21.7154	.4400	.5403
G_A_Q6	1.8021	22.2867	.5586	.5147

Reliability Coefficients

N of Cases = 96.0 N of Items = 6

Alpha = .6189

Reliability test on arousal questionnaire upon mobile phone Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
P_A_Q1	2.1458	30.6732	-.0406	.7482
P_A_Q2	1.1771	24.5262	.2796	.6429
P_A_Q3	-.7292	23.1890	.4667	.5670
P_A_Q4	1.0313	23.6937	.6096	.5343
P_A_Q5	-.6354	20.8025	.4877	.5533
P_A_Q6	.6042	23.2732	.6910	.5141

Reliability Coefficients

N of Cases = 96.0 N of Items = 6

Alpha = .6449

Reliability test on behavior questionnaire upon gift Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
G_B_Q1	28.5104	36.4420	.6668	.7482
G_B_Q2	27.5208	32.8206	.7572	.7244
G_B_Q3	28.0521	38.7657	.5881	.7645
G_B_Q4	27.3958	35.8627	.6930	.7428
G_B_Q5	28.6667	37.3193	.6126	.7581
G_B_Q6	27.6562	43.9332	.1578	.8397
G_B_Q7	29.5104	39.3894	.3532	.8089

Reliability Coefficients

N of Cases = 96.0 N of Items = 7

Alpha = .7985

Reliability test on behavior questionnaire upon mobile Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
P_B_Q1	27.4167	29.6982	.6798	.6895
P_B_Q2	26.0938	27.9806	.6253	.6906
P_B_Q3	27.1875	29.0803	.5912	.7003
P_B_Q4	26.3438	28.2069	.6018	.6960
P_B_Q5	27.6771	28.1788	.6185	.6925
P_B_Q6	25.7917	34.7982	.2010	.7791
P_B_Q7	28.6771	35.1262	.1177	.8058

Reliability Coefficients

N of Cases = 96.0 N of Items = 7

Alpha = .7557

Reliability test on evaluation questionnaire upon gift Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
G_E_Q1	9.4792	52.0838	.8116	.9344
G_E_Q2	9.2292	54.7259	.8337	.9298
G_E_Q3	9.2188	56.1306	.8547	.9280
G_E_Q4	9.1458	57.7890	.8252	.9310
G_E_Q5	9.3542	55.5364	.8364	.9295
G_E_Q6	8.7708	58.4311	.7398	.9379
G_E_Q7	8.8646	60.5815	.7977	.9348

Reliability Coefficients

N of Cases = 96.0 N of Items = 7

Alpha = .9414

Reliability test on evaluation questionnaire upon mobile phone Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
P_E_Q1	4.6875	52.0066	.8038	.9146
P_E_Q2	4.4687	55.8306	.8100	.9110
P_E_Q3	3.4896	58.4630	.7847	.9139
P_E_Q4	4.0521	58.5973	.8253	.9107
P_E_Q5	4.6875	57.3539	.7604	.9161
P_E_Q6	3.1250	61.0789	.6513	.9260
P_E_Q7	3.6771	60.8736	.8009	.9144

Reliability Coefficients

N of Cases = 96.0 N of Items = 7

Alpha = .9265

Reliability test on satisfaction questionnaire upon gift Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
G_S_Q1	9.6771	6.7262	.8523	.9108
G_S_Q2	9.6979	6.6762	.8721	.8945
G_S_Q3	9.7083	7.1351	.8635	.9027

Reliability Coefficients

N of Cases = 96.0 N of Items = 3

Alpha = .9330

Reliability test on satisfaction questionnaire upon mobile phone Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
P_S_Q1	9.4479	5.7867	.8421	.8637
P_S_Q2	9.2500	6.1684	.8124	.8885
P_S_Q3	9.2813	5.8885	.8271	.8762

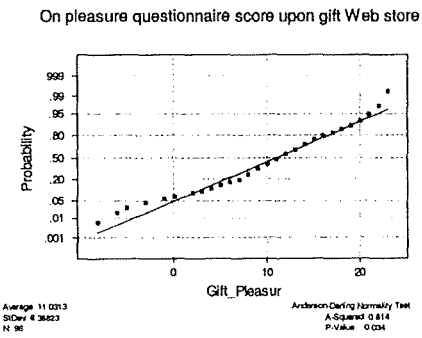
Reliability Coefficients

N of Cases = 96.0 N of Items = 3

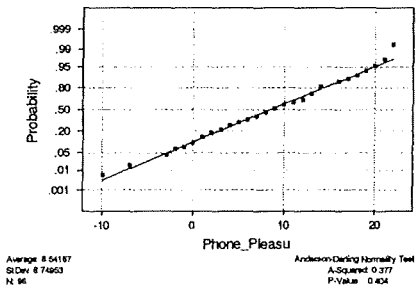
Alpha = .9141

A5.2 Normality test plot of questionnaires

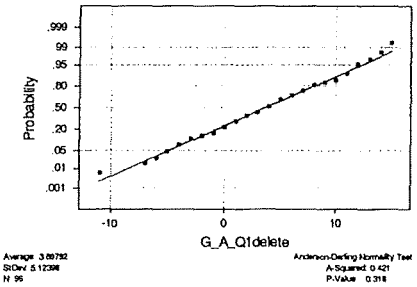
Anderson-Darling normality test was applied to all measurements. For some marginal responses, Ryan-Joiner or Kolmogorov-Smirnov normality tests were also applied.



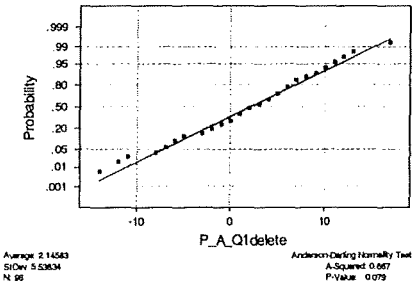
On pleasure questionnaire score upon mobile phone Web store



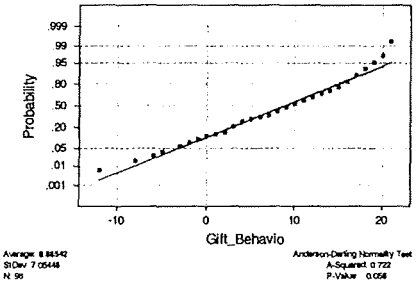
On arousal questionnaire score upon gift Web store



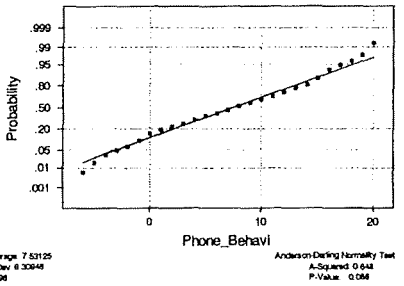
On arousal questionnaire score upon mobile phone Web store



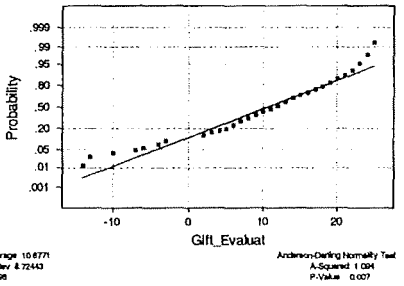
On behavior questionnaire score upon gift Web store



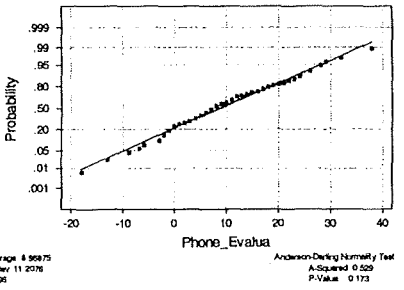
On behavior questionnaire score upon mobile phone Web store



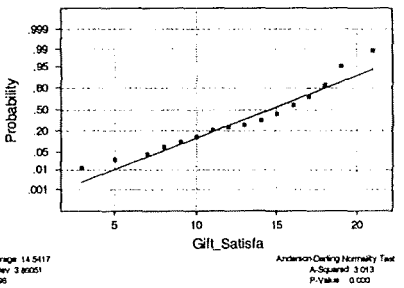
On evaluation questionnaire score upon gift Web store



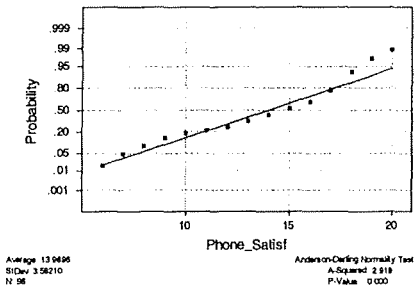
On evaluation questionnaire score upon mobile phone Web store



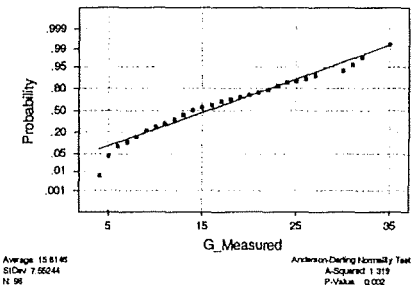
On satisfaction questionnaire upon gift Web store



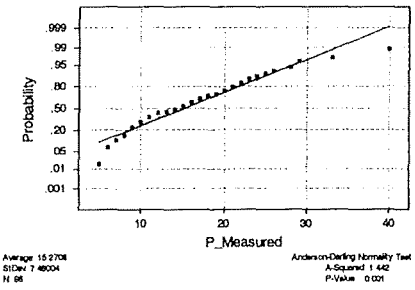
On satisfaction questionnaire upon mobile phone Web store



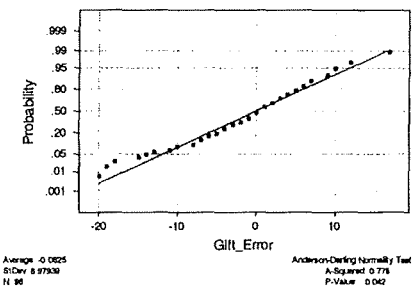
On measured shopping time upon gift Web store



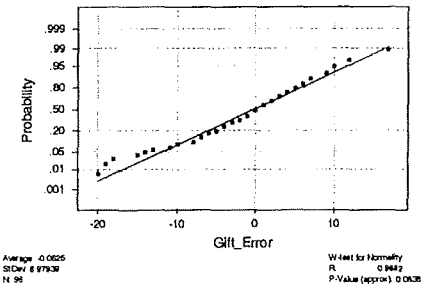
On measured shopping time upon mobile phone Web store



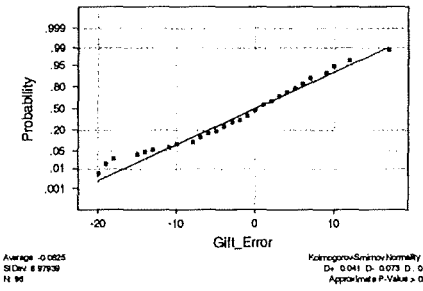
On time perception error upon gift Web store



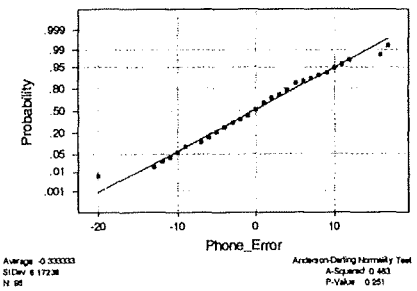
On time perception error upon gift Web store



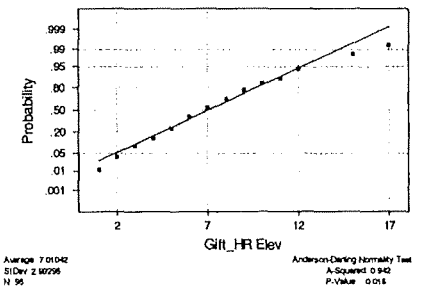
On time perception error upon gift Web store



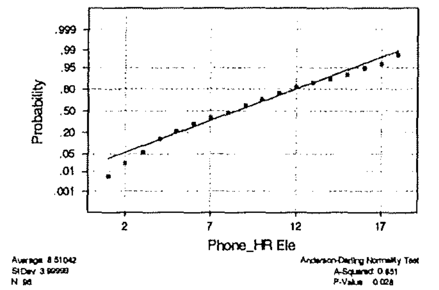
On time perception error upon mobile phone Web store



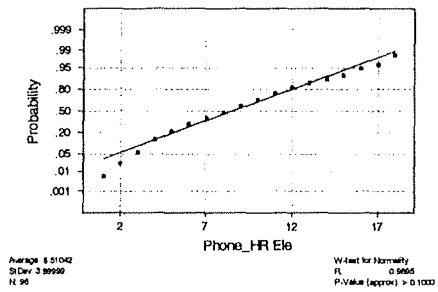
On heart rate elevation upon gift Web store



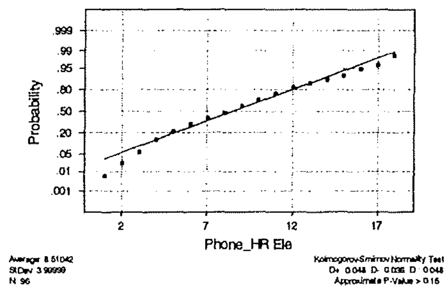
On heart rate elevation upon mobile phone Web store



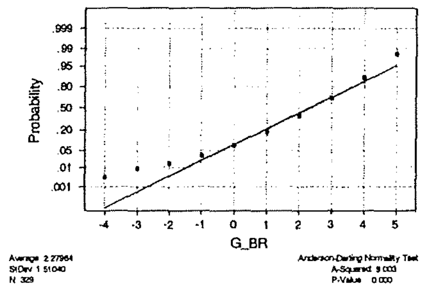
On heart rate elevation upon mobile phone Web store



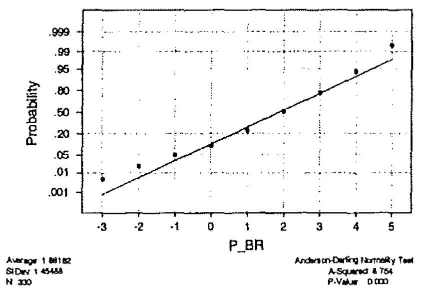
On heart rate elevation upon mobile phone Web store



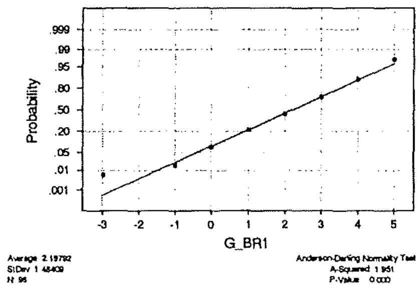
On bipolar ratings of general feeling upon gift Web store



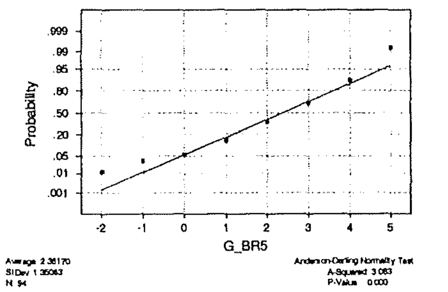
On bipolar ratings of general feeling upon mobile phone Web store



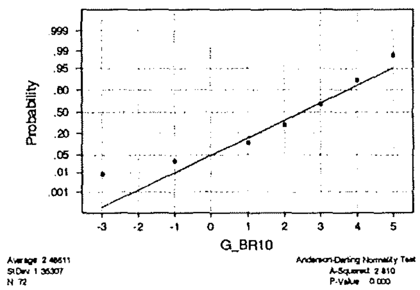
On bipolar ratings of general feeling at 1min upon gift Web store



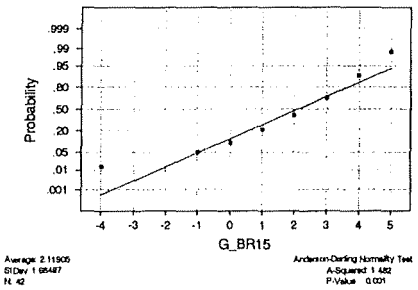
On bipolar ratings of general feeling at 5min upon gift Web store



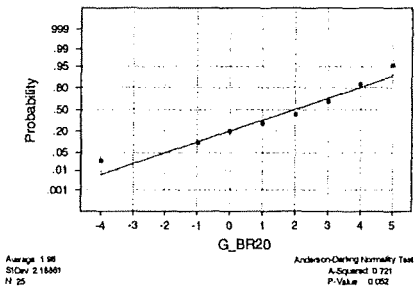
On bipolar ratings of general feeling at 10min upon gift Web store



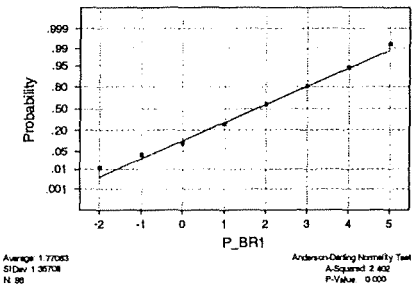
On bipolar ratings of general feeling at 15min upon gift Web store



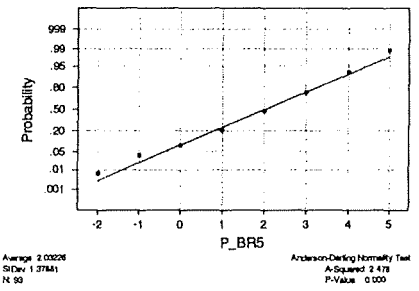
On bipolar ratings of general feeling at 20min upon gift Web store



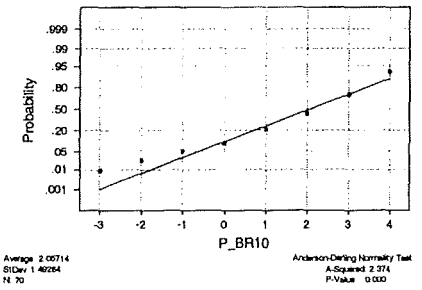
n bipolar ratings of general feeling at 1min upon mobile phone Web sto



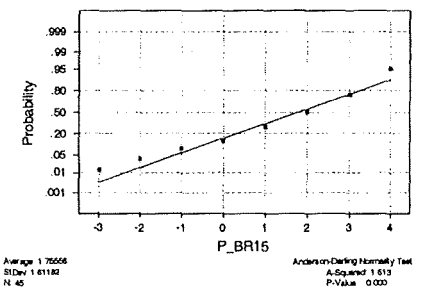
n bipolar ratings of general feeing at 5min upon mobile phone Web sto



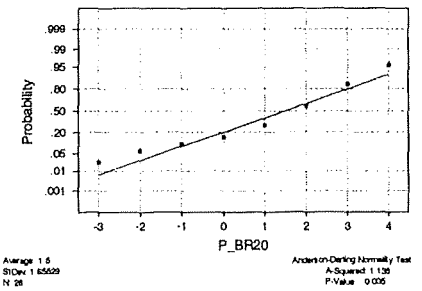
ı bipolar ratings of general feeing at 10min upon mobile phone Web stc



ı bipolar ratings of general feeing at 15min upon mobile phone Web stc

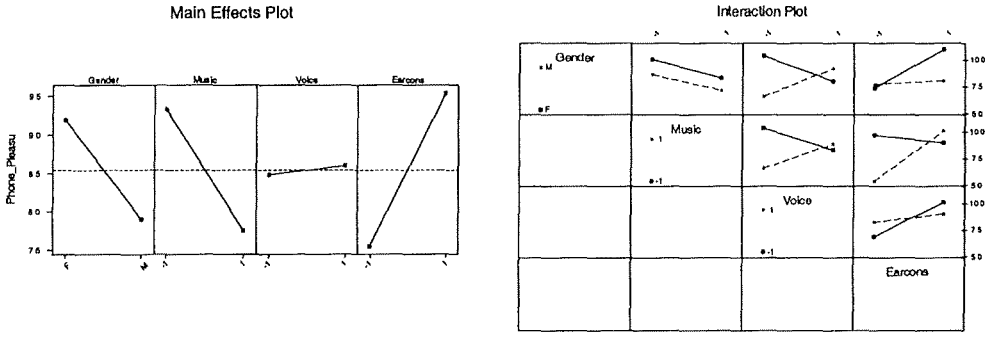


ı bipolar ratings of general feeing at 20min upon mobile phone Web stc

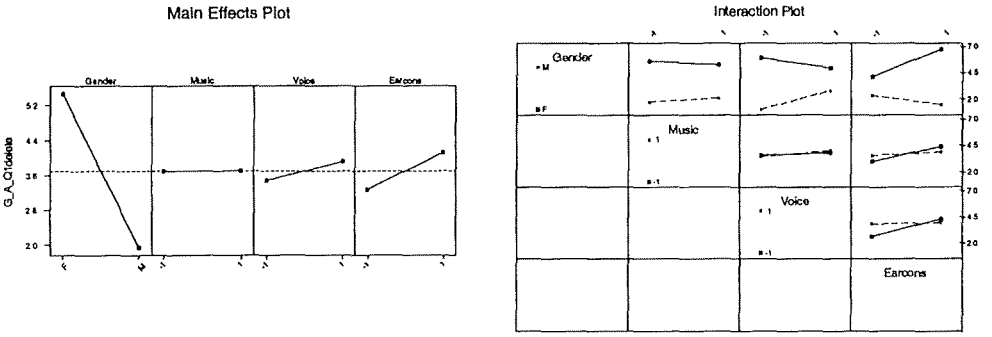


A5.3 Main effect plots and interaction plots

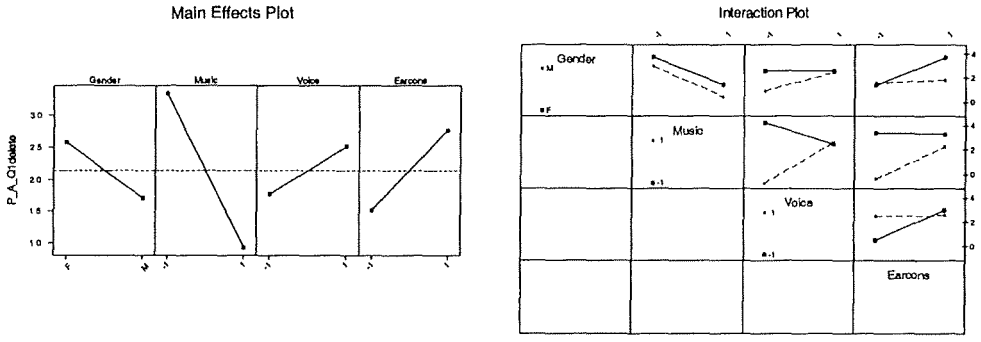
Below are the main effect plots and two-way interaction plots for all normal dependent variables attained by Minitab.



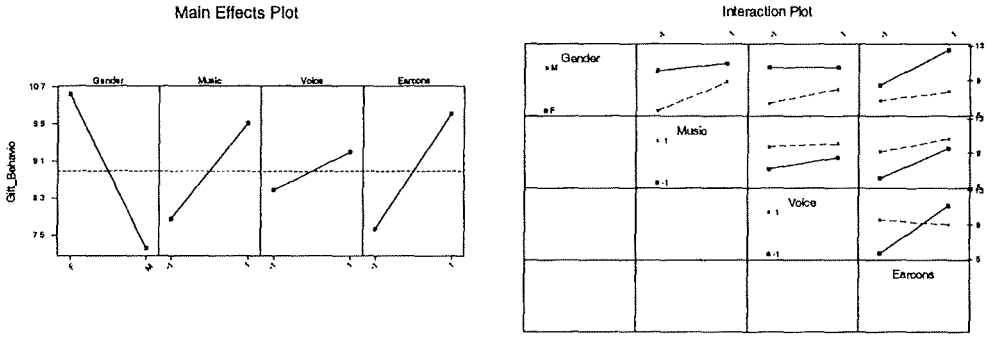
Pleasure questionnaire score on mobile Web store



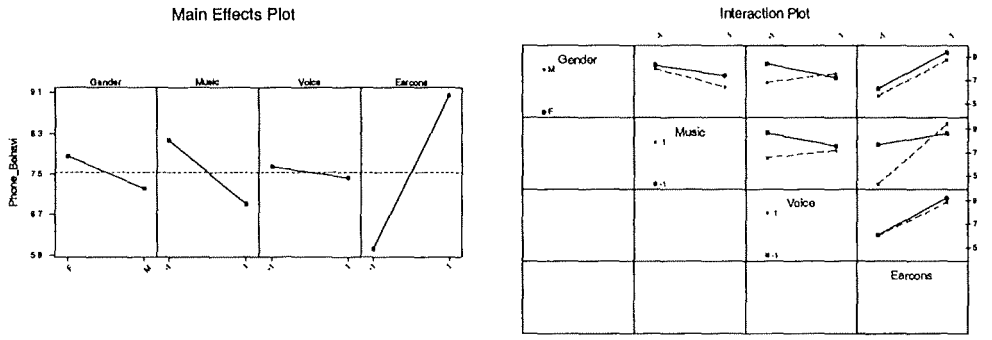
Arousal questionnaire score on gift Web store



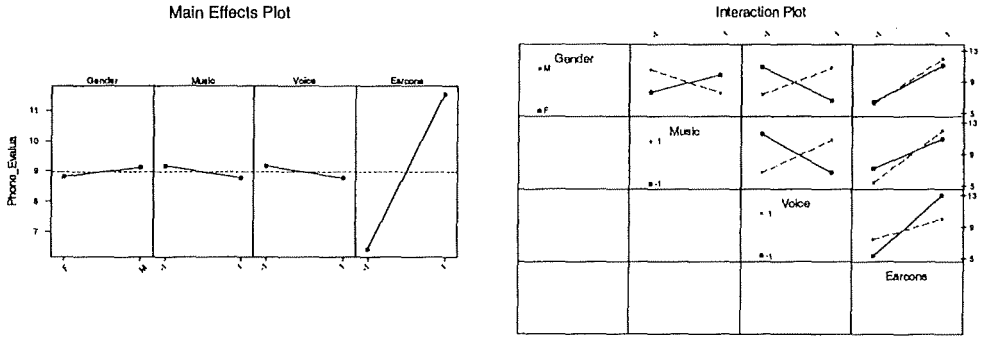
Arousal questionnaire score on mobile phone Web store



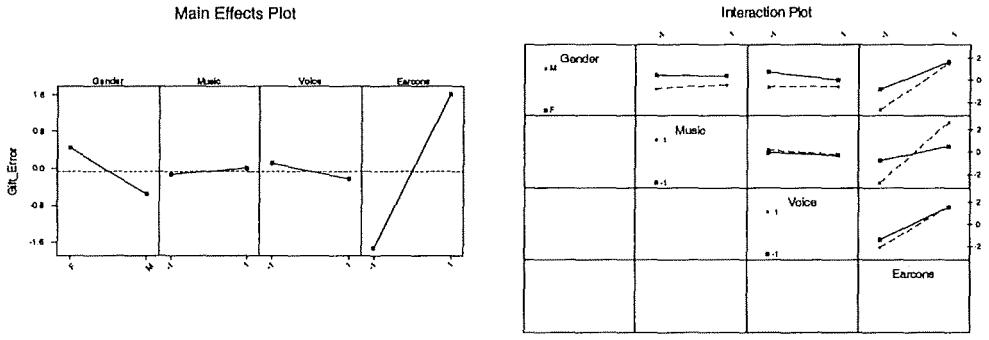
Behavior questionnaire score on gift Web store



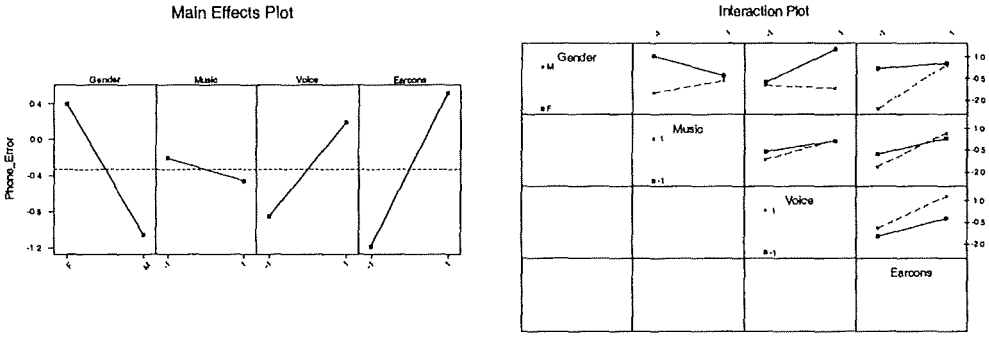
Behavior questionnaire score on mobile phone Web store



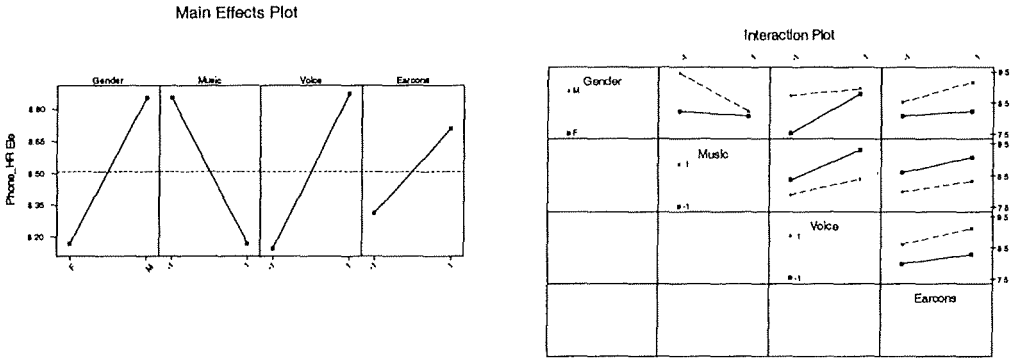
Evaluation questionnaire score on mobile phone Web store



Time perception error on gift Web store

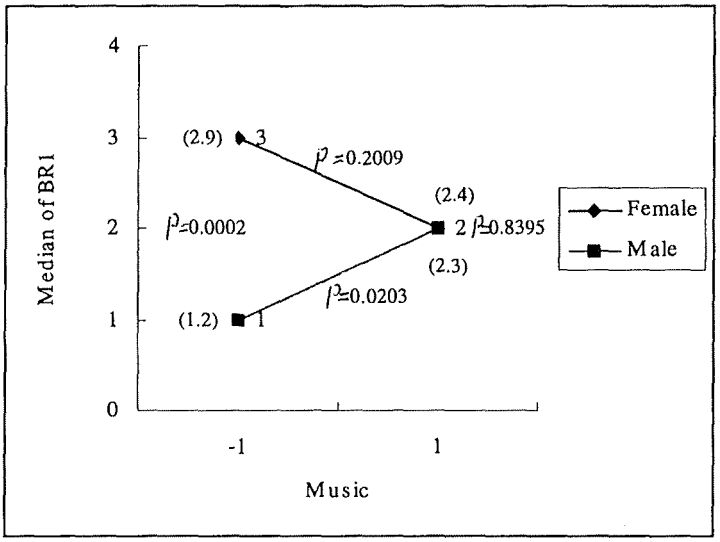


Time perception error on mobile phone Web store



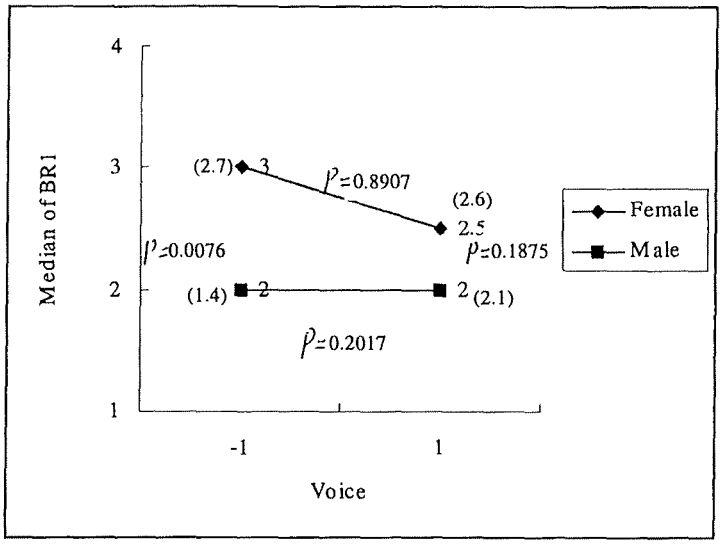
Heart rate elevation on mobile phone Web store

Interaction plots for bipolar ratings of general feeling at 1 min on gift Web store



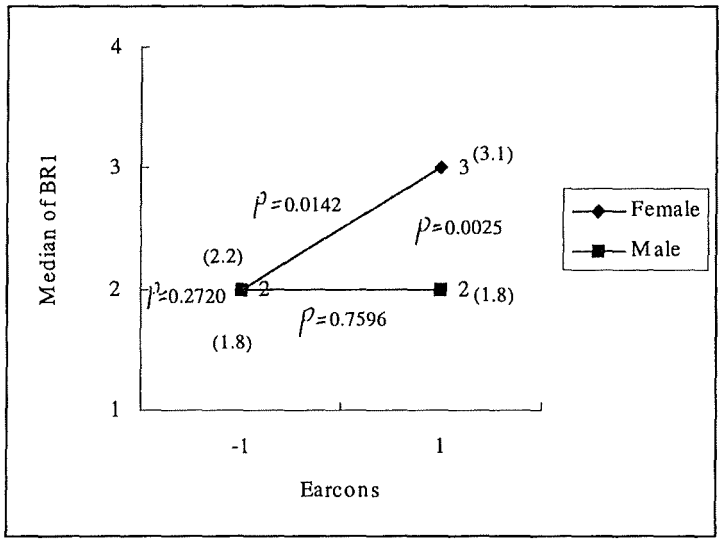
Interaction between effects of gender effects of and music

(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)



Interaction between effects of gender and effects of voice

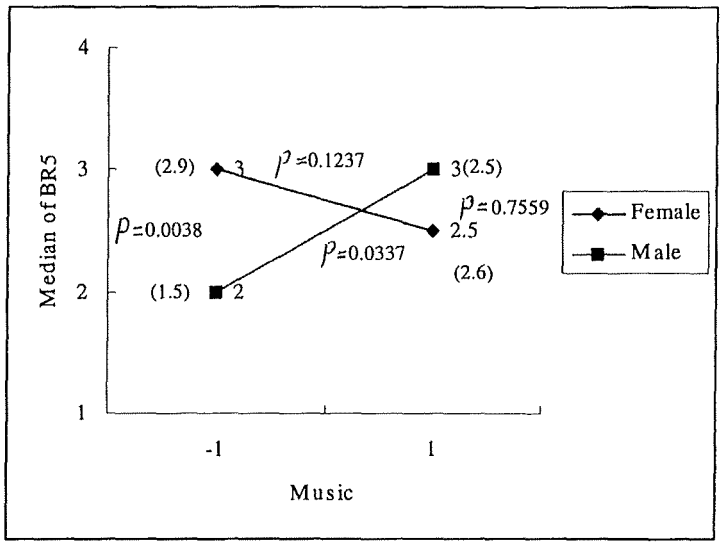
(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)



Interaction between effects of gender and effects of earcons

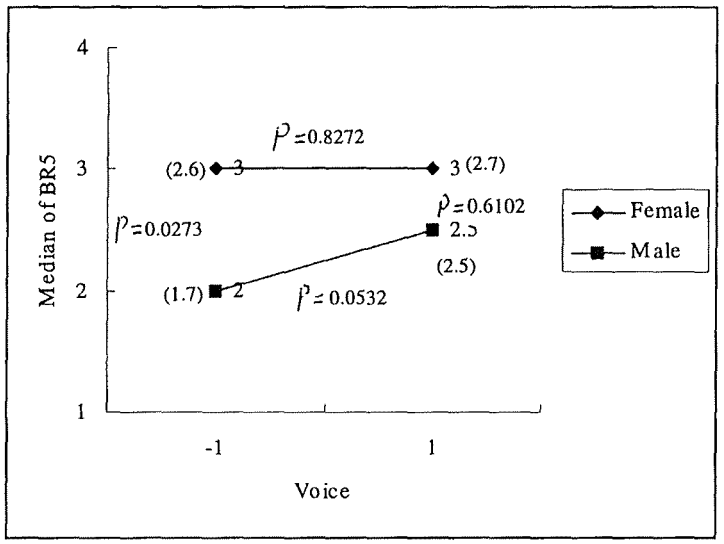
(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)

Interaction plots for bipolar ratings of general feeling at 5 min on gift Web store



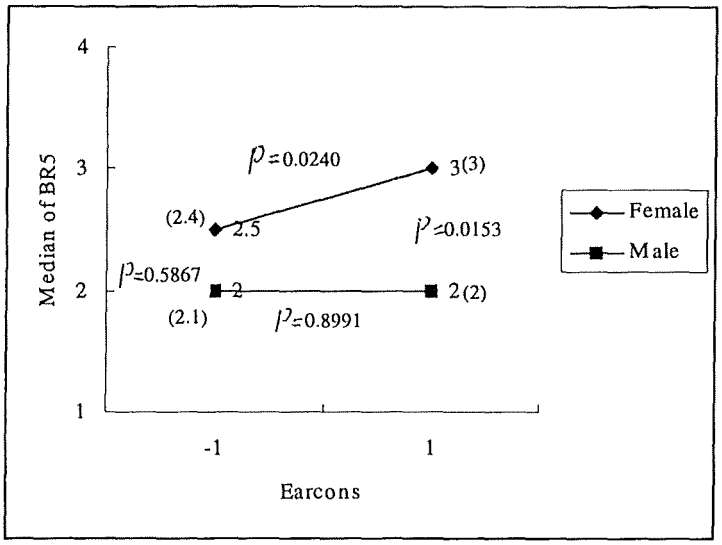
Interaction between effects of gender and effects of music

(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)



Interaction between effects of gender and effects of voice

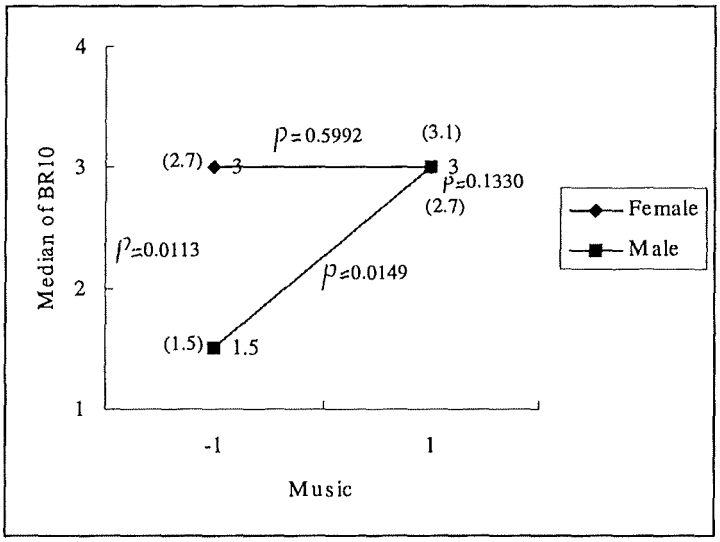
(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)



Interaction between effects of gender and effects of earcons

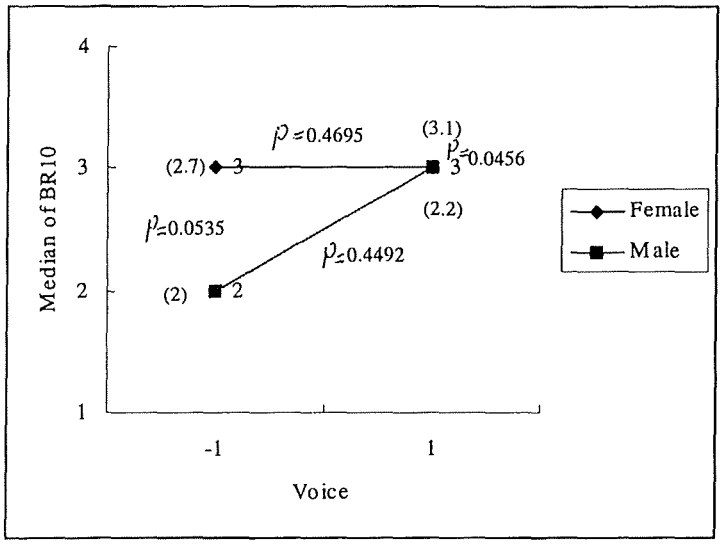
(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)

Interaction plots for bipolar ratings of general feeling at 10 min on gift Web store



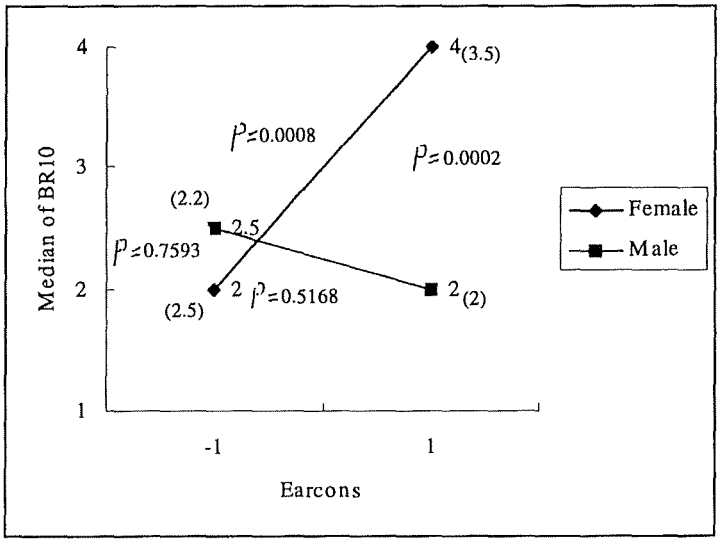
Interaction between effects of gender and effects of music

(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)



Interaction between effects of gender and effects of voice

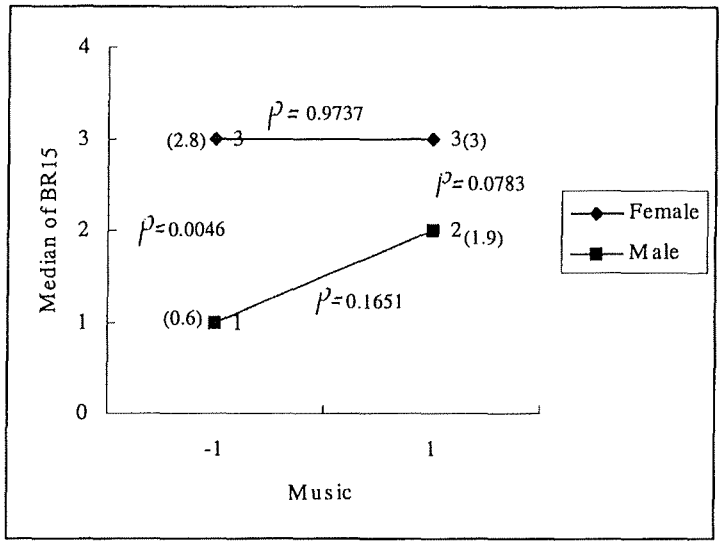
(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)



Interaction between effects of gender and effects of earcons

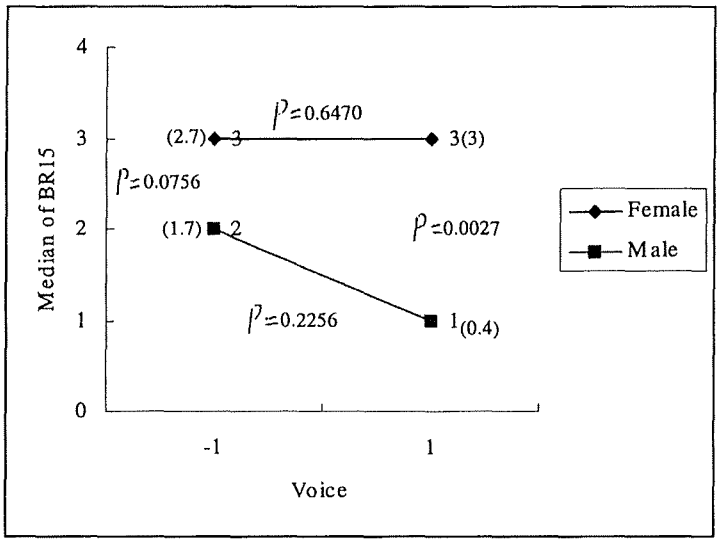
(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)

Interaction plots for bipolar ratings of general feeling at 15 min on gift Web store



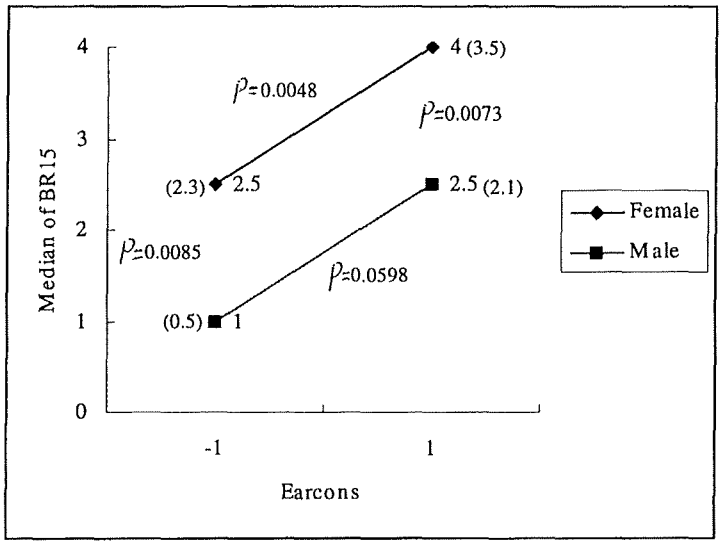
Interaction between effects of gender and effects of music

(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)



Interaction between effects of gender and effects of voice

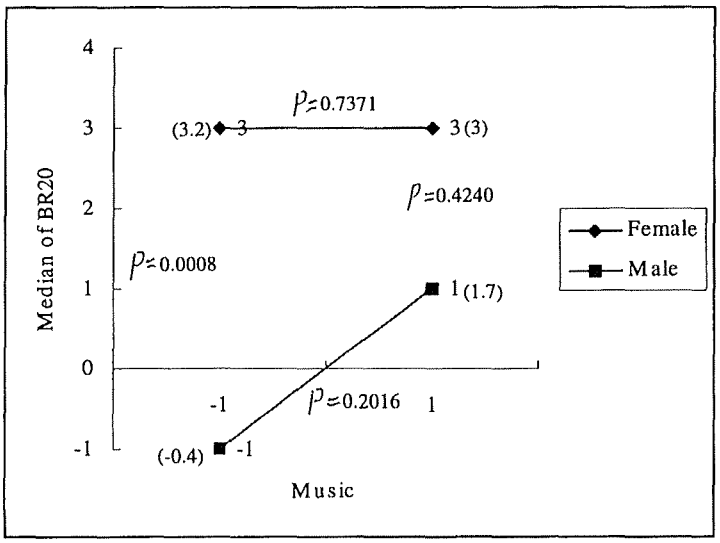
(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)



Interaction between effects of gender and effects of earcons

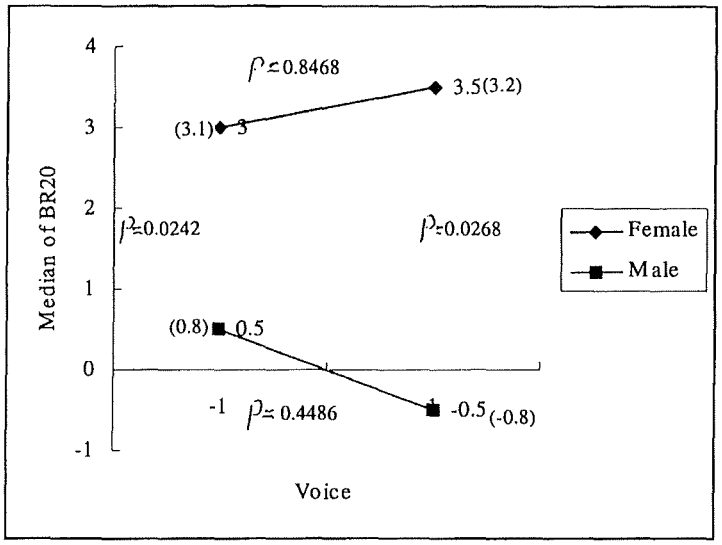
(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)

Interaction plots for bipolar ratings of general feeling at 20 min on gift Web store



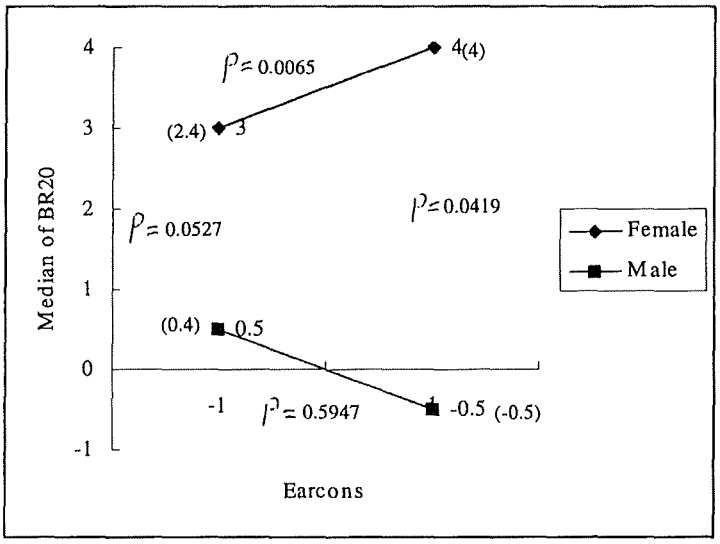
Interaction between effects of gender and effects of music

(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)



Interaction between effects of gender and effects of voice

(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)



Interaction between effects of gender and effects of earcons

(Numbers shown in brackets were the mean values. P values between pairs of conditions were also shown.)

A5.4 Effects tables

Mean of each question for pre-questionnaire in 16 conditions

(-G: female, +G: male, -M: absence of music, +M: presence of music, -V: absence of voice, +V: presence of voice, -E: absence of earcons, +E: presence of earcons)

Conditions	Q1	Q2	Q3	Q4	Q5a	Q6a	Q7	Q8
-G-M-V-E	4.5	3.5	3.8	3.0	2.3	1.2	4.8	3.3
-G-M-V+E	4.5	3.7	4.0	3.2	3.2	1.5	4.5	3.3
-G-M+V-E	4.7	3.3	3.8	3.0	2.8	1.9	4.7	3.8
-G-M+V+E	4.8	4.2	3.3	3.3	2.7	1.2	4.8	2.9
-G+M-V-E	4.8	3.3	4.0	3.0	2.5	1.5	4.3	3.3
-G+M-V+E	5.0	3.7	4.0	3.8	2.8	1.3	5.0	3.7
-G+M+V-E	4.8	4.2	3.5	3.5	2.8	1.8	4.8	2.9
-G+M+V+E	4.2	4.3	3.0	4.3	3.0	1.8	4.7	3.2
+G-M-V-E	4.8	4.3	3.8	4.0	3.2	2.0	5.8	4.2
+G-M-V+E	4.3	3.8	3.5	3.3	2.2	1.3	5.0	3.8
+G-M+V-E	4.5	4.2	4.0	4.0	2.8	1.8	5.0	3.8
+G-M+V+E	4.7	3.7	3.0	3.2	2.7	2.0	4.7	3.5
+G+M-V-E	5.0	4.5	3.5	3.3	3.5	1.2	5.2	3.7
+G+M-V+E	4.3	4.5	3.5	4.0	4.0	1.7	5.8	4.3
+G+M+V-E	4.8	4.5	3.5	3.5	2.8	1.8	5.0	4.0
+G+M+V+E	4.0	4.2	3.0	4.0	2.8	1.2	4.8	2.9

ANOVA table of pleasure questionnaire score on gift Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	412.51	412.51	12.27	0.001
Music	1	173.34	173.34	5.16	0.026
Voice	1	38.76	38.76	1.15	0.286
Earcons	1	157.59	157.59	4.69	0.033
GenderxMusic	1	52.51	52.51	1.56	0.215

GenderxVoice	1	78.84	78.84	2.35	0.130
GenderxEarcons	1	52.51	52.51	1.56	0.215
MusicxVoice	1	0.26	0.26	0.01	0.930
MusicxEarcons	1	58.59	58.59	1.74	0.190
VoicexEarcons	1	102.09	102.09	3.04	0.085
Error	80	2688.83	33.61		
Total	95	3876.91			

ANOVA table of pleasure questionnaire score on mobile phone Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	40.4	40.4	0.94	0.336
Music	1	60.17	60.17	1.41	0.238
Voice	1	0.37	0.37	0.01	0.926
Earcons	1	96.00	96.00	2.25	0.138
GenderxMusic	1	0.37	0.37	0.01	0.926
GenderxVoice	1	150.00	150.00	3.52	0.064
GenderxEarcons	1	63.38	63.38	1.49	0.226
MusicxVoice	1	108.37	108.37	2.54	0.115
MusicxEarcons	1	170.67	170.67	4.00	0.049
VoicexEarcons	1	35.04	35.04	0.82	0.367
Error	80	3412.67	42.66		
Total	95	4327.83			

ANOVA table of arousal questionnaire score on gift Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	297.51	297.51	12.46	0.001
Music	1	0.01	0.01	0.00	0.983

Voice	1	4.59	4.59	0.19	0.662
Earcons	1	17.51	17.51	0.73	0.394
GenderxMusic	1	3.01	3.01	0.13	0.723
GenderxVoice	1	44.01	44.01	1.84	0.178
GenderxEarcons	1	71.76	71.76	3.01	0.087
MusicxVoice	1	0.51	0.51	0.02	0.884
MusicxEarcons	1	6.51	6.51	0.27	0.603
VoicexEarcons	1	14.26	14.26	0.60	0.442
Error	80	1910.17	23.88		
Total	95	2494.24			

ANOVA table of arousal questionnaire score on mobile phone Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	18.37	18.37	0.62	0.434
Music	1	140.17	140.17	4.71	0.033
Voice	1	13.50	13.50	0.45	0.503
Earcons	1	37.50	37.50	1.26	0.265
GenderxMusic	1	0.17	0.17	0.01	0.941
GenderxVoice	1	13.50	13.50	0.45	0.503
GenderxEarcons	1	24.00	24.00	0.81	0.372
MusicxVoice	1	155.04	155.04	5.21	0.025
MusicxEarcons	1	45.37	45.37	1.52	0.221
VoicexEarcons	1	35.04	35.04	1.18	0.281
Error	80	2381.33	29.77		
Total	95	2913.96			

ANOVA table of behavior questionnaire score on gift Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F

Gender	1	263.34	263.34	5.55	0.021
Music	1	102.09	102.09	2.15	0.146
Voice	1	15.84	15.84	0.33	0.565
Earcons	1	147.51	147.51	3.11	0.082
GenderxMusic	1	36.26	36.26	0.76	0.385
GenderxVoice	1	15.84	15.84	0.33	0.565
GenderxEarcons	1	55.51	55.51	1.17	0.283
MusicxVoice	1	5.51	5.51	0.12	0.734
MusicxEarcons	1	23.01	23.01	0.48	0.488
VoicexEarcons	1	225.09	225.09	4.74	0.032
Error	80	3796.83	47.46		
Total	95	4727.74			

ANOVA table of behavior questionnaire score on mobile phone Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	10.01	10.01	0.25	0.621
Music	1	38.76	38.76	0.95	0.332
Voice	1	1.26	1.26	0.03	0.861
Earcons	1	219.01	219.01	5.38	0.023
GenderxMusic	1	2.34	2.34	0.06	0.811
GenderxVoice	1	23.01	23.01	0.57	0.454
GenderxEarcons	1	0.01	0.01	0.00	0.987
MusicxVoice	1	17.51	17.51	0.43	0.514
MusicxEarcons	1	106.26	106.26	2.61	0.110
VoicexEarcons	1	0.84	0.84	0.02	0.886
Error	80	3257.50	40.72		
Total	95	3781.91			

ANOVA table of evaluation questionnaire score on gift Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	356.51	356.51	5.37	0.023
Music	1	380.01	380.01	5.73	0.019
Voice	1	152.51	152.51	2.30	0.133
Earcons	1	380.01	380.01	5.73	0.019
GenderxMusic	1	90.09	90.09	1.36	0.247
GenderxVoice	1	304.59	304.59	4.59	0.035
GenderxEarcons	1	0.09	0.09	0.00	0.970
MusicxVoice	1	0.01	0.01	0.00	0.990
MusicxEarcons	1	58.59	58.59	0.88	0.350
VoicexEarcons	1	162.76	162.76	2.45	0.121
Error	80	5306.50	66.33		
Total	95	7230.99			

ANOVA table of evaluation questionnaire score on mobile phone Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	2.3	2.3	0.02	0.890
Music	1	3.8	3.8	0.03	0.861
Voice	1	3.8	3.8	0.03	0.861
Earcons	1	635.5	635.5	5.20	0.025
GenderxMusic	1	162.0	162.0	1.33	0.252
GenderxVoice	1	348.8	348.8	2.86	0.095
GenderxEarcons	1	6.5	6.5	0.05	0.818
MusicxVoice	1	490.5	490.5	4.02	0.048
MusicxEarcons	1	46.8	46.8	0.38	0.538
VoicexEarcons	1	152.5	152.5	1.25	0.267
Error	80	9767.8	122.1		

Total	95	11932.9			

ANOVA table of satisfaction questionnaire score on gift Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	26.04	26.04	1.82	0.181
Music	1	24.00	24.00	1.68	0.199
Voice	1	1.04	1.04	0.07	0.788
Earcons	1	51.04	51.04	3.57	0.062
GenderxMusic	1	3.37	3.37	0.24	0.628
GenderxVoice	1	10.67	10.67	0.75	0.390
GenderxEarcons	1	0.17	0.17	0.01	0.914
MusicxVoice	1	3.37	3.37	0.24	0.628
MusicxEarcons	1	22.04	22.04	1.54	0.218
VoicexEarcons	1	88.17	88.17	6.17	0.015
Error	80	1143.67	14.30		
Total	95	1415.83			

Main effects table of satisfaction questionnaire score on gift Web store

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	16	15	0.076
Music	16	15.5	0.076
Voice	16	15	0.456
Earcons	9.5	13	0.284

ANOVA table of satisfaction questionnaire score on mobile phone Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F

Gender	1	2.34	2.34	0.20	0.655
Music	1	0.26	0.26	0.02	0.882
Voice	1	6.51	6.51	0.56	0.457
Earcons	1	55.51	55.51	4.77	0.032
GenderxMusic	1	2.34	2.34	0.20	0.655
GenderxVoice	1	46.76	46.76	4.01	0.048
GenderxEarcons	1	3.01	3.01	0.26	0.613
MusicxVoice	1	98.01	98.01	8.41	0.005
MusicxEarcons	1	19.26	19.26	1.65	0.202
VoicexEarcons	1	19.26	19.26	1.65	0.202
Error	80	931.83	11.65		
Total	95	1218.99			

Main effects table of satisfaction questionnaire score on mobile phone Web store

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	15	15	0.734
Music	15	15	0.734
Voice	15	14.5	0.807
Earcons	13	15	0.641

ANOVA table of heart rate elevation on gift phone Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	0.51	0.51	0.06	0.807
Music	1	41.34	41.34	4.88	0.030
Voice	1	2.34	2.34	0.28	0.600

Earcons	1	10.01	10.01	1.18	0.280
GenderxMusic	1	4.59	4.59	0.54	0.464
GenderxVoice	1	0.01	0.01	0.00	0.972
GenderxEarcons	1	12.76	12.76	1.51	0.223
MusicxVoice	1	1.26	1.26	0.15	0.701
MusicxEarcons	1	17.51	17.51	2.07	0.155
VoicexEarcons	1	7.59	7.59	0.90	0.347
Error	80	678.17	8.48		
Total	95	850.99			

ANOVA table of heart rate elevation on mobile phone Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	11.34	11.34	0.68	0.411
Music	1	11.34	11.34	0.68	0.411
Voice	1	12.76	12.76	0.77	0.383
Earcons	1	3.76	3.76	0.23	0.635
GenderxMusic	1	6.51	6.51	0.39	0.533
GenderxVoice	1	6.51	6.51	0.39	0.533
GenderxEarcons	1	1.26	1.26	0.08	0.784
MusicxVoice	1	1.26	1.26	0.08	0.784
MusicxEarcons	1	0.09	0.09	0.01	0.940
VoicexEarcons	1	0.26	0.26	0.02	0.901
Error	80	1327.50	16.59		
Total	95	1519.99			

ANOVA table of measured shopping time on gift phone Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	58.59	58.59	1.04	0.310

Music	1	33.84	33.84	0.60	0.440
Voice	1	19.26	19.26	0.34	0.560
Earcons	1	225.09	225.09	4.01	0.049
GenderxMusic	1	0.51	0.51	0.01	0.924
GenderxVoice	1	0.01	0.01	0.00	0.989
GenderxEarcons	1	0.09	0.09	0.00	0.968
MusicxVoice	1	250.26	250.26	4.46	0.038
MusicxEarcons	1	147.51	147.51	2.63	0.109
VoicexEarcons	1	0.51	0.51	0.01	0.924
Error	80	4490.83	56.14		
Total	95	5418.74			

Main effects table of measured shopping time on gift Web store

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	15.5	13.5	0.411
Music	16	13	0.411
Voice	14.5	14	0.448
Earcons	16	13	0.570

ANOVA table of measured shopping time on mobile phone Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	4.17	4.17	0.07	0.794
Music	1	100.04	100.04	1.64	0.204
Voice	1	57.04	57.04	0.94	0.336
Earcons	1	48.17	48.17	0.79	0.376

GenderxMusic	1	0.17	0.17	0.00	0.958
GenderxVoice	1	16.67	16.67	0.27	0.602
GenderxEarcons	1	3.38	3.38	0.06	0.814
MusicxVoice	1	18.38	18.38	0.30	0.584
MusicxEarcons	1	4.17	4.17	0.07	0.794
VoicexEarcons	1	10.67	10.67	0.18	0.677
Error	80	4870.00	60.88		
Total	95	5286.96			

Main effects table of measured shopping time on mobile phone Web store

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	15	14.5	0.545
Music	15	14.5	0.545
Voice	15	13.5	0.304
Earcons	15.5	13	0.467

ANOVA table of time perception error on gift Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	24.00	24.00	0.49	0.485
Music	1	0.37	0.37	0.01	0.930
Voice	1	2.67	2.67	0.05	0.816
Earcons	1	266.67	266.67	5.46	0.022
GenderxMusic	1	0.67	0.67	0.01	0.907
GenderxVoice	1	3.37	3.37	0.07	0.793

GenderxEarcons	1	18.38	18.38	0.38	0.541
MusicxVoice	1	0.17	0.17	0.00	0.954
MusicxEarcons	1	104.17	104.17	2.13	0.148
VoicexEarcons	1	3.38	3.38	0.07	0.793
Error	80	3909.67	48.87		
Total	95	4627.63			

ANOVA table of time perception error on mobile phone Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Gender	1	51.04	51.04	1.29	0.259
Music	1	1.50	1.50	0.04	0.846
Voice	1	26.04	26.04	0.66	0.419
Earcons	1	70.04	70.04	1.78	0.186
GenderxMusic	1	30.38	30.38	0.77	0.383
GenderxVoice	1	37.50	37.50	0.95	0.332
GenderxEarcons	1	42.67	42.67	1.08	0.301
MusicxVoice	1	2.04	2.04	0.05	0.821
MusicxEarcons	1	9.38	9.38	0.24	0.627
VoicexEarcons	1	6.00	6.00	0.15	0.698
Error	80	3155.33	39.44		
Total	95	3619.33			

Main effects table of bipolar ratings of general feeling on gift Web store at 1 min (N=96)

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	3	2	0.004

Music	2	2	0.004
Voice	2	2	0.491
Earcons	2	2.5	0.385

Main effects table of bipolar ratings of general feeling on gift Web store at 5 min (N=94)

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	3	2	0.046
Music	2	3	0.046
Voice	2	3	0.459
Earcons	2	3	0.103

Main effects table of bipolar ratings of general feeling on gift Web store at 10 min (N=72)

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	3	2	0.005
Music	2	3	0.005
Voice	3	3	0.054
Earcons	2	3	0.334

Main effects table of bipolar ratings of general feeling on gift Web store at 15 min (N=42)

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	3	1	0.001
Music	2	3	0.001
Voice	2	3	0.522
Earcons	2	3	0.785

Main effects table of bipolar ratings of general feeling on gift Web store at 20 min (N=25)

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	3	0	0.001
Music	2	3	0.001
Voice	3	2	0.496
Earcons	2	4	0.693

Main effects table of bipolar ratings of general feeling on mobile phone Web store at 1 min (N=96)

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	2	2	0.308
Music	2	2	0.308
Voice	2	2	0.629
Earcons	2	2	0.353

Main effects table of bipolar ratings of general feeling on mobile phone Web store at 5 min (N=93)

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	2	2	0.746
Music	2	2	0.746
Voice	2	2	0.228
Earcons	2	2	0.097

Main effects table of bipolar ratings of general feeling on mobile phone Web store at 10 min (N=70)

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	2	2	0.561
Music	2	3	0.561
Voice	2	2.5	0.443
Earcons	2	2.5	0.134

Main effects table of bipolar ratings of general feeling on mobile phone Web store at 15 min (N=45)

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	2	2	0.505
Music	2	2	0.505
Voice	1.5	2	0.843
Earcons	2	2.5	0.387

Main effects table of bipolar ratings of general feeling on mobile phone Web store at 20 min (N=26)

(–Median: median calculated at low level of one factor; +median: median calculated at high level of the factor)

Independent Variables	-Median	+Median	Significant Level (P value)
Gender	2	1	0.111
Music	1.5	2	0.111
Voice	2	2	0.530
Earcons	2	2	0.333

A5.5 Kruskal-Wallis test result on bipolar ratings of general feeling.

Ranks

	TIME	N	Mean Rank
G_BR	1.00	96	155.92
	5.00	94	168.94
	10.00	72	177.88
	15.00	42	158.54
	20.00	25	158.82
	Total	329	
P_BR	1.00	96	153.83
	5.00	93	173.46
	10.00	70	180.33
	15.00	45	162.18
	20.00	26	145.94
	Total	330	

Test Statistics[a,b]

	G_BR	P_BR
Chi-Square	2.796	5.187
df	4	4
Asymp. Sig.	.593	.269

a. Kruskal Wallis Test

b. Grouping Variable: TIME

Appendix To Chapter 6

A6.1 Reliability test on questionnaires

Reliability test on pleasure questionnaire on gift Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
G_Q1_P	7.3125	15.1625	-.0380	.8093
G_Q3_P	7.1875	10.5625	.5709	.6844
G_Q5_P	7.2500	11.0000	.5002	.7055
G_Q7_P	7.3750	11.9833	.3563	.7450
G_Q9_P	7.0000	10.4000	.7474	.6420
G_Q11_P	7.0000	8.5333	.7771	.6067

Reliability Coefficients

N of Cases = 16.0 N of Items = 6

Alpha = .7463

Reliability test on evaluation questionnaire on gift Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
G_E_Q1	7.0000	17.6000	.5606	.8574
G_E_Q2	6.6250	21.3167	.4940	.8514
G_E_Q3	6.8125	18.0292	.8025	.8070
G_E_Q4	6.7500	22.2000	.6959	.8401
G_E_Q5	7.0625	21.3958	.6241	.8389
G_E_Q6	6.4375	17.5958	.6471	.8349
G_E_Q7	6.9375	19.1292	.7839	.8139

Reliability Coefficients

N of Cases = 16.0 N of Items = 7

Alpha = .8554

Reliability test on pleasure questionnaire on mobile phone Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
P_Q1_P	5.8125	29.6292	.6949	.8895
P_Q3_P	6.4375	30.7958	.5575	.9106
P_Q5_P	6.8125	24.5625	.8697	.8626
P_Q7_P	6.4375	30.7958	.6597	.8943
P_Q9_P	6.1250	28.5167	.9110	.8606
P_Q11_P	6.1875	30.1625	.7604	.8813

Reliability Coefficients

N of Cases = 16.0 N of Items = 6

Alpha = .9016

Reliability test on evaluation questionnaire on mobile phone Web store

RELIABILITY ANALYSIS - SCALE (ALPHA)

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
P_E_Q1	.3750	43.0500	.7216	.8971
P_E_Q2	.3750	48.2500	.6762	.8966
P_E_Q3	-.0625	42.9958	.8681	.8733
P_E_Q4	-.0625	54.5958	.6087	.9046
P_E_Q5	.7500	49.2667	.7661	.8878
P_E_Q6	-.4375	49.5958	.6429	.8999
P_E_Q7	-.1875	48.5625	.8638	.8795

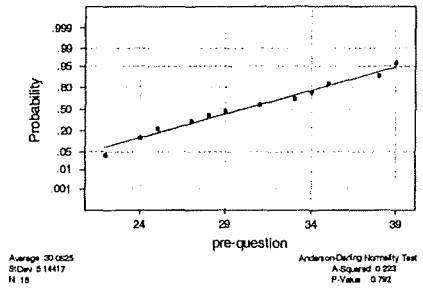
Reliability Coefficients

N of Cases = 16.0 N of Items = 7

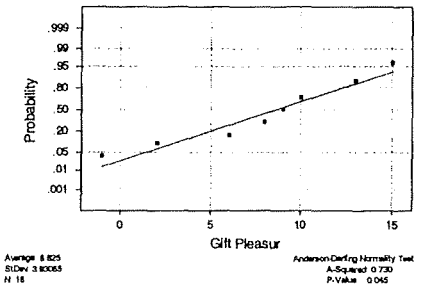
Alpha = .9057

A6.2 Normality test plot of questionnaires

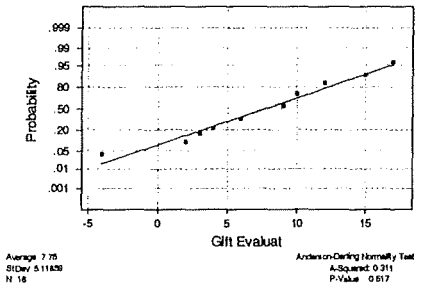
On pre-questionnaire score



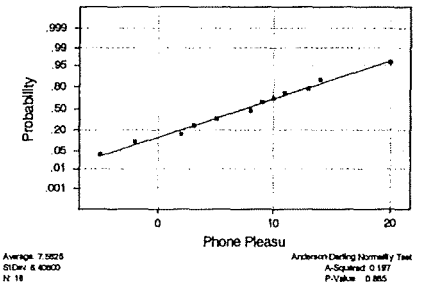
On pleasure questionnaire score upon gift Web store



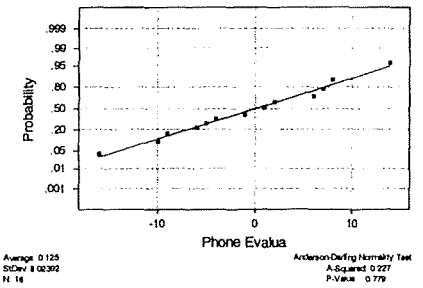
On evaluation questionnaire score upon gift Web store



On pleasure questionnaire score upon mobile phone Web store

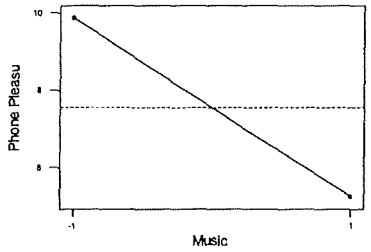


On evaluation questionnaire score upon mobile phone Web store

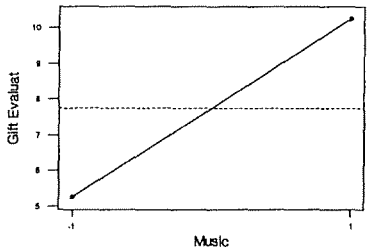


A6.3 Main effect plots

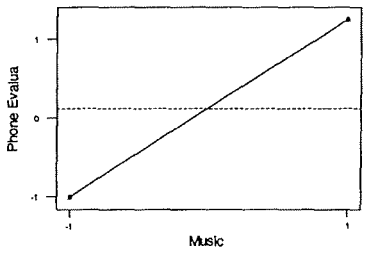
Pleasure questionnaire score on mobile Web store



Evaluation questionnaire score on gift Web store



Evaluation questionnaire score on mobile phone Web store



A6.4 Effects tables

ANOVA table of pleasure questionnaire score on mobile phone Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Music	1	85.56	85.56	2.26	0.155
Error	14	530.37	37.88		
Total	15	615.94			

ANOVA table of evaluation questionnaire score on mobile phone Web store

Source	DF	Sum of Squares	Mean Square	F Value	Pr>F
Music	1	20.25	20.25	0.30	0.593
Error	14	945.50	67.54		
Total	15	965.75			