A New Model for Cross-cultural Web Design

A thesis submitted for the degree of Doctor of Philosophy

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Aug, 2008

Acknowledgements

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Abstract

People from different cultures use web interface in different ways, expect different visual representation, navigation, interaction, mental model, and layouts etc., and have different communication patterns and expectation. In the context of globalisation, web localisation becomes a powerful strategy to acquire an audience in a global market. Therefore, web developers and designers have to make adaptations to fit the needs of people from different cultures, and the way cultural factors are integrated into web interface design needs to be improved. Most previous research lacks an appropriate way to apply cultural factors into web development. No empirical study of the web interface has been carried out to support the cross-cultural web design model. It is noted that no single model can support all cross-cultural web communication but a new model is needed to bridge the gap and improve the limitations.

Thus the research aim was to build a new model of cross-cultural web design to contribute to effective communication.

Following an extensive literature review, a local web audit was conducted, then a series of experiments with users to gather and evaluate data and build and validate the new model.

A new model, based on a study of British and Taiwanese users, was formulated and validated demonstrating that content and message remain the core of web design but the performance of the selected users is influenced by the cultural dimension and cultural preferences and this, in turn impacts on the effectiveness of the web communication. For the British user sample, ease of using the website was seen to be strongly related to desirability. Taiwanese users showed preference for visual pleasure but no relationship between efficient performance and desirability.

The resultant model contributes to the knowledge of how to design effective web interfaces for British and Taiwanese cultures and is replicable for the purpose of comparing approaches to designing for other cultures.

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Chapter 1 Introduction

1.1 Background & Motivation

1.1.1 The age of Globalisation - Think global, Act local

The world is becoming a global marketplace. Globalisation affects computer-based communication and this is particularly obvious in web design applications, which can be accessed globally. According to Smith (2003: p.65), "In the e-commerce environment, the web makes a global market accessible to even the smallest company, however, for international websites to be successful, many organisations are now beginning to understand, and address the needs of a culturally diverse users base." In e-commerce, the correlation between success and the effort that companies adapt their websites to local markets was reported from a survey by World trade (2000). As the article summed up, incorporating the principle of "think globally, act locally" into product development is not simple, but the rewards can be large.

Under the context of globalisation, Hofstede (1999: p.147) suggests that web developers can accommodate the diverse cultural market, "Localisation, a strategy that specifically addresses cultural differences, is an alternative to globalisation."

The web design guru (Marcus, 2000: p.34) also echoes Hofstede that, "In a global economy...companies that want to do international business on the web should consider the impact of culture on the understanding and use of web-based communication, content, and tools."

Google is a good example of an international company adapting their web interface design in Taiwan and Hong Kong to fit the need of specific cultures, in order to extend their global market. According to PC World on-line news (2007), Google set up testing in the new homepage, "igoogle", for Taiwan and Hong Kong. The new homepage is embedded with different attributes such as adding a row of icons above the search bar and a row of animated icons below it. This new design for its South Korea website was announced by Google Chairman and CEO Eric Schmidt on May, 2007 at the Seoul Digital Forum.

The site's new design is very different, compared with Google's conventional identity of simplicity, directness, and minimalism. It surprised some people because Google usually formulates their brand image as minimalism. "We're actually now experimenting with trying new kinds of homepages, for example in Korea, Taiwan and Hong Kong, that are a completely different type than we've tried before on our U.S. site as well as our European sites." said Brin (2007), a co-founder of Google and the company's president of technology, speaking to investors during a conference. He added, "We think the new design will be more appropriate for the local cultures, and their context, and their broadband connections, which, for example, in Korea, are extraordinarily fast." It indicates that the response of Taiwan, Hong Kong, South Korea users to the new site designs had been quite positive.

However, it addresses the interesting and important issue that some cultures do not react as positively to minimalism as the North American and European users response to Google. It implies that audiences from different cultures have different requirements, expectations, mental models, and preferences. Google pays attention to the issue, and

carries out the user test to fit specific cultures. Google puts the principle of "think globally, act locally" in action because its worth is recognised.

1.1.2 Culture, globalisaton, internationalisation, and localisation

When web-based design is discussed in an international context, terms such as globalisation, internalisation, and localisation are important. Therefore, the following section presents a brief introduction to these terms. Baumgartner (2003: p.7) defines globalisation as "an umbrella term that refers to all the issues involved in designing or modifying products for audiences worldwide...we can also say that globalisation combines all aspects of internationalisation and localisation."

Internationalisation refers to the process of creating a base design that can be modified for audience from different countries. Baumgartner (2003: p.7) declares that, "An internationalised product is one with functionality, terminology, and design elements that can be localised for specific countries or cultures." According to Sun's (2003) definition, internationalisation refers to the process of designing an application which can be adapted to different markets worldwide without engineering changes.

Localisation refers to the process of adapting an internationalised product to make it usable in a particular region, culture, or market. In true localisation, it not only considers graphics, colours, symbols, terminology, date/time/currency formats and many other technical aspects of a product, but also takes into account language, custom, culture, and characteristics of the target culture market. Marcus (2000) explains that localisation is often misunderstood as translating an internationalised product into the language and text of a specific culture; however, localisation also includes making

adaptations to fit the needs of target culture in metaphor, navigation, mental model, interaction, appearance and so on.

Based on Gribbons's (1997) study, usually two sub-level need to be carried out in the localisation process. The surface level: modifying the attributes of the web artifact including translation, dates, punctuation, weights, measurements, addresses, currency, and so on to reflect the conventions and needs of the target users. The cultural level: modifying the visual representation such as symbols, images, icons, colours, structure, layout, functionality and communication patterns to accommodate the target users. This research will focus on cultural level.

1.1.3 The current dominant model

Evers (2002: p.14) states that, "Historically, the computer industry was predominantly developed in North America and, as a result, interfaces were originally designed with North American users in mind." Indeed, the majority of current web-based applications assume a one-size-fits-all model (North American model), whereas people from different cultures interact and communicate according to their cultural context. North American models do not necessarily fit the needs of people from other cultures.

Jagne & Smith-Atakan observed the trend and echo that, "Computer software and the Internet were predominately a North American skilled white male market It has now become a worldwide commodity and the market has now grown to include all nations, creeds, gender and task use" (2006: p.299). Now, many non-English users have expanded their internet activities and have increased their utilisation of internet. If companies seek to expand globally, there is growing force to provide appropriate

products and services for diverse audiences (non-English users), which are increasing.

Therefore, when web-based artefact developers and designers want to localise their

products, they need to take the context of the target culture into account.

In the past, web developments were aligned with cognition theory and computer

technology. Now more companies are aware of the importance of using localisation to

extend their customers in the globalisation age. However, the research, with regard to

applying cultural issues to web design development, needs to be considered deeper and

be applied properly into the web design. There is a need to improve the limitations of

the current cultural approaches and the way that the current cultural models are applied

into web design.

1.1.4 Developing a web based on target culture context

"Culture, in term of web globalisation, means how people from certain cultural

orientations view and interpret specific images and messages" (Sheridan, 2003).

People from different cultures use web interfaces in different ways, expect different

graphics, colours, symbols, layouts, and have different mental models. Thus, in today's

increasingly global market, many designers are faced with the tasks to make sure that

their product design fits the needs of different cultures. International web-based design

should reflect the cultural orientation of their target audience and the impact that culture

has on people's behaviour should be taken into account.

Cultural diversity makes it impossible for designers to depend on instinctive knowledge

or personal experience, therefore, many researchers have identified the need to explore

cultural issues in web interface design. For example, Marcus & Gould (2000) pointed

out that web designers need to do much planning, research, analysis, design, evaluation, documentation, and training to deeply comprehend the requirements of the user, market, and business. They also added that, "As they carry out all of these tasks, however, they would do well to consider their own cultural orientation and to understand the preferred structures and processes of other cultures. This attention would help them to achieve more desirable global solutions or to determine to what extent localised, customised designs might be better than international or universal ones."

Indeed, people from different cultures use web interface in different ways, expect different visual representation such as typography, graphics and layouts, and have different expectation and behavioural patterns. Therefore, the web developers and designers have to make adaptations to fit the needs of people from different cultures, but the way culture is integrated to web interface design needs to be improved.

1.1.5 Motivation

Based on the globalisation context, localisation becomes a powerful strategy to acquire audience in a global market and more companies are becoming aware that it is crucial to incorporate the cultural issues into the product to meet the requirements of the diverse audience.

But the way culture is integrated to web design still needs to be further considered and improved. There are not enough assessments on the cultural preferences of web interface design in the non-English region. So this cross-cultural web design model is proposed, and the local web audit is conducted to investigate the culturally preferred elements across British and Taiwanese cultures. Thus, the web experiment is established,

and the usability test is set up to support the claim of the model. The aim is to bridge the

gap and contribute to the need of localisation and help the web developers and designers

to render the web product culturally appropriate.

1.2 The limitations of the previous research

The way culture is incorporated into web interface design needs to be improved. Most research lacks an appropriate way to apply culture into the web development. Many web-based design guidelines are too general and do not provide sufficiently effective strategies on how to apply cultural models in an appropriate way for a web artefact design.

According to Zahedi et al. (2001: p.83) "No single model of cultural understanding is sufficient for communicating effectively with all web audiences."

Hall (2001) also pointed out two reasons why cultural models could not be applied efficiently. One is that the attributes of existing cultural models are descriptive, and not prescriptive, so they cannot be applied deductively. It would be a mistake if the web designers just applied the attributes from the current cultural models and then deduce how the target audience would respond to the web technology. The other reason is that the web designers apply the current cultural models that are designed for another purpose

Marcus (2001) indicated that some anthropologists have already built up the cultural theories and cultural models, but these theories and models are not applied appropriately and effectively into the web design community. Because the models are conducted to meet their own purposes, they are not always compatible with all web design. Hofstede's (1999) suggestion may inspire us. Since globalisation and localisation are two of the predominant ways for a company who wants to develop their product in a global market, some problems remain. Hofstede (1999: p.148) provides a solution for

this problem: "A team of people, particularly a multicultural and multi-linguistic team that work together to figure out creative approaches to cultural differences is perhaps the best strategy today." In this research, it is proposed that if the web developer has a design team to engage the target culture directly, observe the target culture preferences, integrate the existing cultural model, and then set up the cultural model to meet their own target culture, an innovative and creative solution could materialise.

1.3 Key Question

How can culture factors be incorporated into web design to facilitate communication?

1.4 Aim & Objectives

The aim of this research is to build up the model of cross-cultural web design to contribute to the effective communication on the web. This research seeks to bridge the gap and improve the limitations. A theoretical cross-cultural model is proposed, a local web audit is then conducted, and web experiments involving data collections and analysis are established to validate the proposed theoretical model.

A cross-cultural study will be undertaken using Taiwanese and British culture to test the model. The results suggest criteria for web cultural localisation and will be analysed to apply the model to other cultures.

The objectives of this research are presented as follows:

● Develop a research framework to explore how culture factors can be incorporated into web interface design to facilitate the effective communication.

● Validate the theoretical model of cross-cultural web design.

● Present implications that emerge from the research for future web design which involve cross-cultural issues.

● To explore how users' culture influences their behaviour and practices.

● To build criteria for designers and web developers when they intend to localise their artefact to meet the need of a specific region or culture.

1.5 Research scope

The scope of this research encompasses the national identity of two cultures. Participants from two countries, Taiwan and the UK, were recruited for this research.

1.6 Research framework

Figure 1.1 Research framework

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                      ┌─────────────────────────┐
                      │   Research Background    │
                      └─────────────────────────┘
                                  │
                      ┌─────────────────────────┐
                      │   Research Motivation    │
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                      ┌─────────────────────────┐
                      │      Research Aim        │
                      └─────────────────────────┘
                                  │
                      ┌─────────────────────────┐
                      │  Research Methodology    │
                      └─────────────────────────┘
                                  │
                      ┌─────────────────────────┐
                      │   Secondary Research     │
                      │   (Literature Review)    │
                      └─────────────────────────┘
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Research and theories related to web communication	Culture and cultural model	Current approaches for cross cultural web design	Web usability

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                      ┌─────────────────────────┐
                      │      Main finding        │
                      └─────────────────────────┘

      ┌─────────────────────────────────────────────────────┐
      │ Proposing a  theoretical model of cross-cultural Web design │
      └─────────────────────────────────────────────────────┘

                      ┌─────────────────────────┐
                      │   Primary  Research      │
                      └─────────────────────────┘

      ┌─────────────────────────────────────────────────────┐
      │                 Local website Audit                  │
      │ "Cultural Markers" approach and literature survey is adopted │
      └─────────────────────────────────────────────────────┘

           ┌──────────────────────────────────────┐
           │     Results of the local websits audit │
           │   Culturally preferred design elements │
           └──────────────────────────────────────┘

        ┌────────────────────────────────────────────┐
        │          Production of web prototype        │
        │ embedded with culturally preferred design elements │
        └────────────────────────────────────────────┘

   ┌───────────────────────────────────────────────────────────┐
   │                      Web experiment                        │
   │ recruiting British and Taiwanese users to participate usability test │
   └───────────────────────────────────────────────────────────┘
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Task execution	Questionnaire	Observation	Evaluation of the effective web communication

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                      ┌─────────────────────────┐
                      │      Data analysis       │
                      └─────────────────────────┘

      ┌─────────────────────────────────────────────────────┐
      │  Validating theoretical cross-cultural Web design model │
      └─────────────────────────────────────────────────────┘

                  ┌──────────────────────────────┐
                  │  Cross-cultural web design model │
                  └──────────────────────────────┘

                  ┌──────────────────────────────┐
                  │  Limitations and future research │
                  └──────────────────────────────┘

                      ┌─────────────────────────┐
                      │      Suggestion          │
                      └─────────────────────────┘
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1.7 Outline of the research

There are nine chapters in this thesis. The structure of the chapters are described below:

Chapter 1 Introduction:

This chapter presents an overview of the research background, motivation, aim & objectives, research scope, as well as the research framework.

Chapter 2 Literature Review:

This provides the analytical review of communication theories, visual communication principles and concepts, web usability and cultural influence, cultural theories and current approaches for cross-cultural Web design, as well as the existing cultural models, which are related to this research. The findings are eventually presented, and the gap and limitations from reviewing the previous research are discussed.

Chapter 3 Proposing a theoretical cross-culture Web design model:

This elaborates how a theoretical cross-cultural Web design model is proposed. In this chapter, cultural studies, cultural design preferences approach, and existing cultural web models, are reviewed and discussed. Based on the limitations of the previous study review, a new theoretical cross-culture model is formulated.

Chapter 4 Methodology:

The research methodology is illustrated in this chapter and consists of six stages:

Stage 1 and 2: Comprehension in the previous research involving the accommodation of cultural issues into Web design and the related theories such as cultural models, cultural markers approach, communication theories, and web usability. Further, a key question and two related questions are formulated.

Stage 3: Based on the literature review, and by criticising the existing cultural models,

improving the limitations of these models, and bridging their gaps, the theoretical model is formulated.

Stage 4: In this stage, it is proposed that different countries' preferences differ across cultures (e.g., Taiwan and the UK). The local website audit is established to find the different preferences across British and Taiwanese cultures, and identify the cultural markers (culturally preferred web interface design characteristics) which include eight aspects, namely, visual representation, multimedia, colour, layout, navigation, links, content & structure, and language. The result of this audit will be applied in the websites experiment.

Stage 5: In this stage, it is proposed that the web would be more effective if it reflected the users' culture. The culturally preferred design elements are embedded in these websites. British and Taiwanese subjects are recruited to interact and navigate in the websites set up by the author. The website experiment is conducted to test the propositions, and web usability is evaluated. This web experiment involves data collection, data analysis, and then the results and implications are integrated to validate the proposed model.

Stage 6: In this stage, the data, results and implications from the local website audit and web experiment are analysed, interpreted and integrated to validate the theoretical cross-culture web design model.

Chapter 5 Local website Audit:

This chapter introduces why the local website audit is required, discusses the hypothesis the "preferences for web design elements differ across cultures" and web design elements to access effective communication. This chapter also presents the method applied in this audit, culture categories, the procedure of the local website audit

including the scope of websites, and identification of web design characteristics and culturally preferred design elements. Finally, the findings, discussions and implications are presented.

Chapter 6 The web experiment: recruiting British and Taiwanese participants for the usability test

In this chapter, it is assumed that if the web interface design can reflect the users' culture, it can be more effective in communication. Based on the outcome of the local website audit, the cultural preferences of Taiwan and UK are found to be different, and the culturally preferred design elements incorporating the cultural dimension are thus embedded into the experimental websites. Four websites are set up and British and Taiwanese subjects are recruited to participate in the web experiment. The participants are required to carry out the assigned tasks, interact and navigate within the websites. The usability test is conducted in this web experiment, in order to evaluate the effectiveness of web communication. Finally, data are collected, analysed, and interpreted.

Chapter 7 Validating theoretical cross- cultural Web design model

The proposed theoretical cross-cultural Web design model is validated by analysing, interpreting, and integrating the data, results and implications from the local website audit and web experiment.

Chapter 8 Conclusion and contributions

The findings and implications are discussed and the contributions of this research are presented.

Chapter 9 Limitations and future research

The limitations and future research are presented in this chapter.

Chapter 2 Literature Review

2.1 Introduction

This chapter reviews the theories and the previous research relating to how cultures affect web interface design. The theories and research are related to different professional areas such as anthropology, human computer interaction, psychology, and communication studies. In this chapter, culture and cultural models from anthropologists, existing approaches for cross-cultural web design, theories and research that are related to web communication, as well as web usability, will be reviewed. To understand and diagnose the problems of how cultural factors are incorporated into web interface design, it is necessary to look at previous theories and research to understand their limitations and strengths.

2.2 Cultural studies and the approaches for cross-cultural web design

2.2.1 What is culture?

The meaning of the culture is very complex and applied in lots of different ways among many professions. Presenting the overview of all the culture definitions is not the purpose of this research. The usefulness of culture definition and the current cultural models in addressing cross-cultural difference will be presented and discussed in this section.

Trompennaars and Hampden-Turner (1997: p.6) defined culture as "the way in which a group of people solves problems and reconciles dilemmas." Culture is "the set of shared attitudes, values, goals, and practices..." (Webster, online). In addition, Del Galdo (1996: p. 78) states, "Culture can also be affected by nationality, language, history, and level of technical development." Furthermore, Sheriden (2003) defines, "culture, in terms of web globalisation, means how people from certain cultural orientations view and interpret specific images and messages." Evers (2002: p.21) defines it as, "Culture shapes the way people behave, view the world, express themselves and think. It is formed by historical experience, values, traditions, and surroundings". This suggests that the world is understood by people based on the context of culture. The way of people's behaviour, comprehension, expression and interaction is accumulated by culture.

After reviewing many different definitions of culture and, based on the aim of this research (constructing the model of cross-cultural web design to contribute to the effective communication), this research defines culture as the collective of specifiable signs, symbols, artefacts, values, behaviours, practices, conventions, beliefs, and norm which represent a cluster of people.

Many web design researchers note that culture play a crucial part in web communication. Jaimes (2006: p.12) states, "Culture plays an important role in human-human communication because the way we generate signals and interpret symbols depends entirely on our cultural background. Multimedia systems should therefore use cultural cues during interaction." In addition, Marcus & Gould (2000: p.34) adds, "Companies that want to do international business on the web should consider the impact of culture on the understanding and use of web-based communication, content, and tools."

The following four sections present cultural dimension models and the current approaches to cross-cultural Web design. Cultural dimension models that seek to measure different cultures according to many cultural factors or variables. Patterns of thinking and behaviours which can distinguish one culture from another are defined by some researchers and the patterns are collected and categorised into a cultural dimension model. Three approaches are described as follows. The first one is the global interface design guidelines. The second approach focuses on cultural design preferences, which means that different cultures will prefer cultural signs or symbols. The third approach is the existing cultural web models.

2.2.2 Cultural dimension model

Cultural dimension models attempt to measure and compare different cultures using a number of cultural factors. Some researchers have studied culture and analysed the impact of culture and present classical theories. Hofstede's cultural dimensions have been applied to many web design research. Hall (1990), Victor (2003), and Trompenaars and Hampden-Turner (1997) have discussed the problem of cross-cultural issues on the web. The most cited cultural dimensions model is Hofstede's (2005) five dimension model. The other developed culture dimension models that will be discussed are Trompenaars and Hampden-Turners' (1997) seven dimension model and Hall's (1990) cultural model (communication pattern). These cultural dimension models are presented next.

2.2.2.1 Hofstede's cultural model

The Dutch anthropologist Hofstede examined IBM employees in 53 countries from 1978 to 1983. He defines patterns of differences and similarities among the replies of employees through statistical analysis of many valid data. He formulated the five dimension culture theory from analysing these data. The dimensions are power distance, collectivism vs. individualism, femininity vs. masculinity, uncertainty avoidance, long-term vs. short-term time orientation. Many web design researchers such as Marcus & Gould (2000), Sheridan (2001), Smith et al. (2004), and Simon (2001), apply Hofstede's cultural dimension model to develop their research.

Hofstede (2005) states that everyone carries their own patterns of thinking, feeling, behaviour which are accumulated from their life time, mostly learned from childhood. He defines the patterns of feeling, thinking, and acting mental programs, and these vary as much as the social environments in which they were acquired. As he stated (2005: p.4), "Culture is always a collective phenomenon, because it is at least partly shared with people who live or lived within the same social environment, which is where it was learned. Culture consists of the unwritten rules of the social game. It is the collective programming of the mind that distinguishes the members of one group or category of people from others."

Hofstede (2005) defines culture as patterns of feeling, thinking and acting that are established in people's childhoods. The cultural differences manifest themselves in a culture's choice of symbols, heroes, rituals, and values. Hofstede (2005) explains symbols, such as texts, images and body language, which convey specific meanings that can be recognised by a group of people who share the culture. He defines heroes as persons, real or imaginary, who possess the highly revered attributes and are respected within a culture and are regarded as models for behaviour. For Hofstede (2005: p.8), rituals are, "Collective activities, technically superfluous to reaching desired ends, but which within a culture are considered as socially essential." For instance, the ways of greeting, showing respect to people, and religion ceremonies are rituals. Finally, the central part of culture is formulated by values, "Values are broad tendencies to prefer certain states of affairs over others. Values are feelings with an arrow to it: a plus and a minus side." (Hofstede, 2005: p.8)

In terms of localisation, culture refers to how the users from a target culture view and respond to visual representation and information in relation to their patterns of thinking, behaviours, expressing themselves, which are accumulated from their childhood.

According to Hofstede's (2005) theory, culture can be defined as the accumulation of symbols, rituals, behaviours, customs, norms and values that distinguish a society. Symbols, heroes, rituals and values are four key terms of culture, values are the core of culture, and these terms can be applied by designers to formulate an approach to web communication.

• **Collectivism and individualism dimension**

This refers to the extent to which the individuals incorporate with the group. Collectivist cultures emphasise the benefits of working in a social group. Collectivist cultures value training, skills, and physical condition, and they value harmony more than truth in family relations, using shame to achieve goals and to save face. On the other hand, individualistic cultures value personal time, freedom and truth in their family relations, and pursue the goals by guilt (Marcus & Gould, 2000). Collectivist cultures (e.g., Taiwan and China) tend to prioritise group welfare over the individual's target where the achievement of an individual is not regarded as important as the accomplishment of the group, and believe in group relationship where loyalty is dominant. Individualistic cultures (i.e. USA, Australia) are inclined to lose ties, where everyone is expected to look after themselves and their nuclear family, and are usually inclined to be independent of other people.

●**Uncertain avoidance dimension**

This refers to the degree to which people are comfortable with uncertain conditions.

People from cultures with low uncertainty avoidance are more comfortable with

uncertain situation. Countries (e.g., Japan, China and Taiwan) with high uncertainty

avoidance tend to be expressive, speaking with gestures and showing their emotions.

People are inclined to be aggressive, emotional to stay away from ambiguous conditions,

and keep an orderly structure in an organisation or society. On the other hand, people

from cultures with low uncertainty avoidance (countries like the USA and UK) tend to

be less expressive, less openly anxious and people act without strongly showing their

emotions.

●**Short and long-term time orientation dimension**

Marcus & Gould (2000) states "Long-term orientation stands for the fostering of virtues

oriented towards future rewards, in particular, perseverance and thrift." Long-term time

orientation plays a crucial role in Asian countries (e.g., Taiwan, China, Hong Kong and

Singapore) that have been influenced by Confucianism. People in these countries

believe strongly that an unequal state of connection is required to keep a society stable,

a clear hierarchical relationship is needed to keep family and society in harmony, the

family is the prototype of the social organisations, aged people own more authority,

younger people have to be filial to older people, and virtuous behaviour is identified as

hard-working and perseverant. People in countries with short-term time orientation

(e.g., UK, Germany and USA) tend to prefer the equal relationships, stress on

individualism, concentrate on treating other people as one would like to be treated, and

fulfilment is attained through creativity and real execution or action. Usually, Asian

people are oriented to practice and looking for virtuous behaviour, whilst western countries are oriented to belief and looking for the truth.

● Power distance dimension

This refers to the extent to which less powerful members expect and accept unequal power distribution within a culture. Cultures with high Power Distance (e.g., Malaysia and Mexico) have characterised hierarchies in organisation and autocratic leadership. For example, leaders with a certain level of dictatorship, such as teachers and parents, are highly respected. Students are expected to show their respect to teachers and children have to be filial to parents. On the contrary, cultures with low Power Distance (e.g., Austria and New Zealand) tend to have characteristics such as more equal relationships between leaders and subordinates, and subordinates are more able to express their thoughts and participate in managerial decisions. Teachers and students, and parents and children regard themselves as equal relations.

● Masculinity and Feminism dimension

This refers to gender roles within a culture. Countries with Masculine cultures (for example, Japan) tend to present assertive, competitive qualities. On the contrary, countries with feminine cultures (e.g., the Scandinavian countries) tend to collapse gender distinction and overlap gender roles, and present family oriented and tenderness roles.

2.2.2.2 Trompenaars and Hampden-Turners' cultural model

According to Trompennaars and Hampden-Turner (1997: p.6), "The way in which a group of people solves problems and reconciles dilemmas." Trompennaars and Hampden-Turner (1997) define culture as how people get the solution to solve the problem, and there are three layers of culture, the outer layer (explicit products), the middle layer (norms and values) and the core (assumption about existence) in their cultural model. The outer layer would encompass the objects of daily life or real life, for example, the building, art, temple, church, agriculture, market, fashion and language. The above objects are the symbols of a deeper level of culture. The common sense of what is right and wrong within a group of people is classed as norms. Norms can be conducted to the formal level as law, or can be developed as social control. The notion of good and bad is influenced by values and the notions are shared by a group of people. If we want to know what impacts the basic differences in value, it is essential for us to turn back to the most basic value, survival, which is what people strive for.

Trompenaars and Hampden-Turner (1997) have built up their model based on collecting data from an extensive multinational survey. In their survey, questions are designed and the survey carried out across 30 companies and 50 countries, with a total of 15000 managers responding to his survey. Trompenaars and Hampden-Turner (1997) present a seven dimension model. Some of their main cultural dimensions are presented below.

- **Universalism vs. Particularism**

This refers to the degree of adherence to the rules. Universalists tend to be standard-based, where good and right are distinct and always applicable. Particularists tend to be

relationship-based, basing their solution to problems on the relationships that they build with people.

• Specific vs. Diffuse Relationships

This dimension refers to how far people get involved with each other's privacy. People who are from specific-oriented tend to consider relationships with others explicit and regulated, as in a contract, with the lives of public and private separated. People from diffuse-oriented tend to emphasise their relationships with other people. There is no specific distinction between public and private lives.

• Neutral vs. Affective Communication Style

This dimension describes the way that people show their emotions. People from neutral cultures tend to believe that the relationships with others should be objective and separated. Affective cultures believe that all relationships with other people are human affairs, and people will show their feeling very directly, such as via oral conversations and physical contact.

• Achievement and Ascription

This dimension covers how status is associated with a person. Achievement-oriented cultures are inclined to value a person depending on what they have accomplished in their life. Ascriptive societies value a person based on his birth, age, gender. or wealth.

• Time orientation, this dimension refers to how cultures react to time.

2.2.2.3 Hall and Halls' High and low context culture

High context communication and Low context communication is defined by Hall and Hall (1990: p.6) as, "A high context (HC) communication or message is one in which most of the information is already in the person, while very little is in the coded, explicit, transmitted part of the message. A low context (LC) communication is just the opposite; i.e., the mass of information is vested in the explicit code."

According to Hall (1976), Kaplan (1966), Chen and Starosta (1998), and Choe (2001), High context cultures tend to be implicit, indirect, ambiguous, maintaining of harmony, polychronic cultures and have specific thought patterns. The attributes reflected in high context and low context cultures are introduced as follows:

● **Communication pattern**

People who are from high context cultures countries (e.g., Japan, Taiwan and China) are inclined to have more confidence in their non-verbal communication, and face-to-face communication is characterised by applying the non-verbal way for transferring meanings extensively. A high number of gestures, body language, silence, and symbolic behaviour would be preferred and expected by them. People from low context cultures, such as Germany and the United Kingdom, are inclined to express meaning depending on content and the oral language.

● **Indirectness**

People from a high context culture tend to use ambiguous, indirect, and harmonious ways to communicate, and it depends on the ability of the listeners to catch the meaning from the context. People from low context cultures tend to express themselves in a more direct way to make sure that the listener understands completely and catches the

information as accurately as it was transmitted.

• Thought pattern

A non-linear way is used to explore something to eventually uncover the truth.

Rationality is not necessarily confined to countries with a high context culture. People

from a high context culture tend to use indirect strategy in their communication

including conversation and writing, usually not stating the subject directly. People from

a low context culture have a strong belief that there is one objective truth which can be

reached by linear exploration, so they want to meet their aims directly by applying

logical thinking and rationale.

•Polychronic & Monochronic Time Perception

Hall and Hall found that the perception of time varies across cultures. People from high

context culture countries (e.g., Taiwan and Japan) tend to be polychronic in time

perception, whilst people from low context culture countries (e.g., German-speaking

countries) tend to be monochromic in time perception. People in polychronic cultures

think that everything will happen and go smooth when the right time comes, while

people in monochronic cultures believe that executing a task on time is very important,

so they tend to set up plans and schedules, and then carry everything out.

2.2.3 Cross-cultural Web design guidelines

2.2.3.1 Popular cross-cultural Web design guidelines

Most cross cultural design guidelines are developed based on real working experiences in developing internet products, but there is no empirical study to support their claim. (Evers, 2002) In this section, three important guidelines will be introduced.

Del Galdo & Nielson (1996) pointed out the web interface components which are influenced by culture, and these are: character sets, collating sequences, currency, time, date, numeric formats, addresses and telephone numbers, icons, symbols and colours, screen text, menu accelerators and documentation.

Fernande (1995) categorises these Web design attributes into the physical world related areas and explains that Web design attributes can be influenced by culture such as rituals, religion, taboos, heroes, values, consumer products and architecture. The areas mentioned are: national language, visual language, national formats (number and currency representation, calendar, time, postal address) and telephone numbers. Fernande's guidelines are different from others, because he associates the concept of real objects, norm and values in the environment with the representation of Web interface.

In Boor & Russo's (1993) cross-cultural checklist, it is stated that the aspects of Web interface design below are affected by culture. The aspects are text, number, date and time, image and systems, colours, flow, functionality. Russo and Boor (1998) also

discuss social norms and intuitive behaviour that influence the use of Web design attributes.

Marcus & Gould (2000) develop the cross-cultural Web design guidelines based on Hofstede's five dimensional model. There are five web design components which would be influenced by cultural dimension and access effective communication. These components are metaphors, mental model, navigation, interaction, and appearance. For countries with different cultural dimension, web interface design would have different tendencies. The details of this guideline are introduced specifically in Section 2.2.5.1

2.2.3.2 Limitations

- Yeo (2001) contended that the guideline and standards are too general and not sensitive to the context of the target-culture.

- Bourges-Waldegg & Scrivener (1998) criticised the established guidelines very sharply. Firstly, more cultural differences are found and more design guidelines for cross-cultural web have been developed. This makes the design process of Web design more complicated, but still cannot really meet the need of the users. Secondly, culture progressively changes and technology is developed continuously, therefore, the long-term utility of these guidelines is questionable.

- Lansdale and Ormerod (1994) criticised that these guideline can be applied to legitimise poor design, but not guarantee well-designed systems.

2.2.4 The cultural web design preference approaches

2.2.4.1 Cultural Marker Model

Badre (2001) states that cultural markers are the attributes or characteristics of Web interface design, and these attributes are particularly popular in a region, or preferred by a specific audience group. Barber and Bardre (1998) suggest "culturability" which combines the two words "usability" and "culture". They constructed a cultural marker approach which is a kind of systematic usability method to examine hundreds of websites, and then define cultural markers such as colours, fonts, icons, metaphors, geography, sounds, motions, flags, language, preferences for text and graphics, directionality of how language is written, help features and navigation tools to facilitate user performance.

The procedure of the cultural marker approach is described as below.

First is the foraging of websites. Hundreds of websites are classified into categories by country, style, and language, and they are listed in order for further investigation. Secondly, identification of Web design characteristics, where the details of each website are examined and categorised by genre and nationality. Web design characteristics (which are referred as "cultural markers" by Barber & Badre, 1998) are found in webpages, and become cultural markers when they are proven to be particularly prevalent in a particular cultural area (or within a particular group of people). Thirdly, the identification of patterns in a specific region. These patterns are emerging which reveal that there are culturally and genre specific web design cultural markers (Barber & Badre, 1998).

Some researchers have applied Barber & Badre's cultural approach to develop their study. For example, Sheppard and Scholtz (1999) examined Arab and USA users to see whether they perform better if the website incorporates the cultural markers. The results show the performance of Arab users is impacted by the cultural marker.

Sun (2001) has examined how cultural markers affect web usability by interviewing target culture people about their experiences. In order to identify which kinds of cultural markers are more prominent to people from a specific culture, he recommends that people prefer websites with cultural markers from their own cultures. He found that culture plays a crucial role in web usability and the usability of web can be strengthened by cultural markers. Furthermore, he states that it is necessary to analyse the needs and the pattern of the target audience before cultural markers are set up in a specific website. 40 Korean and British users are examined by Juric et al. (2003), and these users have their own preference based on their culture context.

Based on Baber & Badre's cultural marker approach, Smith et al. found the culturally preferred design elements in Taiwanese and Indian cultures, and defined these design elements as cultural attractors. Smith et al. (2004) defines cultural attractors as "the interface design elements of the websites that reflect the signs and their meanings to match the expectations of the local culture." Smith et al. (2004) uses a local site audit to identify the elements that are preferred in the target culture and define cultural design elements as "Cultural Attractors". The cultural attractors founded in their study are colours, colour combination, banner adverts, trust signs, use of metaphor, language cues, navigation and controls (Smith et al., 2004).

2.2.4.2 Limitations

Cultural design preferences can map directly into culturally appropriately design elements for a website, but are usually inclined to be stereotypical. Sun (2001) criticised that social and cultural context surrounding the artefact are not taken into account by Barber and Badre. In Barber and Badres' study, only the culturally preferred design elements of the dominant cultures are identified and presented, but the minority cultures are ignored. Furthermore, Sun (2001) explained, "If cultural markers are applied unselectively in website localisation, the localisation process might fall into the trap of stereotyping other cultures." Another drawback about cultural markers is they have their own inherent limitations.

2.2.4.3 Strengths

- Fitzgerald (2004) believes, "cultural markers show the best promise." These culturally preferred design elements can be comprehended by the target culture users quite well if they are used properly. Kondratova et al. (2005) echoes Fitzgerald, "In general, it appears that the cultural marker approach is the one that is easier to map directly into culturally appropriate design elements for a website."

- In Sun's (2001) study, it is stated that if the cultural markers are applied properly in the website, they can really increase the cultural sensitivity of multilingual websites. The cultural marker approach is an efficient means to address the target culture audience. As Sun stated, "With the help of cultural markers, complex and exotic cultures are simplified into some manageable cultural markers. If the company knows what kind of cultural markers can be applied to a specific culture, exhausting research work will be saved."

- Cultural markers can increase web usability

2.2.5 The existing cultural web model

2.2.5.1 Theoretical studies

Theoretical studies which are based on the existing cultural models. For example.

Marcus and Gould (2000) applied Hofstede's (2005) five dimension cultural model, to

build up the guidelines for designing web interfaces for different countries, and outlines

how these dimensions can influence components of a web interface sign. These

guidelines are shown below:

For cultures with collectivism, the web interface design tends to have the following

attributes:

- pictures with groups

- pictures of aged experienced, leaders

- emphasis on state of being

- pictures of success displayed through accomplishment of social-political

  agendas

- more official slogan

For cultures with individualism, the web interface design tends to have the following

attributes:

- pictures of individuals

- images of young individuals

- images of action

- emphasis on action

- pictures of success displayed through materialism and consumerism

●argumentative speech

●presentation of personal achievement

For cultures with high uncertainty avoidance, the Web interface design tends to have the following attributes:

● Restricted choices

● Limited amounts of data

● Restricted scrolling

● Simplicity, with concise metaphor, limited options, and restricted amounts of information

● Try to predict the results or implications of actions

● Navigation structure intended to prevent users from getting lost

● Mental models focus on decreasing user errors

● Using typography, colour, sound, etc. to decrease ambiguity

For cultures with low uncertainty avoidance, the Web interface design tends to have the following attributes:

● Many different choices

● Long scrolling webpages

● Acceptance of surfing and exploring, over-protection regarded as shame.

● Courage for navigation

● Mental models focus on comprehension underlying concepts rather than narrow tasks

For cultures with long-term time orientation, the Web interface design tends to have the following attributes:

- Information concentrated on practice and practical value

- Relationships as a reference of information and believability

- Patience required to attain result and reaching goals

For cultures with short-term time orientation, the Web interface design tends to have the following attributes:

- Information concentrated on the true and certainty of notions

- Regulation as a reference of information and credibility

- Quickly getting results and reaching goals

For cultures with high power distance, the Web interface design tends to have the following attributes:

- evenly distributed layout

- deep information hierarchies

- concentrates on official seal

- images of leaders

- architecture of monuments

For cultures with low power distance, the Web interface design tends to have the following attributes:

- unevenly distributed layout

- shallow information hierarchies

- pictures of both genders

For cultures with masculinity, the Web interface design tends to have the following attributes:

- Attention attracted by games and competition

- Conventional gender role distinction

- Restricted actions to get quick result of tasks

- Navigation oriented to discovering and control

- Visual graphics, sound, and animation for useful purposes

For cultures with femininity, the Web interface design tends to have the following attributes:

- Ambiguous of gender role distinction

- Reciprocal group action, exchange, and support

- Attention attracted by aesthetics, appealing to unifying values

Gould, Zakaria, and Yusof (2000) built up their research to compare the cultural orientations and design preferences for web interface between Malaysian and USA websites. They identified web design characteristics associated with three cultural dimensions based on using Hofstede's (2005) cultural model and Trompenaars's (1997) cross-cultural theory. Eventually they suggested design guidelines for cultural localisation for Malaysia and USA.

Sheridan (2003) also applied Hofstede's cultural dimension model to develop web interface design guidelines for localisation. Her guidelines are developed following the

patterns of Marcus & Gould (2000) and predicted the tendencies of web interface design attributes in each cultural dimension. She does not explain why she applied Hofstede's model.

2.2.5.2 Experimental studies

Experimental study has been conducted using the existing cultural dimension model as a way to choose and identifysamples by fitting them into a cultural category. Some empirical studies which adopts cultural dimension models are presented below.

Ford & Gelderblom (2003) applied Hofstede's five dimension model to construct their empirical study. In their study, they examined whether the user's performance would be influenced by the culture variables. The results of this experiment did not provide enough evidence to support that cultural variables influenced the subjects' performance, but the performance levels gained revealed that the usability of the interfaces was increased for all of the subjects, as a result of incorporating the five cultural dimension attributes into the web interface design.

Smith et al. (2004) constructed their study with target-culture users to determine the extent to which cultural factors influence the international websites usability and acceptability. Based on Hofstede's study of cultural dimension, their experiment adopted the Taguchi method to investigate the differences between British and Chinese users' preferences and satisfaction within websites. The significant preferences between British users and Chinese users were found. They mentioned the preferences and perception, but did not state that satisfaction and perception were equivalent. The issue

of performance was not considered in a usability test, with the focus on perception alone.

Simon (2001) used Hofstede's (2005) dimension as a method to examine the perception and satisfaction difference between the cultural groups and gender groups within different cultures. The analysis of this study indicates that there are differences between cultural and gender-based perception and satisfaction within these cultures such as Latin and South America, North America, Asia, and Europe. However, perception and satisfaction in this study were not defined very clearly.

2.2.5.3 Synthesis theoretical works

Some researchers have seen the limitations of developing the current cross-cultural web model based on anthropologists'cultural models (i.e. Hofstede, Trompenaars and and Hampden-Turner), so Zahedi et al. and Sun incorporate other theories into their conceptual cross-cultural Web model.

Zahedi et al. (2001) combine the social construction theory with Hofstede's (2005) five dimension model to develop their conceptual cross-cultural Web design model. The aim of their conceptual model is to analyse how the cultural and individual factors impact on the effectiveness of web designs. Zahedi et al. (2001) claim that their conceptual framework is for web design, but actually the propositions of this study totally emphasise one web document of web interface design, but other important web interface characteristics are not considered. Therefore, a shadow is cast over their conceptual model, and no usability test was constructed to conclude their propositions.

Sun (2003) incorporates a dynamic process and changing variables by integrating the study from previous researchers such as Hofstede (2005), Hall (1990), Marcus & Gould (2000), Zahedi et al.(2001), but there was no usability experiment to support his claim, and it is questionable to validate Sun's model for cultural usability. Jagne & Smith-Atakan (2006) developed a strategy for cross-cultural interface design, which combines the theory of Hofsted, the design guidelines from Marcus & Gould and Barber & Badre, but lacks an empirical study to support their model.

2.2.5.4 Limitations

2.2.5.4.1 Cultural dimension model descriptive, not prescriptive, and too stereotypical

• The cultural dimension model concentrates on description for culture, but not prescription for practical communication of Web interface design. (Fitzgerald, 2004)

• Hall (2001) also pointed out two reasons why cultural dimension models could not be applied efficiently. One is that the attributes of existing cultural models are descriptive, and not prescriptive, so they cannot be applied deductively. It would be a mistake if the web designers just applied the attributes from the current cultural models and then deduced how the target audience would respond to the web technology.

• It is too stereotypical, with users originating from the same country not necessarily fitting the cultural model developed by Hofstede.

• In Hovenschiold's study (2002), it is found that Hofsted's five dimension model can not anticipate the differences in mobile phone use between subjects from German and British cultures.

● Griffith (1998) examined whether differences in power distance in Bulgaria and the U.S. would affect the use of group conference support technology. Based on Hofstede's measures of power distance, Bulgarians were expected to be less critical of the technology, whilst Americans were thought to be more critical to the authority, due to cultural response to power and authority. However, the results of this study reveal that Bulgarian students, who are expected to have high power distance and obeying the authority, were more likely to challenge authority than American students.

2.2.5.4.2 The purpose of cultural dimension model is not for Web design

●Marcus (2001) indicated that some anthropologists have already built up the cultural theories and cultural models, but these theories and models are not applied appropriately and effectively into the web design community. Because the models are conducted to meet their own purposes, they are not always compatible with all web design.

●Hall (2001) also pointed out the reasons why cultural models could not be applied efficiently. This is because web designers apply current cultural models that are designed for another purpose.

● Gunter and Randall (2003) indicated that Hofstede's model is not sufficient enough to be used as a design approach, but is a type of solution favoured by businesses, as Hofstede's model was developed for business communication, and not for any kind of design.

● Del Galdo & Nielson (1996), and Fernandes (1995) has pointed out that it is difficult to incorporate models developed by these anthropologists into Web interface design for specific cultures in a business area.

2.2.5.4.3 No empirical study (usability) to support the claim of cultural web model

There is no usability study from users of different countries to support the cross-cultural web models developed by Marcus and Gould (2000), Sheridan (2003), Zahedi et al. (2001).

2.2.5.4.4 Cultures keep on interacting and developing

• Jagne & Smith-Atakan (2004) criticised that Hofstede constructed his cultural dimension model nearly 20 years ago, and only recruited subjects from IBM, therefore, there are limitations in this model, as it focus on a particular time period and a specific group of people.

• Sun stated (2002) that not only culture is dynamic, and will keep on changing, developing and interacting, but also technology is continually developing.

• Walsham (2002) pointed out four limitations in Hofstede's cultural dimension model. Firstly, it is crude and simplistic. Secondly, Hofstede's model treats culture as a stable phenomenon, but in reality it is always changing and developing. Thirdly, Hofstede did not provide links to cross-culture conflicts, but only mentioned the accumulated difference. Fourthly, he discussed that Hofstede's cultural model is not easily translated into effect on work patterns.

2.2.5.5 Strengths

• Although Hofstede's cultural dimension model is not appropriate directly to predict the design result, Hofstede N. (1996) suggests that it can indicate the gap between two different cultures. Based on Hofstede's (1996) inspiration, Gillham (2004) suggests,

"Hofstede's cultural dimension model can provide a subjective measurement of the gulf

between the culture of origin and the localization target culture."

● Hofstede's (2005) model is the most widely cited and used in the previous cultural

research, and is regarded as the most influential culture theory among social science

research (Nokata & Sivakumar, 2001; Pavlou &Chai, 2002)

● Marcus& Gould (2000) and Sheridan (2001) applied Hofstede's cultural dimension

model to develop cross cultural web design guidelines.

2.2.6 Connections between cultural markers and cultural dimension model

To address the connections between culturally preferred web design elements and the cultural dimension model, some of the usable literature is reviewed and discussed in the following paragraphs.

According to Callahan (2005), she investigated whether the web interface design elements in the literature are the proper markers for a specific cultural dimension, by examing the correlations between web interface design elements and Hofstede's (2005) cultural dimension for selected countries (i.e., Austria, Denmark, Ecuador, Greece, Japan, Malaysia, Sweden, and USA). Overall, the culturally preferred design tendency in web interface identified in Marcus and Goulds'(2000) cultural web model relate to specific dimensions, but Hofstede's dimensions and cultural preferences require more intensive study. To interpret the connections between cultural preferences and cultural dimensions, the cultural web design model from Marcus and Gould (2000) which applied Hofstede's (2005) five dimension cultural model in the interpretation of differences in web interface design elements is depicted in the following tables.

Table 2.1 The web interface tendency on cultural dimension from Marcus and Gould (2000)

Dimension	Tendency in web interface design	Tendency in web interface design
Collectivism and individualism	Collectivism	Individualism
	■Pictures of groups ■Pictures of aged experienced, leaders ■Emphasis on state of being ■Pictures of success will be displayed through accomplishment of social-political agendas ■More official slogan	■Pictures of individuals ■Images of young individuals ■Images of action ■Emphasis on action ■Pictures of success will be displayed through materialism and consumerism ■Argumentative speech ■Presentation of personal achievement
Uncertainty avoidance	High uncertainty avoidance	Low uncertainty avoidance
	■Restricted choices ■Limited amounts of data ■Restricted scrolling ■Simplicity, with concise metaphor, limited options, and restricted amounts of information ■Try to predict the results or implications of actions ■Navigation structure intended to prevent users from getting lost ■Mental models focus on decreasing user errors ■Using typography, colour, sound,etc. to decrease ambiguity	■Many different choices ■Long scrolling webpages ■Acceptance of surfing and exploring, over-protection regarded as shame. ■Courage for navigation ■Mental models focus on comprehension underlying concepts rather than narrow tasks
Long-term time and short-term time orientation	Long-term time orientation	Short-term time orientation
	■Information concentrated on practice and practical value ■Relationships as a reference of information and believability ■Patience required to attain Result and reaching goals	■Information concentrated on the true and certainty of notions ■Regulation as a reference of information and credibility ■Quickly getting results and reaching goals
Power distance	High power distance	Low power distance
	■Evenly distributed layout ■Deep information hierarchies ■Concentrates on official seal ■Images of leaders ■ Architecture of monuments	■Unevenly distributed layout ■Shallow information hierarchies ■Photographs of students rather than faculty ■Pictures of both genders

Masculinity and feminity	Masculinity	Feminity
	■Conventional gender role distinction ■Restricted actions to get quick result of work tasks ■Navigation oriented to discovering and control ■ Attention attracted by games and competition ■ Visual graphics, sound, and animation for useful purposes	■ Ambiguous of gender role distinction ■ Reciprocal group action, exchange, and support ■ Attention attracted by aesthetics, appealing to unifying values

Sun's (2001) study indicates that there are deep connections between cultural markers and cultural context. Sun interviewed users from Germany, Brazil, and China in his empirical study and gathered users' opinion data. He asked users to compare cultural markers in real sites and focused his examination on four categories of cultural markers: language, visuals, colours, page layout. Based on the results of his study, it was found that cultural markers are an effective means to address target culture users and can increase the web usability. Sun (2001) looked at different participants' preferences for cultural markers and their cultural background, he found a clear connection between their preferences and their context cultures and the connection is depicted in the table below.

Table 2.2 Preferences for cultural markers and cultural background from Sun (2001)

Preferences for Cultural Markers	Cultures of Origin	Context
Hierarchical and structured page layout	Germany	Low context
Attractive colours, more pictures	Brazil	High context
Visual related to local culture	China	High context

Sun (2001) used Hall and Halls' (1990) culture context model to interpret the correlation between cultural preferences and cultural context. People from different

contexts have different communication pattern. High context tends to be implicit, indirect, and ambiguous, whilst low context tends to be explicit, direct, and clear. Thus people from a low context culture (i.e., Germany) would prefer logical and structured layout, whilst people from a high context culture (i.e., Brazil and China) have preferences for visuals. Also he states "Cultural markers work as a layer of context which conveys the contextual information to the international users and helps them establish their familiar cultural frames so that they can understand and navigate through the information product" (2001: p.100). His study implies, "different types of cultural preferences should be incorporated on webpage to target different context culture " (2001: p.100). Implicit culturally preferred design elements (i.e. graphics, images, and colour) should be applied in high context culture, whilst explicit culturally preferred design elements (i.e., logical and structured layout) should be applied in high context culture.

According to Würtz's (2005) study, she used Hall's (1976) high and low context dimension model as the parameters to explore the analysis of McDonald's website in different countries (i.e.,China, India, Hong Kong, Korea, Sweden, and Taiwan) to provide evidence that differences in communication patterns between high and low context cultures indeed exist in the websites. Countries with high context cultures tend to form strategies for assimilating human presence in the website. For example, the animations are highly present in high context culture, whilst the animations are not present in countries with low context culture websites. High context cultures tend to use more visuals such as graphics and images, on the contrary, low context cultures tend to

use less pictures and more text. Based on Würtz's (2005) study. The web interface

tendency between high and low context culture is depicted in the following table.

Table 2.3 Web interface tendency in high and low context culture from Würtz (2005)

Parameter	Tendency in high context cultures	Tendency in low context cultures
Animation	High use of animation, especially in connection with images of moving people	Lower use of animation, mainly reserved for highlighting effects e.g., of text
Promotion of values	Images promote values characteristic of collectivist societies	Images promote values characteristic of individualistic societies
Individuals separate or together with the product	Featured images depict products and merchandise in use by individuals	Images portray lifestyles, with or without a direct emphasis on the use of products or merchandise
Level of transparency	Links promote an exploratory approach to navigation on the website; process-oriented	Clear and redundant cues in connection with navigation on a website; goal-oriented
Linear vs. parallel navigation on the websites	Many sidebars and menus, opening of new browser windows for each new page	Few sidebars and menus, constant opening in same browser window

The literature above supports the correlations between cultural preferences and cultural

dimensions. Thus it underpines the basis of the two related hypotheses in this thesis.

2.3 Research and theories related to web communication

2.3.1 Web design characteristics to access effective communication

Marcus (1999) defined five web interface components to access effective communications. These components are metaphors, mental model, navigation of model, interaction, and the look. He declared, "To enable users to take advantage of these advanced products, product developers will need to provide more sophisticated UIs that achieve effective communication of increasingly complex information through new technologies, techniques, and tools" (Marcus, 1999: p.101). These elements can help users access the content of complex systems, comprehend the information, and enrich their experience. Smart et al.(2000) identified six categories of web design characteristics which are vital in helping the designers to convey desired meaning and making the users easier to obtain the intended meaning.

The specific characteristics of web that impact communication are typography, site structure and cognitive design, medium use, message content, appeal, accessibility. In this research, integrating the studies of web interface design elements from Cyr & Trevor-Smith (2004); Sun (2001); Russo & Boor (1993); Baumgartner (2003); Smart et al. (2000) and Marcus (1993) and modifying them, the web element which would influence the web communication are defined visual representation, multimedia, colour, navigation, layout, content & structure, link, and language. The detailed introduction of them is shown as below.

● Visual representation

Visual representation includes images, pictures, symbols, icons and graphics.

The attributes of visual representation can efficiently transmit a message to the viewer

in an attracting manner. Russo & Boor (1993) state that images are the visual language

of a culture and they are similar to words; thus images do not always translate. The

images, symbols, icons we recognise in our culture may have no meaning in another

culture. An image can be recognised by the audience, but it is difficult for them to

associate the image with the original intended meaning. Many images that do not

transmit the same meaning in all cultures are discovered in a number of previous studies

(e.g., Cook, 1980; Fussell & Haaland, 1978). Russo & Boor (1993: p.344) have

declared, "To succeed in an international market, images must be carefully selected and

designed. Designers must be sufficiently aware of difference among cultures to

recognise images that are culturally specific."

Marcus & Gould (2000) apply Hofstede's five dimension cultural model to develop

their cross-cultural web guidelines, and indicate that there are different tendencies and

preferences for images based on the users' culture context.

● Multimedia

In web communication, the usage of multimedia in the Internet plays a significant role.

Web multimedia refers to sounds, animation, moving text, and streaming video. If the

multimedia can be used properly, it can enrich the experience of the user. In Web design,

text and graphics can be kinetic (i.e., flash animation, gif animation), and moving text

can add emphasis in a page. Integrating multimedia into Web interface design can be a

very powerful means for transmitting information beyond that of text, visual

representations, still images and pictures, if it is incorporated into the web appropriately. Multimedia can be used for increasing comprehension or facilitating understanding for users and enhancing the user experience. Multimedia is also an effective means to mislead, distract, and aggravate the audience (Brinck et al., 2002). Not all audiences expect or prefer flash animations or moving text. This is dependent on where the audience is from and the culture backgrounds of the users. As with all design elements, to incorporate an attribute or not depends on whether it can be devoted to communicating the intended information (Smart et al., 2000).

●Colour

Colour can be an effective and powerful means to convey meaning and information, which has been mentioned by Boor and Russo (1993). The meaning of colour would be interpreted by users based on their culture background. For example, French interpret green as criminal, but people from the Middle East (i.e., Iran, Saudi Arabic) regard green as prosperous. Moods and symbolically signified meanings can be aroused by colour. What colours mean and how they are interpreted depend on the context of different cultures.

It is very important to read colour studies to prevent unintentional colour pitfalls when a designer designs for a particular culture. This means that colours own irrefutable power, and the designer has to choose colour accurately to convey the intended meaning by studying specific colour symbolism in different cultures.

●Navigation

Navigation refers to different kinds of navigational tools, menu formats, different kinds

of links, and search capabilities. Marcus (1993: p.101) defined navigation as,

"movement among appropriate organisation and representation of data, functions, work

task/play activities, and roles depicted in the model that provide speedy access and

facilitate comprehension." The users would get lost when moving in a website without a

precise and assisted way for attaining information.

Marcus & Gould (2000) declare that culture would influence the navigation in web

design. Audiences from cultures with a high uncertainty dimension (where anxiety

arises when uncertain situations are encountered) tend to prefer a navigation structure

intended to prevent the audience from getting lost. On the other hand, audiences from

cultures with a low uncertainty dimension are inclined to prefer less control of

navigation.

●Layout

Layout is the display structure that directs scanning information and reflects the orderly

flow of tasks. It includes categories of grouping, menu placement, search functions, and

orientation. It has been an important part on information retrieval system research. If the

layout is properly designed, it can easier for the viewer to access information,

comprehend the information within a contextual and structural model, and facilitate the

communication between the user and the system (Yu and Roh, 2002).

Marcus and Gould (2000) developed their cross culture web design guidelines, and

indicated that a symmetrical layout would be more prevalent in web interface design for

cultures which are influenced by high power distance, whilst asymmetrical layout of

web would be popular in low power distance cultures. According to Barber & Badre's study (1998), users from different cultural backgrounds have their preference for orientations and layout structure in web pages.

●Content and structure

How the information is organised on a site is referred to as structure. Structure is a crucial and significant attribute to assess the usability of a website as well as a key attribute to facilitate web communication. The audience uses the web structure to assign meaning to the composition in the web site and to orient themselves as they navigate in the Web. Mighty site structure shapes a base on which the web designers can construct navigation bars, index on menu (Smart et al., 2000).

Hall & Hall's (1990) study might have some implications about how communication patterns vary across culture on the Internet. A country with a low context culture tends to prefer the messages to be represented in an explicit, direct, and precise way. On the other hand, a country with a high context culture tends to prefer messages that are presented in an implicit and indirect way.

The content of a website is still the core in effective web communication. Smith et al. (2000: p.599) state, "Unfortunately, designers frequently overlook the importance of content - a main reason users go online."

●Language

Language is one of the discriminable characteristics of culture. Language is the basis where the audience can get information within webpages. However, if the website wants

to be accessible by the target culture users, it has to have the availability of the target

audience's language (Cyr & Trevor-Smith, 2004).

2.3.2 Visual communication design principles

In Bloomer's research (1976), visual communication design principles were developed

based on a deep understanding of the visual perception of people.

According to Roth (1995), the principles of visual communication design and concepts

can be applied to the design of visual interactive interface design. Realising the

principles of human visual perception will help the web interface designer to arrange

effective computer images, icons and visual interface. Comprehension attributes of

human visual perception allows the web designers to construct effective computer-based

programs and facilitate web communication. Visual communication design principles

and concepts, such as similarity, proximity, contrast, figure-ground, visual hierarchy,

colour interaction, visual metaphor and graphic icons, typography consideration, can be

applied to Web interactive interface design. How these principles of visual

communication design can be applied in web interface design to facilitate

communication, which is based on Roth's (1995) study, is presented below:

●Similarity

In human perception, one of the factors for dividing visual elements into

groups is similarity. Depending on different attributes, such as size, colour, shape and

style, similarities between several visual elements are identified.

Similar functions and categories of content can be instructed by similarity.

For example, designing controls for navigation in computer interaction, the designer should make these controls in similar sizes and shapes, and the other kind of controls should be designed in different types of consistent mode so that they can be identified by the audience very easily. Different colours and types of graphics can be set up to identify different controls and different information, and to divide these controls and information into different groups within a display.

A consistent position of visual element (i.e., text, image, graphics pattern, icons) is an important organisational concept related to similarity. For example, when many dialogue boxes or screens are shown in the mean time, the general interaction controls such as "Open", "New" should be located in similar positions. The control buttons should be arranged in a way that allows the user to use the interface easily and not be disappointed or frustrated.

●Proximity

Proximity is the other kind principle of grouping. With regard to perception, visual elements that are placed in near proximity are grouped conjointly in an area which is full of many different types of visual elements.

When the designers arrange many controls representing similar functions in a computer display, they can take advantage of proximity grouping and place the similar function controls together. For example, navigation controls can be arranged at the right hand side or the top, allowing the viewer to change displays and many types of controls in the rest of the area.

●**Contrast**

In a display which comprises many visual elements, designers can use the contrast

principle to attain prominence. The notion of prominence is related to the design of

visual communication design, information design, and graphic design.

And it can be applied in a web visual interface design. To catch the viewer's

attention with some important content or information, some components must be

represented prominently in the digital display.

When many elements on a display look similar because of a lack of emphasis and

contrast, the page seems boring, dull, and lacks of a concise organisational scheme.

After all, when everything looks similar in importance, it is difficult for the viewer to

know which components need more attention. Under these circumstances, some of the

important components need to be emphasised by using contrast. The designers can

manage some visual element such as colour, size, shape and position to get a focal point

of the important components by using the contrast principle.

●**Figure-ground**

The way humans perceive form in the physical surroundings affect how ground and

figure is distinguished, which allows the viewer to differentiate a figure within a bigger

area of view or ground. How the viewer discriminates a figure or object from a

background in the digital display in based on the effective use of the contrast principle.

For example, the designer can manipulate the contrast of value, size, colour, and shape

to make the viewer easily to tell figures from their backgrounds. When a smaller visual

element or less dominant visual element is arranged in the context of a larger dominant

area, it is very important to ascertain the appropriate contrast between figure and

background to make the visual elements prominent.

●Visual Hierarchy

Visual hierarchy can be used by the designers to promote the understanding of a message or instruction of interaction, and forge a viewing experience for the audience. But the Visual hierarchy must be built up according to the content or message (Roth, 1995).

Establishing a visual hierarchy, which means arranging elements according to order of priority of all messages in a display. When the designers want to set up a visual hierarchy, they need to consider where the viewers look first, where they look second, and where they look third.

Arranging visual elements in an area, modifying size, changing the shape and adjusting degree of event happening can build up visual hierarchy. Visual hierarchy is applied to dominate the focus point and viewing order.

●Colour

Colour is a vital visual strength. Selecting the proper colour can make the interface design more appealing, attract the viewer's attention, and promote the message more comprehensibly. Choosing the wrong colour can seem clumsy and result in less effective readability. As Roth (1995: p.46) mentions, "Caution should be used when colour is employed metaphorically or symbolically. Perception of colour symbolism is culture sensitive, colour is not perceived in the same way by all social groups or individuals". For example, white, in Western cultures, symbolises purity and innocence, but in China it means death.

•Typographic Consideration

The principles of typography such as typeface, type size, and spacing can be applied in the design of visual interface. But the pliable trait of the screen display may overcome fundamental principles of the correct typography. On the procedure of developing, the needs and potentials of the viewer will be considered as the most important factor to design effective visual interface, which is based on cognition of the principles of visual communication design.

2.3.3 Semiotics

Semantic problems relate to how the symbols transmit the intended significance. According to Marcus (1997), semiotics principle can help web developers, web designers, and researchers in developing more efficient and effective means to communicate to diverse audiences from different cultures. If the signs can be applied properly, the user can communicate with the Web interface design efficiently.

•Semiotics is the study of signs

Fiske (1990: p.40) defines, "The study of signs and the way they work is called semiotics". Marcus (1993) defines semiotics as follows: All of communication keeps on going through the exchange of signs. The study of signs is called semiotics, which discusses things that stand for something. If signs can be used appropriately, the audience can communicate with the visual interface design efficiently. Understanding semiotics, web artefact developers and designers can design web interface acutely.

Fiske (1990: p.41) explains that the basic concepts of the meaning of signs share a

generally similar pattern, it concerns with three elements which are (1) the sign, (2) that

to which it refers, (3) the users of the sign. A sign has to be apprehensible, physical and

be related to something else, whilst it also needs to be realised by the users.

Peirce is considered as the founder of the American tradition of semiotics.

Peirce (1931-58) and Ogden and Richards (1923) establishes a very resemble model

that defines how signs imply something. A triangular relationship between a sign, the

user, and the outside existent world has been identified. This triangular relationship

model is regarded as the most important to the study of the meaning of signs.

Peirce's three terms is modelled as in Figure 2.1. Each end point can be realised to the

others is accentuated by the two ended arrows. A sign which implies something else can

be inferred by the viewer. This means that it influences the user's mind – interpretation.

Figure 2.1 Peirce's elements of meaning

sign

interpretant   object
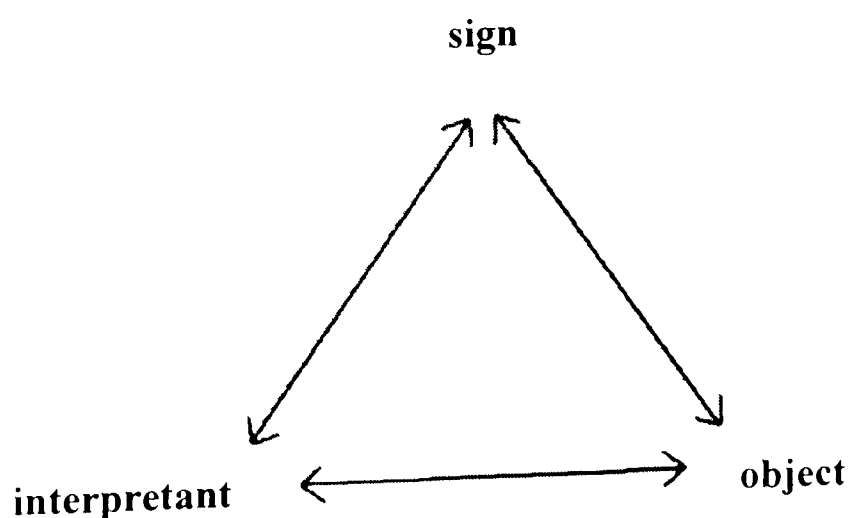
●**Sign is the elemental term in semiotics**

Signs were divided by Peirce into three categories - icon, index, and symbol.

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Marcus (1993) explains that semioticians divide signs into icon, index, and symbol according to qualities that allow them to signify the meaning of the object, but the sign is still the primary term.

●Icon

Fiske (1990) defines what an icon is. In an icon, it has significant resemblance to the physical object and it looks similar to it. An icon conveys the meaning through the physical attributes which is similar to the object. An icon is very easy to use and is intuitive. For example, the printer icon represented in the Microsoft Office application means that, when the user presses it, a document can be printed out.

●Symbol

Fiske (1990) explains that a symbol does not look like the object. A symbol is defined by people because they concord what it stands for.

A symbol doesn't have any resemblance to the object which it represents and has no any inherent implication. A symbol is realised on the basis of convention. Symbols do not have the physical attributes of the objects, which are usually abstract or without any visual features. A good example of interpreting what a symbol is, the letters and alphabets are the symbols and used to represent sounds.

●Index

In an index, there is a deep connection between sign and object. A sign has a direct link with the object (Fiske 1990). For instance, when we see smoke and it direct us to thinking there might be a fire.

●Metaphor

According to the observation of Marcus (1993), awareness of semiotics principles, in particular, the use of metaphors, can assist developers and researchers in achieving more

efficient, effective ways to communicate.

Metaphors can include the all important terms, concepts and graphics, which can imply contents, characters, functions, purpose, organisations, and people. The application of metaphors is needed in the designing of user interface. Understanding the principle of semiotics, especially metaphors applying, it will help the designer and web developers to design a visual interface more efficiently to communicate with different type of users (Marcus, 1993). "Metaphors are the fundamental concepts, terms, and images by which and through which information is easily recognised, understood, and remembered." (Marcus, 1993: p.101) All important elements consist of metaphors. The choosing of command and control, and all of the status of information is portrayed by using metaphors.

The way to minimising the misunderstanding of visual representation and using metaphors properly is according to the cognition of users. Metaphors play a very important part in user interface design and they are culturally predetermined. If metaphors are applied appropriately, they are a powerful tool for communication. According to Evers (2002), if the designer completely apprehends the value of culture and understands the real need and orientation of the users, they can design a visual interface very well. If the designer can engage metaphors in interface design properly, then they are able to make a cultural bond as well.

●**Visual Metaphor and Graphic Icons**

In computer interface design, metaphor and graphic icons are often applied.

Icons are metaphorical visual expressions and they may be concrete or abstract.

A large amount of text can be reduced in the digital display if an icon is applied

accurately to convey the meaning of the text. This means that icons can make good use

of display space, but the premise is they have to be correctly interpreted by the viewer.

Actually icons may be interpreted in different ways by viewers based on the differences

of culture, experience. How the audience interprets pictorials or graphic icons become

an important issue.

It is important to understanding the communication between the visual representation

(graphic icons) and the viewer. Pettersson (1994) makes a good statement,

"Pictorial language must be adapted to the viewer's capacity for interpreting it.

Communication can be said to function successfully, if the viewer understands

to the fullest extent, what the picture-maker wants the picture to say, and if the

message conveyed is unambiguous ".

It makes the visual representation very ambiguous when the designers make the graphic

icon universal by increasing more general features of them. To make the graphic icons

abstract may result in unclear communication to the viewers.

To make a visual interface easy to use, the designers should refrain from using too

many additional icons and functions. Otherwise it may have adverse effects (Roth,

1995).

●Using metaphor in the context of culture

Eminent metaphor design should be developed through the core of culture and represent

the essence of culture by precise visual icons. The visual interface designer should

target the inter-relationship among cultural essence and interface metaphor, but not just

keep on focusing on the newest technology, function, and visual pleasure.

Marzano (2000) also mentions that the product should not only offer the function,

technology, and form, but also offer meaningful content for the audiences.

In order to reach this level, the designers have to consider cultural elements and realise how to put these cultural elements into the web interface design. To be brief, two factors are required to design a successful web interface. One is using metaphors properly and effectively, reflecting from the mental model of the users, and the other is facilitating human computer interaction.

Marcus (1997) suggests that, in future, the research needs to search deeper into various cultural metaphors, to see how they have an effect upon communication, the ways of measuring their effectiveness, and the procedure of designing the metaphors.

Good metaphors enable user to understand, memorise content easily and promptly, effectively by being in charge of how the user expects, how they understand, and how they are pleased (Marcus1997).

2.3.4 Cognition theory

According to Preece (1993), we need to apply psychology theory to the Web interface design. Another researcher, Evers (2002), also mentions that the understanding of human computer interfaces is related with the process of cognition. Usually, people interacting with a computer system is regarded as interacting with information. The objective of using the machine is to undertake a job to allow the users to access, manipulate and understand the information. People use computers and peripheral devices to reach the above-cited objective. That is, the interaction between humans and computers is cognitive-based; in other words, it requires the use of the mind.

Consequently, cognitive psychology is implemented in order to make sure that the treatment of information matches the user's mental process capabilities (Preece. 1993). Regarding the design of computer systems, cognitive psychology benefits can be summarised as follows: Firstly, giving insights about the possibilities that the user can and cannot be expected to do. Secondly, naming and providing explanations about the nature and causes of the problems that the users have to cope with. Thirdly, providing modelling tools to enhance (help set up more compatible interfaces) interface compatibility.

What is cognitive psychology? Oakley (2004) explains that, "The word cognitive originally comes from Latin word "cognoscere", which means "to know". Therefore cognitive activities include all the psychological processes and activities involved in thinking and knowing. These include how information is acquired, processed and organised". Apparently, the cognitive activity is similar to the process when the users navigate the websites to get the information they need. In the following, some principles of cognition theory which can be applied in interactive web design are introduced. They include visual perception, attention, human information process, memory, learning and model.

● **Visual Perception**

According to the visual perception analysis of Preece (1993), the seeing process is regarded as an active process. When things are seen, instead of seeing the external world reproduced, we see a model created by our visual system. Information coming from the environment and antecedently acquired knowledge is used. As a result, we are

provided with a more invariant view of the world than if the flux of changing images was simply projected onto our retinas. This process includes the organisation of the sensory input and information. The principal organisation is the separation of the figure, object of interest and focus from the background. This allows us to discern an object from its environing background. That is, visual depth cues allow a three dimensional perception of the world. Indeed, our perception of three dimensional objects in two dimensional representations (i.e., pictures, films) is possible, thanks to the application of these cues. Among computer systems, information can be presented in numerous ways, such as text graphics, animation, video or combinations of these.

Some elements regarding the information have to be taken into account when designing screen displays. The information has to be: readable (i.e., the text is easy to read at a glance), distinct (i.e., the figure is discriminated from the larger ground apparently), capable of being understood, uncluttered, meaningful and structured.

● **Attention**

According to Preece (1993), our senses are bombarded by sights, sounds and smells in our daily life, and the amount of information that we can integrate is limited by our cognitive processes. In other words, this is regarded as "selective attention". However, this means that our organism is more likely to be restricted to realise one task at a time. In the following, the implications of our limited attention for system design are shown. Firstly, how can people's concentration be focalised on the information at any stage of a task? Secondly, as people can easily lose their attention, what are the possibilities to focus it in order to not miss any crucial information? Thirdly, what are the solutions to enable the users to shift between tasks at an interface? Fourthly, numerous techniques

are accessible to attract and guide the user's attention, they include: displaying the information in a coherent and significant structure helping users to find pertinent information. Using various visual items (flashing lights, fonts...) and auditives prompts the attraction of people's attention. E.g., dividing a screen into distinct or imbricate sections or windows.

● **Human information process**

Preece (1993: p.26) states "When interacting with a computer system, a user will frequently look at a certain part of a screen and then perform an action". A user's computer interaction will include a glance at a different part of a screen followed by the realisation of an action (i.e., scan a list of options on a menu and select one). In cognitive psychology, the way the realisation of an action is performed is considered as a series of information processing stages. Sounds, sights and smells are regarded as interrelationship in information processing. In human information processing, a series of information processing stages are:

The first stage: converting the environmental information into some intrinsic representation. The second stage: comparing this representation with the existing ones that are already in the brain. The third stage: taking the decision of a pertinent response

The forth stage: organising a response and a requisite question.

Through the encoding process, in order to give a constant model of the world, information is manipulated and reconstituted. This information retention will depend on how well it has been treated. Our capability to memorise things will depend on the manner in which they are at first encrypted.

● **Memory**

Preece's (1993: p.27) states, "memory is involved in all our action". Without memory, we would not be able to carry out a simple task such as cleaning our teeth. It is variable that a human's capability to remember things which reflect the human's interaction with computer system. When designing a computer system, we have to follow some important guidelines. They are listed as follows: Using only significant names and icons which are easy to perceive from each other in a set. Using names and icons which are relevant with the structure of the set and the relationships between the numerous functions and commands in the set. One of the most known findings in memory research is that it is far more difficult to recall a material from a display when not looking at it rather than when looking at it.

● **Learning**

Preece (1993: p.28) states that, "Learning to use a computer requires active involvement." During the involved process, a learner will face different learning schemes which include:

1. Learning through doing. People are kinaesthetic learners and prefer to learn by doing something rather than learning through a manual.

2. Learning by active thinking. Understanding how a system works and the reason of its way of acting is needed. This is generally done by providing their own explanations and specific reasoning.

3. Learning through goals and planned knowledge. Users apply a goal that they have in mind into a plan of action. To achieve their goals, users have to fit the operations

according to the computer system ability to perform the desired end. However, in most

of the cases, there is an imbalance between the two, leading to errors.

4. Learning through analogy: comparison of a previously acquired familiar system with

a new and unknown one.

5. Learning from making mistakes. The users learn from wrongdoing and, as a result,

enhance their understanding in an activity.

● **Norman's Psychology**

There are seven key issues related to web communication in Norman's psychology.

These key issues are (1) User's Model, Design Model, System Image, (2) Use

Metaphors, (3) Use Constraints, (4) Make things visible, (5) Mapping, (6) Feedback, (7)

Human always makes mistakes.

1. User's Model, Design Model, System Image

Preece (1993: P.30) explains the definition of a mental model from Norman and Draper

(1986), "When we interact with anything, be it the environment, other people or

technological artefacts, we form internal mental models of ourselves interacting with

them. When 'run' or 'rehearsed', these mental models provide the basis from which we

can predict and explain our interactions". This means that when we interact with

anything, no matter if it is the physical environment, people or multimedia artefact, we

will shape our mental model in mind to interact with them.

Actually there are three kinds of models: the user's mental model, the design mode and

the system image. The user's mental model originates from their earlier experience: the

design model is the model for which the designer assumes that the system can work

properly: and the parts of the system are named the system image.

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People can get predictions and explanations of interaction based on these mental models shaping in their mind when interactions are executed or rehearsed.

Ex-experience from a user's mental model and the users will interact with the interface according to their mental model. Conjointly, the parts of the system are named the system image. The design model comes from design teams and they think that the system should work in a design model. Generally design models should be precise, direct and concrete, and try to be an entirely coherent model of a system.

The user usually just uses parts of the mental model of a system, which will be constant, simplified, and contorted in many circumstances.

2. Use Metaphor

To design a system image that enables the user to extend a properly mental model. A technique is to design a precise and clear metaphor that is appropriate for the system. Designing a metaphor which fits the task is very important (Norman, 1998).

3. Use Constraints

When the designers design the interface, they can anticipate what kind of mistakes the user will make and restrain the interaction to remind the users to modify their mistakes (Norman, 1998).

4. Make things visible (What You See Is What You Get)

The action which fits the aims should be offered by the system. The system state should be understood by the user and be satisfied by user's expectation. And the system state should also be visible, comprehensible and readable. All of the essential components are presented in the screen display, so the users can find and use them without any ambiguity and carry out their purpose easily (Norman, 1998).

5. Mapping

Mapping implies a connection between three matters. They are the controls, the movement, and the consequence in the world. Norman (1998) defines natural mapping as availing of physical analogies and cultural criterion to lead to instant comprehension.

6. Feedback

Feedback means sending a message back to the users after their accomplishment of an action. In computer science and information theory, it is accepted that sending information to the users in response to what they had finished and what action they executed. When the designers design the visual interface, the interface should offer instant feedback or response to the input of the users (Norman, 1998).

7. Humans always make mistakes

Humans always make mistakes. Different reasons are at the origin of human mistakes. It has to be assumed that mistakes will be made by the users since they carrying out action that they are not entirely and appropriately conditioned for. Regard the action as parts of an instinctive, structural conversation between user and system. The designers should give help to the users, but not to defend them. Let the users get retrieved from mistakes, and let them know what had occurred. Try to make it easy to invert performance. Arrange a system which can be explored (Norman, 1998).

2.4 Web usability

2.4.1 Introduction

Since globalisation has become an important consideration, cross-culture relevance has become the main issue in web-based design. More and more researchers are contributing to establishing the relationship between usability and culture. For example, Barber and Badre (1998) declared that cultural preferences such as colours, text, graphics, geography, sounds, motions, flags, and language, will influence whether people feel that a web design is "user friendly" or not. Thus, usability issues have to be taken into account based on the cultural context. Before we discuss web usability and cultural influence, let us discuss the definition of usability in the next section. In this research, the usability test is adopted to evaluate the effectiveness of web communication.

2.4.2 The definition of usability

The definition from the International Standard Organization (ISO) Standard 9241 is widely accepted in the software engineering community. The ISO Standard 9241 defines usability as, "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context to use." This definition implies that a usable web site design should be intuitive and transparent. It supports users in carrying out the intended task efficiently, easily, enjoyably, functionally, and quickly. In contrast, poor usability means that users who

use a website cannot accomplish the task efficiently, easily, enjoyably, functionally, and quickly.

According to Brinck et al. (2002), "Usability is defined as the degree to which people can perform a set of required tasks." Usability is the quality indicator for web interaction experiences. Usability is the assessment of the quality of user's experience when interacting with the product.

Most previous concepts and ideas of usability have come from human factors engineering and human machine system engineering literature. Since the Internet has been so popular, more and more web usability research have been developed. In the following paragraph, some of the important web usability definitions will be introduced.

Nielsen (1993) defines five attributes of web usability as:

● Learnability: How quickly new users can learn to accurately execute the process of a task is determined by ease of learning. Usually, the fewer steps a procedure requires, the easier it is to learn.

● Efficiency: Efficiency can be the assessment of the time or actions needed to carry out a task. The process of executing a task faster means more efficiency.

● Memorability: The degree to which a system makes demands on human memory determines how easy it is for users to remember.

● Errors: Error tolerance is decided by how well errors are precluded, how easily they are recognised and identified when they occur, and how easily they are amended as they are identified.

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• Satisfaction: Usability is often determined by how users feel about execution tasks within the system. Although a user's perception of usability can be influenced by visual graphics, layout, typography and other visual interface elements, user satisfaction is probably a combination of all these criteria.

Based on Human-computer interaction (HCI) studies, Preece (1993) defines usability as follows. The design of computer systems that are safe, efficient, easy, functional and enjoyable to use is the main concern in HCI. The goals of HCI are to develop and improve user computer interaction so that the users can manipulate the interface and execute their tasks effectively, efficiently, safely, and enjoyably.

Table 2.4 User-Interface Internationalization from Jia Shen (2000)

Objectivity levels	Internationalisaion Issues	Example	Current research example
Comprehensibility ↓ Usability ↓ Desirability	Language	Product language localisation	Unicode; Machine Translation; Microsoft knowledge base for common computer word translation
	Institutional matters	Time zone, date format, currency, measurement	
	Environmental factors	Esthetics, Icons and symbols	ISO symbols for interface; Microsoft knowledge base for international colour use
	Social conventions	Forms and values	Cultural model

Based on Nieson & Del Galdo's study of international user-interface (1996), the three levels are depicted by Jia Shen (2000) in Table 2.4. According to Nielson & Del Galdo (1996), to produce an international user-interface, there are three levels of consideration.

The first level is elaborated as "processing and displaying the user's native language, character set, notations and formats" (Nielson & Del Galdo,1996: preface. vi). Actually most companies have carried out this level. The second level is illustrated as the implementation of "understandable and usable" (Nielson & Del Galdo, 1996: preface. vi) interfaces – it is the adjustment of time zone, currency, usability for the target-market culture. The third level is defined as the creation of Web interfaces that "accommodate user's cultural characteristics" (Nielson & Del Galdo, 1996: preface. vi). The third level extends to the main issue that this research concerns, such as meeting the requirement of the social conventions of the target-culture people. This research focuses between usability and desirability.

2.4.3 Usability approaches

Generally speaking, there are three types of approaches to web usability. They are usability inspection, group walkthrough, and user testing.

A usability inspection involves several design experts (usually they are professional website designers) working together to evaluate the interface design of websites based on general web guidelines. This approach is sometimes known as expert evaluation. A usability inspection is also regarded as a heuristic evaluation. Heuristic evaluation is often interpreted as a specific type of usability inspection with a specific set of 10 guidelines which are presented as follows: content and scope, speed, navigation, appropriateness to task, visual design, compatibility, simplicity, consistency, and error.

In a group walkthrough, a group of stakeholders meet to view websites design through performing some tasks, and then identifying what the problems are. This is very similar to usability inspection except that it is task-oriented, and it involves people who are not professional designers (usually they are managers, salesmen, programmers, marketing experts).

User testing involves observing how users carry out certain tasks on websites and, according to their performance, identifying problems with the web site. Generally, user testing is the most popular and inexpensive approach.

2.4.4 Usability and cultural impact

Some researchers have explored the relationship between culture and usability, and how culture impacts usability. Barber and Badre (1998) suggested culturability, which combines two words, usability and culture. Both of them built up cultural markers which are systematic usability methods to evaluate hundreds of websites, and then define cultural design elements such as colours, fonts, icons, metaphors, geography, sounds, motions, flags, language, preferences for text vs. graphics, directionality of how language is written, help features and navigation tools to facilitate user performance. According to Barber & Badre (1998), the merging of culture and usability - Culturability has implications for web design. What is "user friendly" for one culture may be quite different for another culture. Usability must be re-defined based on cultural context.

Sun (2001) explored how cultural markers affect web usability by interviewing target users about their interaction experiences of websites. There are some important implications from his research. He declares, "Culture is moving from borders of web usability to the forefront. Cultural marker should be one metric in usability matrix as learnability, efficiency, satisfaction, and so on."

According to the literature above, cultural factors influence web usability greatly, particularly in this era of globalisation, cross–cultural thinking has become the main issue in web design.

2.4.5 Evaluating effective web communication

This research integrates the notion of usability from Nielson (1993), Preece (1993), and Nielson & Del Galdo (1996), and defines the evaluation criteria of effective web communication. Based on the literature review, usability is the quality indicator for web interaction experiences, therefore, the web usability could be applied to assess the effective communication within websites, and the assessment criteria of web usability can be adopted in this research. More and more researchers (Nielson & Del Galdo, 1996; Barber & Badre,1998; Sun,2001; Simon, 2001; Smith, 2004) have emphasised that usability must be re-defined based on cultural context. The criteria of desirability from Nieson & Galdo's study (1996) are incorporated into the evaluation criteria of effective communication. Therefore the evaluation criteria of effective communication in this research are defined as learnability, efficiency, errors, satisfaction, desirability. The details are described as follows:

●**Learnability**: The time and effort (i.e. clicks) required to carry out a specific performance. Generally, the fewer steps a procedure requires, the easier it is to learn.

●**Efficiency**: The time required to finish a specific task. The less time required to execute a task, the more efficient it is.

●**Errors**: Usually, an error is defined as any action that does not accomplish the intended target, and the error is evaluated by counting the number of actions made by the user when a task is executed.

●**Satisfaction**: This refers to pleasant use of the website. A user's perception of satisfaction can be affected by visual representations, layout, navigation and other visual interface elements, and user satisfaction is probably a combination of all of the above criteria.

● **Comprehension**: It is easy to understand and readable.

● **Desirability**: This encompasses the expectations and preferences of users. The proportion of users who state that they would prefer using the website over a specified website.

2.5 Summary of findings

2.5.1 Limitations of cross-cultural Web design guidelines

Based on the literature review, the guidelines are too general, not suitable for long-term utility, and does not guarantee a well-design product.

● The guidelines are too general and not sensitive to the context of the target-culture (Yeo, 2001).

● The guidelines make the design process of Web design more complicated, but still can not really meet the need of the users. Furthermore, the long-term utility is questionable (Bourges-Waldegg & Scrivener, 1998).

● It is criticised that these guideline can be applied to legitimise poor design, but not guarantee well-designed systems (Lansdale and Ormerod, 1994).

2.5.2 Limitations and strengths of cultural design preference approach

2.5.2.1 Limitations

● Cultural design preferences are usually inclined to be stereotypical.

● Social and cultural context surrounding the artefact are not taken into account (Sun, 2001).

● The cultural markers of the dominant cultures are identified and presented, but the minority cultures are ignored (Sun, 2001).

●If cultural markers are applied unselectively in the localisation process, it has the probability to fall into the trap of stereotyping other cultures. The cultural markers approach has their own inherent limitations (Sun, 2001).

2.5.2.2 Strengths

● The cultural design preference approach is an efficient means to address the target culture audience and could increase Web usability.

●Some researchers have echoed the above notion. The cultural marker approach is an efficient means to address the target culture audience. Cultural design preferences can map directly into culturally appropriately design elements for a website (Sun, 2001).

Fitzgerald (2004) believes, "cultural markers show the best promise." These culturally preferred design elements can be comprehended by the target culture users quite well. Kondratova et al. (2005) echo Fitzgerald. Generally, the cultural marker approach seems to be the one that is easier to map directly into culturally appropriate design attributes within a website.

2.5.3 Limitations and strengths of the exisiting cultural web model

2.5.3.1 Limitations

● Cultural dimension models are not appropriate for directly predicting design results and are too stereotypical

The existing cultural models are descriptive, and not prescriptive, so they cannot be applied deductively. Fitzgerald (2004) criticised that the cultural dimension model concentrates on description for culture, but not prescription for practical communication

of Web interface design. Hall (2001) also pointed out that it would be a mistake if the web designers just applied the attributes from the current cultural models and then deduce how the target audience would respond to the web technology, because the current model is descriptive, and not prescriptive, it cannot be used deductively. It is too stereotypical, and, in Hovenschiold's study (2002) and Griffith's research (1998), it has shown evidence that the same country does not necessarily fit the cultural model developed by Hofstede.

● **The purpose of cultural dimension models are not for Web design**

Del Galdo & Nielsen (1996), and Fernandes (1995) has pointed out that it is difficult to incorporate these model into Web interface design for a specific culture in the business area.

According to Marcus (2001), models are conducted to meet their own purposes and are not always compatible with web design. Hall (2001) also identified the current cultural models that are designed for another purpose. Gunter and Randall (2003) indicated Hofstede's model was developed for business communication, and not for design.

● **No empirical study (usability) to support the claim of cultural web model**

There is no usability study from users of different countries to support the cross-cultural web models developed by Marcus and Gould (2000), Sheridan (2001), Zahedi et al. (2001), and Sun (2002).

●**Cultural models focus on a particular time, whilst cultures keep on interacting and developing**

Jagne & Smith-Atakan (2004) criticised that they focus on a particular time and a specific group of people. Sun states (2002) that not only culture is dynamic, and will keep changing, but technology also keeps developing. Walsham (2002) claimed that it

is crude, simplistic and defined culture as a stable phenomenon. but the reality is that culture keeps on changing and developing. It is not easily translated effectively into practice.

2.5.3.2 Strengths

● Although Hofstede's cultural dimension model is not appropriate for directly predicting design results, Gillham (2004:p.108) suggests, " Hofstede's cultural dimension model can provide a subjective measurement of the gulf between the culture of origin and the localisation of target culture. "

● **The most widely cited and influential culture theories**

Hofstede's (2005) model is the most widely cited and used in previous cultural research, and the most influential culture theory among social science research (Nokata & Sivakumar, 2001; Pavlou &Chai, 2002).

● **Cultural models have been applied to develop Web design guidelines**

Marcus & Gould (2000) and Sheridan (2003), as well as Gould, Zakaria, & Yusof (2000),apply Hofstede's cultural dimension model to develop cross cultural web design guidelines.

● **Cultural models have been applied to construct many empirical studies**

Simon (2001), Smith (2004) have used the current cultural models to set up their experimental studies.

2.5.4 Research and theories related to web communication

● **Five elements for accessing effective web communication**

The Web design characteristics that would impact effective communication

are visual representation, multimedia, colour, navigation, layout, content & structure,

and language.

● **The principles of visual communication design**

The principles of visual communication design and concepts can be applied to the

design of visual interactive interface design. It is important to realise the principles of

human visual perception, as they will help the visual interface designer arrange effective

computer images, icon and visual interface. A deep understanding of the characteristics

of human visual perception helps the designers to construct effective web-based design

and facilitate web communication.

● **Semiotics can improve web communication**

Semantic problems cover how symbols transmit the intended significance. According to

Marcus (1997), the semiotics principle can help web developers, web designers, and

researchers in developing more efficient, effective means to communicate to diverse

audiences from different cultures. If signs can be used appropriately, the audience can

communicate with the Web efficiently.

● **Cognition theory should be applied into web communication design**

According to Preece (1993) and Evers (2002), we need to apply psychology theory in

Web interface design. The interaction between human and computer is cognitive-based:

in other words, it requires the use of the mind. Consequently, cognitive psychology is

implemented in order to make sure that the treatment of messages cope with the user's

mental process capabilities.

2.5.5 Web usability

The definition of usability indicates that a usable website design should be intuitive and transparent. It supports users in carrying out the intended tasks efficiently, easily, enjoyably, functionally, and quickly.

Since globalisation has become an important consideration, cross-culture relevance has become the main issue in web-based design. More and more researchers are contributing to establishing the relationship between usability and culture. Thus, usability issues have to be taken into account based on the cultural context.

This research integrates the notion of usability from Nielson (1993), Preece (1993), and Nielson & Del Galdo (1996), and defines what the evaluation criteria of the effective web communication are. They are learnability, efficiency, errors, satisfaction, and desirability.

2.6 Gap

Based on the literature review, the main gaps shown below.

2.6.1 Improvement to the way the cultural model is incorporated into web design

● **Cultural dimension models cannot be appropriate used to predict design result directly**

This is because cultural models are descriptive, not prescriptive, and they cannot deduce directly.

● **Design guidelines are too general and cultural dimension models could not be applied efficiently**

Many web-based design guidelines are too general and do not provide sufficiently effective strategies on how to apply cultural models in an appropriate way for a web artefact design. The previous review does not provide extensive information about how cultural models can be applied in a meaningful way to a web product's design

● **Hofstede's model is set up for business communication, not for Web design**

According to the literature review, many researchers have pointed out that it is difficult to incorporate this model into Web interface design for a specific culture because it is set up for business communication, and not particularly for design.

2.6.2 Cultural models focus on a particular time and a specific group of people

Hofstede's dimension model focuses on a particular time and selects a specific group of people (IBM employee) as their samples. Culture is dynamic, not a static phenomenon, and it will keep on changing and interacting, with the technology continually developing.

2.6.3 No empirical study to support the claim of the cross-cultural web model

Most of the current cultural web models self-report data or are from real working experiences in developing web artefacts. No usability study from users of different countries to support the cross-cultural web models were developed by Marcus and Gould (2000), Sheridan (2001), Zahedi et al. (2001), and Sun (2002), therefore, the validity of their claims is questionable. Although Smith et al. (2004) has built up experimental studies to testify the cross-cultural Web design model, these are focused on perception, and ignore the performance issue.

2.6.4 No single cultural model is sufficient for communicating effectively

- There is a lack of knowledge in developing websites which can facilitate effective communication. According to Zahedi et al. (2001), "No single model of cultural understanding is sufficient for communicating effectively with all web audiences." There is still lack of knowledge that could form the guidelines to contribute to the researchers, web developers and designers, with regard to reaching audiences with specific cultural characteristics.

- **There is not enough cultural study for successful localisation.**

2.7 Bridging the gap

To bridge the gap, improve the limitations, and apply the strength from the previous research, this research could address the following issues:

- Based on the fact that there is no single sufficient model to facilitate effective communication, and culture factors are not incorporated into web design appropriately, a theoretical cross-cultural Web design model is proposed to bridge the gap. (the details of this theoretical model are introduced in Chapter 3).

- According to the literature review, the cross-cultural design guidelines and cross-cultural-web models are inclined to be too stereotype, therefore, this research suggests that web developers should have their own teams to engage the target culture directly, and construct local web audits (where the cultural marker approach is adopted) to investigate the target culture users' preferences. The culture is dynamic, and the local

website audit is constructed to survey how the changing of culture impacts on the target culture audience directly and immediately.

• Based on the review of the previous research, the cultural markers approach can map directly into culturally appropriately design elements for a website. Therefore, this research integrates the strength of the cultural markers approach (construct local website audit) and the strength of the cultural dimension model, which can be used as a good indication in comparing the culture of origin and the localisation target culture.

• Based on the literature review, the previous cross-cultural Web design models lack empirical studies to support their claims. Even some empirical studies have been constructed, but ignored the performance issues in usability. To improve the limitations, an empirical study (web experiment) is constructed to test the proposed model. There are two main parts in this web experiment: experimental websites design and implementation, as well as evaluation of web communication, (user testing approach is adopted in this stage) and the evaluation of users' performance will be emphasised in this research.

Chapter 3 Proposing a theoretical model of cross-cultural Web design

3.1 Introduction

The internet has a diverse multi-cultural user-base, so it is important for web designers and developers to get the web interface design right and not to risk losing their customers to cultural biases. Web developers and designers should be conscious not to stereotype their target-culture customers by applying current cultural models. According to this context, there is a need to diagnose the limitations and gaps of previous culture theories, cultural models, to minimize the limitations and bridge the gap, and to propose a new model to fit the dynamic culture market within the globalisation age.

Three types of studies (cultural studies, cultural design preferences approach, and existing cultural web model) have been reviewed in Section 2.2.5 of Chapter 2. Based on the review of these studies and finding the limitations, a new proposed theoretical cross-cultural web design model will be formulated.

3.2 Formulating the theoretical model

Let us consider the overviews of the three existing cultural web models.

Firstly, reviewing the theoretical model built up by Marcus and Gould (2000), there is no user usability test from different countries to back up their guidelines and it is too stereotypical, with users from the same country not always conforming to Hofstede's model. Therefore, the validity of their model is questionable.

Secondly, looking at the experimental studies of Smith et al. (2004), the issue of performance is not considered in usability, but only perception are concentrated on.

Thirdly, checking the theoretical work integrated with social construction theory developed by Zahedi et al. (2001), important web interface components have been ignored (i.e. visual representation, navigation, interaction, mental model) which would influence the effective communication, thereby casting a shadow over their conceptual model. The other issue in their model is that no usability test was developed to support their claim. Sun (2003) applied the model of Zahedi et al. with dynamic processes and changing variables from the existing models, but there are no usability experiments to verify his claim, and therefore the validity of Sun's model is also questionable.

3.2.1 Summary of the limitations of the previous research

Reviewing the above cultural studies, cultural design preferences approach and existing

cultural models, there are some limitations in the above research. Bourges-Waldegg and

Scrivener (1998) have pointed out that Hofstede's (2005) model is too stereotypical,

stating there are some disadvantage about localisation, and that the existing culture

models are too general and not sensitive enough to the applied context of target-culture.

To conclude briefly, most of the existing models for web interface design lack usability

tests to support their claims, they are too stereotypical, and one of them (the model of

Zahedi et al.) just focuses on web document, ignoring the other crucial web interface

design features such as visual representations, navigation, interaction, mental model.

Based on reviewing the previous research and criticising the drawbacks of the current

model, there is a need for a new model to fill the void. Therefore, a new theoretical

cross-culture web design model is proposed (see Figure 3.1). It is recommended that the

web designer and developers should be careful that the established cultural model might

be too stereotypical and do not really fit the target culture market. As Del Galdo and

Nielson (1996) suggested that the web designers should get involved into the target

culture directly and Hall (2001) also recommended that it is likely that a better

comprehension of target culture can be attained if the target culture is directly addressed.

Later Sun (2002) declared that cultures continue to develop and interact, and they are

not ontologically objective. It reminds web developers and designers to maintain

practical observation of the target-culture users, because culture is constantly changing,

particularly in the internet era. To avoid being too stereotypical by applying the existing

cultural model and to engage the target culture directly, this new model not only adopts

the established conceptual cultural model, but also applies the "Cultural Markers" approach to find out the culturally preferred web interface design attributes from the target culture. This proposed model would integrate the cultural markers approach with the cultural models. Some other researchers such as Sun (2001), and Konfdratova et al. (2005) also echo that the cultural markers approach would be an effective way to map into the target-culture market directly.

In Sun's study (2001), it is documented how culturally preferred design elements (cultural markers) such as visuals, language, colours, and pages affect web usability by interviewing target culture users about their experiences. The study also seeks to identify which kinds of cultural markers are more distinguished to the people from specific culture, and it is recommended that people prefer websites with culturally preferred characteristics from their culture. To sum up, the key issues are that cultures play a crucial role in web usability and the usability of web can be strengthened by cultural markers. Kondratova et al. (2005) also corroborate with Sun, and the Cultural markers approach is seemingly the easier way to map directly into culturally design attributes for a specific culture website.

A new theoretical model of cross-culture website design is formulated (see Figure 3.1, next page). The new proposing model consists of four stages and will be introduced in details.

Figure 3.1 Theoretical cross-cultural Web design model

Phase1.Understand the context of use

Investigate cultural preferences

Local website audit
Foraging websites
Cultural markers identification
(Design preferred characteristics)
Cultural pattern identification

Cultural dimension factors

High context vs. low context
Power distance
Collectivism vs. individualism
Masculinity vs. femininity
Uncertainty avoidance
Long - term vs. short - term orientation

Phase 4.Evaluate the effectiveness of web communication Phase 2.Define a cultural model for the target culture

Usability
learnability
efficiency
errors
satisfaction
Comprehension
Desirability

Facilitate
Effective
Communication

Culture data patterns
Differences
Similarities

Phase 3.Website design production

Components impacting web communication
Visual representation
Colour
Multimedia
Navigation
Layout
Links
Content and structure
Language

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3.2.2 Phase 1: Understand the context of use

The aim of this stage is to integrate the cultural markers approach with the existing cultural model. The cultural markers approach is also adopted in web communication expert Smith's (2004: p.70) research and he states, "Towards gaining a deeper understanding of how to develop websites, that are optically matched to both its target audience and to its domain, it is necessary to investigate the different signs in a local culture, their context of use, and the meanings that the locales attribute to them." This can be carried out by establishing an audit of the local indigenous sites, so the local website audit will be carried out in this stage.

The cultural markers approach aims to use the local website audit to identify culturally preferred characteristics to localise the web interface design at a cultural level. The approach needs to identify the interface design features that are preferred by specific-culture audiences or most prevalent in the specific-culture country.

Firstly, previous research involving cultural preferences is consulted, such as those of Barber & Badre (1998), Sun (2001) and Cyr & Trevor-Smith (2004).

Secondly, observing the real features in websites that have been selected.

Thirdly, Hofstede's (2005) cultural dimension, Hall and Halls' (1990) high and low context dimension, Marcus and Gould (2000), and Würtz (2005) are incorporated, and web design characteristics (cultural markers) are identified by integration with the elements from previous research involving cultural preferences, as well as detailed inspection of the scope websites. Finally, the culturally preferred design elements are defined and comprise of eight categories: visual representations, multimedia, colour,

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layout, navigation, links, content & structure, and language. These elements are united to match the cultural expectations of the users from specific culture. The detailed introduction of people from different cultural dimension or different culture context have different inclinations, with tendencies of preferences as referred to Sections 2.2.2.1, 2.2.2.3, and 2.2.5.1 of Chapter 2.

By looking at different users' preferences for cultural markers on the cultural level (visual design, colour, layout, navigation, and interaction) and their cultural backgrounds, the relationship or connection between the users' preferred characteristics and their cultural background (the cultural dimension and context) can be derived. Furthermore different modes of cultural markers can be applied to specific target culture audiences.

3.2.3 Phase 2: Defines a cultural model for the target culture

This stage defines a cultural model for the target culture and aims to identify and state a picture of differences and similarities in the observed attributes of the target-culture users' specific practice. The objective of this stage will identify the international variables needed to define a cultural model. The next step will compare and find out the similarities and significant differences in the response of the samples in order to create a pattern of the target-culture customers.

3.2.4 Phase 3: Website design production

Based on the results from Stage 1 and 2, the website's prototype will be constructed, and the webpages will be embedded with the observed culturally preferred characteristics. The web interface preferred design characteristics are categorised into

several aspects such as visual representation, navigation, multimedia, colour, layout.

language, interaction, and content and structure. This stage focuses on the production of

the website's prototype.

3.2.5 Phase 4: Evaluate the effectiveness of web communication

From reviewing the previous research from Nielson (1993), Brink et al. (2002). Preece

(1993), and Zahedi et al. (2001), the components of web communication effectiveness

can be derived from web usability. In order to measure effectiveness of each design. the

evaluation criteria of web communication effectiveness is identified, which includes

learnability, efficiency, minimal errors, satisfaction, comprehension and desirability. The

assessment criteria are presented as follows:

● **Learnability**: Is it easy to learn? Can the user find the information he or she wants?

How quickly can new users learn to accurately execute the process of a task is

determined by ease of learning. Usually, the fewer steps a procedure requires, the easier

it is to learn.

● **Efficiency**: Is it efficient to use? Efficiency can be the assessment of the time or

actions needed to carry out a task. The process of executing a task faster implies greater

efficiency.

● **Errors**: According to Nielsen (1993), the evaluation criteria of errors is defined as,

"users should make as few errors as possible when using the website (computer

system)." Nielsen's notion is adopted in this research.

● **Satisfaction**: Is it pleasant to use? Usability is often determined by how users feel

about executing tasks within the system. Although a user's perception of usability can

be influenced by visual graphics. layout. typography and other visual interface elements.

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user satisfaction is probably a combination of all of these criteria.

● **Comprehension** : Is it easy to understand? Is it readable?

The website usability test involves users from the target-culture market to be set up and prototype evaluation includes assigning tasks for the users to carry out, usability questionnaires, and interviewing the users to obtain their preferences, experiences, and subjective impressions.

● **Desirability**: It fits the expectation and preferences of users. The proportion of users who state that they would prefer using the web site over some specified website.

Data are analysed to modify the websites based on the results of the usability test (web experiment). A replicable process should take place subsequently by modifying the prototype website based on the results of the evaluation. Further assessment should be developed on the working site.

Based on the methodology structure in this research, the theoretical model is the initial phase, and the next stage is to perform the local websites audit, the web experiment to collect data, and finally the analysis to validate the proposing theoretical model.

Chapter 4 Methodology

4.1 Introduction

This chapter will review the aim of this research, which is to set up a cross-cultural web design model, and the methodology developed to validate each phase of the theoretical model.

Reviewing literature formulates the basis of this research. Firstly, the key questions are formulated, and then a theoretical cross-cultural model for web design is proposed to answer the key questions, in which the variable, relationships, and measurement methods are identified, and two related of testable hypotheses are conducted. The first related hypothesis is - there are significantly different preferences for web interface design across cultures, and the local website audit is constructed to testify this hypothesis. Furthermore, it is questioned that, if the cultural differences (significantly different preferences) do exist, can those cultural differences be applied to improve web usability? Therefore, the second related hypotheses are proposed - if the websites are embedded with culturally preferred elements and incorporated with their cultural dimension, it can be more effective in communication. To testify the second related hypotheses, a web experiment is developed. Based on the two related testable propositions, the proper methods, data collect instruments, different data analysis method are applied.

The methods, which are applied at each stage, have been reviewed in Chapter 2. They are the cultural dimension model (i.e., Hofstede's, 2005; Trompenaars and Hampden-Turner , 1997; Hall and Hall, 1990) and the current approaches for cross-cultural web design, as well as a usability approach (i.e. usability inspection, group walkthrough, user testing). The proper and robust method will be applied based on different stages and hypotheses. A framework is illustrated below to address the methodology of this research.

Figure 4.1 Methodology Framework

Stage 1: Literature reviewing (Chapter 2)

Comprehension in the previous research involving the accommodation of cultural issues into Web design and the related theories.

↓

Stage 2: Key question and two related questions (Chapter 1)

● How can culture factors be incorporated into Web design to facilitate effective communication?
● Are there significant different Web design preferences across Taiwanese and British cultures?
● If there are significant different preferences across Taiwanese and British cultures, how can those cultural differences be applied to improve the performance of users and facilitate effective web communication?

↓

Stage 3: Formulating theoretical model (Chapter 3)

The theoretical model is formulated based on the gap of literature review, and criticizing the existing cultural model.There are four phases in the theoretical model,which are listed as below.
Phase1: Understand the context of use
Incorporate cultural dimension model and investigate cultural preferences
Phase2: Define cultural model for target culture
Phase3: Website design production
Phase4: Evaluate the effectiveness of web communication

↓

Stage 4: Local websites audit (Chapter 5)

Method:
Literature survey &
Cultural Markers
approach

● To test the first related hypotheses
There are different Web design preferences across Taiwanese and British cultures.

↓

Stage 5: Website experiment (Chapter 6)

Method:
User testing approach
task assigned &
questionnaire

● To test the second related hypotheses
If the web interface design can reflect the user's culture, it can be more effective in communication.
Based on the results of the local website audit, the culturally preferences of Taiwan and the UK are embedded in websites integrating with their cultural dimension in web experiment.
Four experimental websites are set up.

↓

Stage 6 : Validate theoretical cross-cultural Web design model (Chapter 7)

Based on the above framework, the details of each stage are introduced in the following sections.

4.2 Stage 2 key question and two related hypotheses

●**The first related question**

"How can culture factors be incorporated into Web design to facilitate communication?" is the key question of this research. According to literature review, it reveals that users' preferences differ between cultures, but no research has ever investigated the differences between Taiwan and the UK. Therefore, the first related question is formulated. Are there any significantly different preferences across British and Taiwanese cultures? Based on the question, the hypotheses are formulated - The users' preferred web design elements differ across British and Taiwanese cultures. Hofstede's (2005) cultural dimension, Hall and Halls'(1990) cultural context, and Trompannars and Hampden-Turners' (1997) cultural dimension are incorporated in the first related hypotheses.

● **The first related hypotheses**

Taiwanese culture with collectivism, long-term time orientation, high context, higher power distance, lower masculinity has their preferred web design characteristics. British culture with individualism, long-term time orientation, high context, lower power distance, and higher masculinity has their preferred web design characteristics.

● **The second related question**

If different cultural preferences for web design characteristics exist, how can the culturally preferred design characteristics be applied to increase the effectiveness of

communication? Do the users perform better in websites which incorporate culturally preferred design characteristics?

● **The second related hypotheses**

Based on the second related question, the second related hypotheses are formulated - If the web interface design can reflect the user's culture, it can be more effective in communication. Based on the outcome of the local website audit, the cultural preferences of Taiwan and the UK are different. In the website experiment, the culturally preferred design elements are embedded in websites. Whether or not the web reflecting the user's culture can be more effective in communication, and the communication effectiveness (usability), will be evaluated in five aspects such as learnability, efficiency, minimal errors, satisfaction, comprehension, and desirability. The details of the second related hypotheses are shown below.

1. If a typical Liverpool-based website is embedded with culturally preferred design elements that reflect British culture, it can be more effective in communication for British users.

2. If a typical Taichung-based website is embedded with culturally preferred design elements that reflect Taiwanese culture, it can be more effective in communication for Taiwanese users.

3. If a modified Liverpool-based website is embedded with culturally preferred design elements that reflects Taiwanese culture, it can be more effective in communication for Taiwanese users.

4. If a modified Taichung-based website is embedded with culturally preferred design elements that reflect British culture, it can be more effective in communication for British users.

4.3 Stage 3 Formulating the theoretical model

4.3.1 Gaps in the previous research

- **The way the cultural model is incorporated into web interface design needs to be improved**

Cultural dimension models cannot be appropriately used to predict design results directly. This is because cultural models are descriptive, not prescriptive. and they cannot deduce directly.

- **Cultural models focus on a particular time and a specific group of people**

Hofstede's dimension model focuses on a particular time and selects a specific group of people (IBM employees) as their samples. Culture is dynamic. not a static phenomenon, and it will keep on changing and interacting, with continually developing technology.

- **No empirical study to support the claim of the current cross-cultural Web model**

No usability study from users of different countries to support the cross-cultural web models developed by Marcus and Gould (2000), Sheridan (2001), Zahedi et al. (2001), and Sun (2002), therefore, the validity of their claims is questionable. Although Smith et al. (2004) has built up experimental studies to testify the cross-cultural Web design model, these are focused on perception, and ignore the performance issue.

- **No single cultural model is sufficient for communicating effectively**

- **There is not enough cultural study for successful localisation**

4.3.2 Proposal of theoretical cross-cultural Web design model

To bridge the gaps, improve the limitations, and apply the strength from the previous research, the theoretical cross-cultural Web design model is proposed.

● Based on the fact that there is no single sufficient model to facilitate effective communication, and cultural factors are not incorporated into web design appropriately, a theoretical cross-cultural Web design model is proposed to bridge the gap. (the details of this theoretical model are introduced in Chapter 3).

● This research suggests that web developers should have their own teams to engage the target culture directly, and construct local web audits (where the cultural marker approach is adopted) to investigate the target culture users' preferences.

● This theoretical model incorporates the current cultural model, but also studies the local cultural preferences from the target culture (integrating the strength of the cultural dimension and cultural marker approach).

● The previous cross-cultural web design models lack empirical studies to support their claims. Even some empirical studies have been constructed, but ignored the performance issues in usability. To improve the limitations, an empirical study (web experiment) is constructed to test the proposed model and the evaluation of users' performance will be emphasised in this research.

4.3.3 The theoretical cross-cultural Web design model

Phase 1: Understand the context of use: Incorporate cultural dimension model and

investigate cultural attributes (preferences). The details are presented in

Chapter 3.

Phase 2: Define cultural model for target culture. The details are presented in Chapter 5.

Phase 3: Website design production. The details are presented in Chapter 6.

Phase 4: Evaluate the effectiveness of web communication. The details are presented in

Chapter 6.

4.4 Stage 4 Local website audit

4.4.1 Testing the first related hypotheses

In this stage, a local website audit is constructed to test the first related hypotheses-

There are different Web design preferences across Taiwanese and British cultures.

4.4.2 Method

Literature survey and Cultural marker approach are applied.

● **Justification for this method applied**

There are three stages at the local website audit. Firstly, the cultural markers approach

(Barber & Badre, 1998) is adopted. Based on previous research, where the importance

of identifying cultural markers is emphasised, the cultural marker approach is an

efficient means to address the target culture audience. As Fitzgerald (2004) believes,

"cultural markers show the best promise." The culturally preferred design elements can

be adequately understood by the target culture users if they are used properly.

Kondratova et al. (2005) echoes Fitzgerald, "In general, it appears that the cultural

marker approach is the one that is easier to map directly into culturally appropriate

design elements for a website". In Sun's (2001) study, it is stated that, if the cultural

markers are applied properly in the website, they can really increase the cultural

sensitivity of multilingual websites. The cultural marker approach is an efficient means

to address the target culture audience.

Secondly, the real attributes in websites that have been selected are observed and

incorporated .

Thirdly, the respective cultural dimensions of Taiwan and UK are addressed based on

the literature review from anthropologists (i.e., Hofstede, 2005; Hall &Hall, 1990).

Many Web design researchers (i.e., Marcus & Gould, 2000; Sheridan, 2001; Smith et

al., 2004; Simon, 2001) apply Hofstede's cultural dimension model to develop their

research successfully. Web communication researchers (i.e., Würtz, 2005; Chen and

Starosta, 1998; Choe, 2001) develop their cultural analysis of websites based on Hall

and Hall (1990). It is found that these cultural variables, categorised by Hofstede, as

well as Hall and Hall, provide a beneficial level of analytical flexibility to easily and

effectively apply them to web communication. As a previous cultural web researcher,

Ever (2002: p.91), states, cultural variables can be used to "...allow the researcher to

frame participants' responses in term of culture and compare this to what is generally

known of the users' national culture." Therefore, the cultural dimension models are

applied at this stage.

● **Culture categories**

The culture categories used in this research are based on national culture. The UK and

Taiwan are selected for the comparison in this research.

● **Justification of Taiwan and UK selection in this audit**

Taiwan and the UK are selected because they represent very distinctly different cultural

attributes, based on Hofstede's country cultural dimensions (2005).

4.4.3 Sample

● **Genre: local government city websites selection for audit**

According to Barber & Badre (1998), websites of the government genre are chosen.

Local county and city government sites offer many sufficient sample sizes for each

country. Local government websites were selected to avoid the influence of corporate

branding or company images. It is expected that the websites chosen in this audit would

be less influenced by external designers or attributes. Generally, local government

websites are mostly designed by local designers, and the design elements applied by the

local designer will be a subconscious indication of custom, norm, value, bias, and

preferences of local culture.

● **Size**

Twenty-five county government websites in Taiwan and the top twenty-five populated

city council websites in the UK were selected. These are listed in Section 5.3, Chapter 5.

● **Evaluators to do the audit**

The local web audit is carried out by design experts who come from the target culture, and therefore have a deep understanding of the target culture through first-hand personal experiences.

If the characteristic is not present in the web page, it will be given a 0, but if the characteristic is present, it will be given a 1. For example, if the homepage of a site has a flash animation feature, the expert will add a 1 for that categorical variable. Each evaluator has a variable form to record their examination.

Two design experts are invited to be the evaluators. One is Taiwanese, and the other is English. The detailed introduction is presented in Section 5.5 of Chapter 5.

4.4.4 The procedure of local website audit

● **Step 1: Foraging Websites**

25 local city government websites in each country (Taiwan and the UK) were selected. The detailed introduction to how websites are scoped are presented in Section 5.3 of Chapter 5.

● **Step 2: Identification of Web design characteristics**

Web design characteristics (which are referred as "cultural markers" by Barber & Badre, 1998) are found in webpages, and become cultural markers when they are proven to be highly frequently used in a particular cultural area (or within a particular group of people) and less prevalent in another group. The detailed introduction to how the websites design characteristics are identified is presented in Section 5.4 of Chapter 5.

There are three steps to identifying Web design characteristics in this study.

Firstly, previous research (i.e., Marcus& Gould, 2000; Würtz, 2005; Barber & Badre,

1998; Cyr & Trevor-Smith, 2004; Sun, 2001) is consulted.

Secondly, observing the real features in websites that have been selected.

Finally, web design characteristics (cultural markers) are identified by integrating with

the elements from previous research as well as detailed inspection of the scope websites.

The web design characteristics in this research are categorised into eight categories.

namely, visual representation, colour, multimedia, navigation, language, content &

structure, links, and layout. The web design characteristics identified for this study are

presented in Table 5.5 of Chapter 5.

● **Step 3: Identification of culturally preferred design elements**

The cultural design characteristics preferences of local users are identified. All websites

are inspected manually by the two experts. Taiwanese websites are checked by the

Taiwanese expert and British websites are inspected by the British expert. Finally, the

culturally preferred web interface design characteristic are identified through the eight

aspects. The main findings for the web culturally preferred design characteristics

between the UK and Taiwan are displayed in Table 5.16 of Chapter 5.

4.4.5 Data Analysis tool

The inspected results from the two evaluators are entered into and analysed by SPSS.

Chi-Square analysis is applied to perform the cross-tabulation comparisons to check

whether there are significant differences between the UK and Taiwan in each category.

4.5 Stage 5 Web experiment

4.5.1 Website design and production

4.5.1.1 Experimental websites

Based on the second related hypotheses, incorporated with the cultural dimension, and the results of the local websites audit, the culturally preferred features are embedded into four websites, a typical Liverpool based website reflecting British culture, a modified Liverpool based website reflecting Taiwanese culture, a typical Taichung based website reflecting Taiwanese culture, and a modified Taichung based website reflecting British culture. The details of experimental websites are introduced in Section 6.3.3.1 of Chapter 6.

4.5.1.2 Four experimental websites are constructed

Based on the second related hypotheses, the researcher constructed the following four experimental websites.

(1) A typical Liverpool based website is:

http://culturalweb.myweb.hinet.net/livenglish/liverpoolenglish.html

(2) A modified Liverpool based website is:

http://culturalweb.myweb.hinet.net/livmodified/liverpoolmodified.html

(3) A typical Taichung based website is:

http://culturalweb.myweb.hinet.net/taienglish/taichungenglish.html

(4) A modified Taichung based website is:

http://culturalweb.myweb.hinet.net/taimodified/Taichungmodified.html

4.5.1.3 Software applied to Web design and production

In the production of the four websites, Adobe Photosop CS, Illustrator CS, Flash MX, Dreamweaver MX software application are used.

4.5.2 Web experiment

4.5.2.1 Testing the second related hypotheses

It can be more effective in communication if the web interface design can reflect the user's culture. Based on the results of the local website audit, the cultural preferences of Taiwan and the UK are different. In the website experiment, the culturally preferred design elements, integrating with the users' cultural dimension, are embedded in the websites. Four websites, based on the cultural dimension of Taiwan and the UK, and their culturally preferred design elements are set up to test the second related hypotheses.

4.5.2.2 Method

User testing approach is applied.

● **Culture categories**

The culture categories used in this research are based on national culture. The UK and Taiwan are selected for comparison in this research.

● **Selected criteria of town websites**

Websites of the government genre are chosen based on the selection of Chapter 5's local website audit. The Taichung county government website and the Liverpool city council website are selected as templates to develop the website. Both websites reflect the attributes, which are aligned with the cultural dimension developed by Hofstede (2005) and Hall and Halls' (1990) cultural model, as well as the cultural web design model

developed by Marcus and Gould (2000). The details behind why the above two websites are selected are stated in Section 6.3.2 of Chapter 6.

4.5.2.3 Justification for this applied method

Usability is the quality indicator for web interaction experiences. The reason for using this method is to gather real experience and performance from the users of the target culture. User testing is the most direct and efficient way to obtain responses from the real users. As Nielsen (2000) reports, the most cost effective way to evaluate a localised product is to observe local users using it .

User testing involves observing users performing specific activities with the website to identify what problems they have when they interact with the site. As Brinck et al. (2002: p.406) states, "User testing is one of the most popular of all usability method and it can identify the specific problems because the users get involved and actually performing the task, not just simply express their opinions." The tester can have a high confidence in the result of users testing and find unexpected problems that cannot be found by other means.

4.5.2.4 Sample

• **Sample size**

There are fifteen Taiwanese participants and fifteen British participants.

• **Sample characteristics**

Taiwanese and British participants are unfamiliar with the locations of both Liverpool and Taichung, as well as their respective websites. All of the participants recruited are familiar with the Web Browser-Internet Explorer 7.

● **Cultural orientation of the sample**

Fifteen Taiwanese participants are recruited in this experiment, and these are international graduate students from Brunel University, and are native Chinese speakers. Their average age is 27 years old. All of them use the Internet every day and have been staying in the UK for 7 months. All of them are born and brought up in Taiwan and are doing a masters degree at Brunel University. The fifteen British participants recruited in this experiment are native English speakers and are staff and PhD students from Brunel University. Their average age is 37 years old and all of them use the Internet everyday. More details are introduced in Section 6.3.6.2 of Chapter 6.

4.5.2.5 Experiment procedure and equipment

● **Experiment procedure**

Each participant is invited to Laboratory TA403 to participate in the web experiment. At first, the experimenter asks the participant to read the instructions and explains them to make sure they know what they are going to do. They are then shown the consent form, and required to fill in the demographic form. Furthermore, the participants are asked to carry out the tasks assigned on four of the websites by following the instruction and task assigned. When the participants execute the tasks, they interact and navigate with the websites, during which the time and clicks of carrying out each task are captured and recorded. Finally, the usability questionnaires are used to get their response, subjective

opinion, and satisfaction from the participants, based on their real interaction experience within each website.

● **Apparatus**

Computer configuration:

Hardware: Intel Pentium4, 3.20GHz, RAM 0.98GB

OS and version: Microsoft Windows XP, Professional version 2002

Browser and version: Internet Explorer 7

Two nationalities:

Taiwanese and British

Four websites:

A Typical Liverpool based website:

http://culturalweb.myweb.hinet.net/livenglish/liverpoolenglish.html

A modified Liverpool based website:

http://culturalweb.myweb.hinet.net/livmodified/liverpoolmodified.html

A typical Taichung based website:

http://culturalweb.myweb.hinet.net/taienglish/taichungenglish.html

A modified Taichung based website:

http://culturalweb.myweb.hinet.net/taimodified/Taichungmodified.html

Dependable variables:

The culturally preferred Web design characteristics between the UK and Taiwan (see Tables 6.1 in Chapter 6)

Other equipment: Stopwatch, digital video camera

4.5.2.6 Data collection instrument

The data collection instrument consisted of instructions, demographic questions. a

consent form, the tasks assigned, questions for evaluating effective communication, and

a questionnaire for cultural variable.

● **Task assigned**

Using Spool et al.'s (1999) method, the questions are designed so that the answer

comprised of a single fact, and there is only one correct answer.

● Four sets of tasks are constructed for each website. The tasks are equivalent for the

typical and modified websites of each town.

● Two group of participants need to locate requested pages on both versions of each

town website.

● **Questionnaire design**

The assigned tasks are used to evaluate the performance of the users. The questionnaire

is designed to evaluate the usability of the web. The effective communication will be

evaluated by performance and the response of the questionnaire from the users. These

questions, with a 5 point answer scale, are designed to assess participants. Scale 1

means strongly disagree, scale 2 means disagree, scale 3 means neutral, scale 4 means

agree, and scale 5 means strongly agree. These questions are designed to evaluate

learnability, comprehension, satisfaction, desirability, and cultural variables.

4.5.2.7 Analysis tool and method

The SPSS analysis software is applied. A paired sample T-test is applied to compare the performances and responses of participants from the same country between typical and modified version website of each town. An independent sample T-test is applied to compare the performance and response within the same version of a town website between Taiwan and the UK. A general linear model is applied to compare the interaction effect by town from websites across the Taiwanese and British cultures.

4.5.3 Evaluation of effective communication

Usability criteria are applied in this evaluation. The definition of usability indicates that a usable website design should be intuitive and transparent. Since globalisation has become an important consideration, cross-culture relevance has become the main issue in web-based design. More and more researchers are contributing to establishing the relationship between usability and culture. Thus, usability issues have to be taken into account based on the cultural context.

This research integrates the notion of usability from Nielson (1993), Preece (1993), and Nielson & Del Galdo (1996), and defines what the evaluation criteria of effective web communication are. They are learnability, efficiency, errors, satisfaction, comprehension, and desirability. The results from the users' performances of the tasks and the users' responses from the questionnaires are used to evaluate the effective communication.

4.6 Summary

All surveys and web experiments are carried out and different methods are applied at each stage to validate the theoretical cross-cultural web design model which is proposed in Chapter 3. It also explains how these methods are applied to test the hypotheses, justification for this applied method, the sample, experiment procedure and equipment, data collection instrument, and the analysis tool used in each stage. To sum up, this research methodology consists of five stages:

Stage 1: Literature survey including cultural models, cultural markers approach, communication theories, and web usability (The details are presented in Chapter 2).

Stage 2: key questions are addressed and two related hypothses are proposed.

Stage 3: The theoretical model is formulated by criticising the existing cultural models, improving the limitations of these models, and bridging their gaps on the literature review (The details are presented in Chapter 3).

Stage 4: Incorporating cultural dimension and studying the cultural preferences from the target culture. In this stage, it is proposed that there are different preferences across cultures (Taiwan and the UK). The method applied in this stage is a literature survey and cultural markers approach. The local website audit is established to find the different preferences across British and Taiwanese cultures. The results of this audit will be applied to test the second related hypotheses in the web experiment (The details are presented in Chapter 5).

Stage 5: In this stage, it is proposed that the web would be more effective if it reflected the users' culture. The method applied in this stage is a user testing approach. The

culturally preferred design elements are embedded in the experimental websites. British and Taiwanese participants are recruited to interact and navigate in the experimental websites. The website experiment is conducted to test the second related hypotheses, furthermore, it involves quantitative data collection, data analysis, and finally the results are presented (The details are presented in Chapter 6).

From stage 1 to 5, all the data, results and implications from the local website audit and web experiment are analysed, interpreted, and integrated to validate the theoretical cross-cultural Web design model (The details are presented in Chapter 7).

Chapter 5 Local websites audit

5.1 Introduction

The previous research identified some web interface design elements that are culturally specific and these are generalised as cultural markers. These may influence the users' performance, and change their practice and attitude, thus in turn influencing the web usability. The concept of the "cultural marker" has been coined by Barber & Badre (1998) and refers to "interface design elements and features that are prevalent, and possibly preferred, within a particular cultural group". Such design elements can signify cultural association and conventionalised use of the attribute in the website. It is also declared that, "Cultural preferences and biases (i.e., colours, text vs. graphics, spatial orientation, among many others) impact what is deemed user friendly" (Barber & Badre, 1998).

Therefore, it is important to explore the cultural preferences in a target culture if a company wants to develop a website which can appropriately map the target culture. The aim of this chapter is to investigate the culturally preferred design elements based on the cultural dimension of the target culture. Local website audits are conducted to analyse websites in Taiwan and UK, to identify the cultural preferences of web design elements between the two cultures. Twenty-five websites are selected from each country. Web interface design elements (attributes or characteristics), which would influence effective communication, are divided into several categories (i.e., visual representation, navigation, multimedia, colour, content & structure, links, and layout). More details

including the reason why the local websites audit needs to be conducted, the adopted method, as well as the result of local websites audit will be presented in the following sections.

5.1.1 Justification of the local website audit

Sun's (2001) study indicates some important research needs to be carried out, "Larger scale studies to investigate how cultural markers work in multilingual Web design: researching cultural markers originating in as many cultures as possible" (Sun, 2001: p.101). Web developers and designers are supposed to recruit more participants from different cultures to carry out the usability tests in the context of local cultures rather than in the context of the American culture.

According to Smith et al. (2004), to catch a deeper comprehension of how to create a website that is appropriately pitched to the target culture users, it is essential to examine the different signs or symbols (or visual representation) in a target culture, the usage of signs based on the context, and how the target culture audience interprets these signs. This can be achieved by conducting an audit of local indigenous sites. "In order to design the user interface of the website that is culturally optimised, i.e., an interface that matches the cultural expectations of a particular cultural group, it is necessary to first understand how existing sites in a country/culture are built for a particular target culture or sub-culture" (Smith et al., 2004: p.69).

The culturally preferred design elements of UK and Korea are investigated in the cross culture web study by Juric et al. (2003), where 40 UK and Korea web pages were examined and the different specific design elements between two countries were identified. The study suggested that the first step is for the web designers and developers to analyse cultural sensitivities and identify cultural markers in the process of cross cultural web design.

Based on the previous research, where the importance of identifying cultural markers is emphasised, the local web audit is conducted to investigate the difference between web design elements across cultures and to identify the culturally preferred design characteristics between UK and Taiwan.

5.1.2 Hypotheses

Audiences from different cultures have different psychological and social associations with the colour and screen design direction, with the notion of screen usage varying amongst a diverse audience. This observation has been presented by Del Galdo & Nielson (1996). In Evers's research (1997), it is also indicated that preferences for web interface design attributes are different from culture to culture.

Badre (2000) examines the effect of cross-cultural interface design orientation on World Wide Web user performance. Badre (2000) set up an empirical study to test whether the websites, which are embedded with the culturally specific preferred design elements, would affect the native user's performance or preference. The results imply that there are some design elements (cultural markers) which are culturally specific, and these are related with the user's performance and preferences from a specific culture.

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Sun's (2001) empirical study examining cultural markers focused on language, visuals (graphics and images), colours, and page layout, and the results indicate that culture plays a crucial role in improving web usability. Marcus & Gould (2000) applied Hofstede's (2005) cultural dimensions to examine and note the similarities or differences between reactions of the audience from diverse countries on preferences for design features (i.e. colours, images, navigation, interaction).

Based on the above research, it can be assumed that preferences for web design characteristics differ across cultures (countries). In this research Taiwanese and British cultures were selected for comparison to identify on their preferences for prevalent web design characteristics.

5.1.3 Web design elements to access effective communication

Based on the literature review, there are some important web design characteristics that can engage the users into the effective communication. In this research, these web design elements are elaborated as below:

●Visual representation

Based on Hofstede's five dimension cultural model (2005), Marcus and Gould (2000) developed their cross cultural web design guidelines, and indicated that there would be pictures with groups, pictures of aged experienced and leaders, and more official slogan in web interface design from cultures that are influenced by collectivism dimension. There would therefore be pictures of young individuals, images of action, with the emphasis on action in web interface design from cultures that are influenced by individualism dimension. Many images that do not transmit the same meaning in all

cultures are discovered in many previous studies (i.e., Cook,1980; Fussell &

Haaland,1978). Russo & Boor (1993: p.344) suggest that, "some users will recognise an

image, but they will not associate it with the originally intended concept". The image

must be considered very carefully to succeed in the global market. Differences among

cultures to recognise images that are culturally specific must be comprehended by the

web designers (Russo & Boor ,1993). Symbols play a crucial part in web design and

can be an indication of culture (Marcus & Gould, 2000).

Based on the previous research review, it is assumed that preferences for visual

representation vary between British and Taiwanese cultures. In this audit, visual

representation refers to images, symbols, image of regional, and image of architecture.

●Colour

How people interpret the meaning of colours differs across cultures. For example, red

means happy in China while it means danger and violence in U.S.A (Russo & Boor,

1993). Courtney (1986) found that red would be associated with danger or stop when

interpreted by Americans, but Chinese do not have the same interpretation, so when the

designer selects the colour for a product, consideration should be afforded to allow for

the appropriate translation of the colours.

Based on the previous research review, it is assumed that preferences for colours differ

between British and Taiwanese cultures.

In this audit, colour refers to the primary colour in the homepage, which includes

background white, background pale blue, background grey and multicolour.

●Multimedia

Hall (1976) identified High Context communication as involving "more of the information in the physical context or internalised in the person" (Hall, 1976, p. 79): people from a high context (HC) culture would have greater confidence in the non-verbal aspects of communication than the verbal aspects. Face-to-face communication in HC cultures is thus characterised by using many gestures, body language and symbolic behaviour for conveying meanings. Communication in low context (LC) cultures was identified as the opposite of HC communication. HC cultures place the emphasis on the personal relationship in the communicating process. Würtz (2005) hypothesises that, " HC cultures will apply for assimilating human presence on their websites, it is expected that HC cultures draw on the many potentials of the Internet by integrating animation and other communicative effects in their websites". For example, multimedia, flash animations, and chatrooms would have the potential for providing a sense of human representation.

Based on the previous research review, it is assumed that preferences for multimedia vary between British and Taiwanese cultures. In this audit, multimedia refers to streaming video, sound, text in motion and flash animation.

●Navigation

Marcus & Gould (2000) declare that culture would influence the navigation in web design. Audiences from cultures with a high uncertainty dimension (where anxiety arises when uncertain situations are encountered) tend to prefer a navigation structure intended to prevent the audience from getting lost.

Simon (2001) regards navigation and interaction as parts of the web communication interface. The diverse characteristics of web interface design are examined, and it was

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found that Asian and South Americans prefer navigation aids to change the appearance of the site without any concern for movements specially. There are some similarities between Europeans and North Americans; they contemplate changes in navigation on the sites to improve movement while making it simpler to use.

Based on the above literature review, it is assumed that preferences for navigation vary between British and Taiwanese cultures. In this audit, navigation refers to dropdown menus, vertical menus, horizontal menus, the return to home button and the keyword search.

●Language

Website designs will need to have more than one language if a company wants to internationalise themselves (Dempsey & Sussman, 1999). In Robbins & Stylianou's study (2003), websites of global companies were examined in Latin America, Asia, Canada, and the United States, and it was found that 100% of the Latin American and Asian sites had a translatable version available, but only 7% of those from Canada and the United States site had this capability.

Based on the above literature review, it is assumed that preferences for languages vary between British and Taiwanese cultures. In this audit, language refers to available translations, headlines, left to right and top to bottom.

●Content & structure

Hall & Hall's (1990) work might have some implications about how communication patterns vary across culture on the Internet. According to their study, a country with a low context culture, for example, Germany, tends to use a direct, explicit, and clear way to communicate, so people in Germany would prefer the messages to be represented in

an explicit, direct, and precise way. On the contrary, Japan is a high context culture, and messages are presented in an implicit and indirect way in Japanese websites.

Based on the above literature review, it is assumed that preferences for content and structure differ between British and Taiwanese cultures. In this audit, content and structure refer to index features, city slogans, index features, mayor column, help functions available, site map features and commercial banner advertisement.

●**Links**

Sun (2001) observed the users from America, Germany, China, and Brazil for design preferences, and found different preferences in navigation among these countries. It was discovered that the Germany audience prefer links in the navigation bar, which can be set up in alphabetical order, but this is not expected by Chinese and Brazilian users. Based on the above literature review, it is assumed that preferences for links differ between British and Taiwanese cultures. In this audit, links refer to indicated clickables, internal links, external links and symbols used for links and text links.

●**Layout**

Based on Hofstede's five dimension cultural model (2005), Marcus and Gould (2000) developed their cross culture web design guidelines, and indicated that a symmetrical layout would be more prevalent in web interface design for cultures which are influenced by high power distance. The asymmetrical layout would have a high frequency in web interface design from cultures that are influenced by low power distance.

According to Barber & Badre's study (1998), people with different cultural backgrounds have their preference for orientations and layout structure in web pages.

For instance, French users tend to prefer the centre orientation and suggest that the attributes on French websites would likely be centred on the page.

Sun (2001) suggested that a user from a low context culture (for example, Germany) would prefer a logical structure, whilst a user from a high context culture (for example, Japan) would prefer a paralleled structure and visual representation for information. Based on the above literature review, it is assumed that preferences for layout differ between British and Taiwanese cultures. In this audit, layout refers to menu on right, menu on left, menu on top, search top left, search top right, more white space, symmetrical, asymmetrical, proximity and alignment.

Overall, reviewing the literature above, it is assumed that culturally preferred web design attributes, including visual representation, colour, multimedia, navigation, language, content & structure, links, as well as layout, vary across cultures.

5.2 Method

At the local website audit stage, the cultural markers approach (Barber & Badre, 1998) is adopted. Some issues including culture categories, the reason why Taiwan and UK are selected, the reason why local government city websites are selected, and the procedure of the local website audit will be presented in this section.

5.2.1 Culture categories

The culture categories used in this research are based on national culture. UK and Taiwan are selected for the comparison in this research.

5.2.2 Selection of Culture for this audit

Taiwan and UK are selected because they represent very distinctly different cultural attributes, based on Hofstede's country cultural dimensions (2005). This is presented in Table 5.1:

Table 5.1 Hofstede's country cultural dimensions from Hofstede (2005)

Cultural dimension	Power Distance		Idividualism& Collectivism		Masculinity& Femininity		Uncertain Avoidance		Long term & short term time orientation	
	rank	score	rank	score	rank	score	rank	score	rank	score
UK	42/44	35	3	89	9/10	66	47/48	35	18	25
Taiwan	29/30	58	44	17	32/33	45	26	69	3	87

The Dutch anthropologist, Hofstede, examined IBM employees in 53 countries from 1978 to 1983. The study defined patterns of differences and similarities among the replies of employees through statistical analysis of a variety of data. The five dimension culture theory was thus formulated from analysis of the data. The dimensions are Power distance, Individualism vs. collectivism, Masculinity vs. femininity, Uncertain avoidance, Long-term orientation vs. short-term orientation.

Based on Table 5.1, UK is ranked 42/44, whilst Taiwan is ranked 29/30 in Power distance among 53 countries; UK is ranked 3rd, and Taiwan 44th in Individualism vs. collectivism; UK is ranked 9/10, and Taiwan 32/33 in Masculinity vs. femininity; UK is ranked 47/48, and Taiwan 26th in Uncertain avoidance; and finally, UK is ranked 18th, and Taiwan 3rd in Long-term orientation vs. short-term orientation. Particularly, there are significant differences in ranking in Power distance, Individualism vs. Collectivism, Uncertain avoidance, and Long-term orientation vs. short-term orientation dimensions. The introduction of each cultural dimension is presented as below.

• Power distance (PD)

This refers to the extent that less powerful members expect and accept unequal power distribution in a society. Countries with higher Power Distance cultures (e.g., Taiwan, Japan) have features such as hierarchical structure in organisation, with the relationships between superiors and subordinates being stricter than in countries like, Austria, New Zealand, and the Scandinavian countries, which have low power distance. For example, parents, teachers, and the older generation demand obedience and expect respect from the younger generation or children. On the contrary, countries like, UK, New Zealand, and the Scandinavian countries, with low Power Distance culture have characteristics such as more equal relationship between superiors and subordinates, and a flatter structure of organisation. Subordinates are more likely to express their ideas and get involved in making decisions. Children are treated more equal and trained to be independent at an early age.

• Individualism vs. collectivism (IDV)

Individualism in culture implies loose ties and everyone is inclined to take care of themselves or their nuclear family, and usually tends to be independent of other people. Collectivist culture tends to value group welfare more than the individual's target, where the achievement of an individual is not regarded as important as the accomplishment of the group, and believes in group relationship, where loyalty is dominant. Individualistic countries (e.g., UK, the United States) value the individual's accomplishment while collectivistic countries (e.g., Taiwan, China) emphasise the benefits of working in a group.

• Masculinity vs. femininity (MAS)

This refers to gender roles within a culture. Countries (e.g., Japan, UK) with higher masculine cultures tend to place emphasis on challenge, social recognition, and pursuit of welfare. On the contrary, countries like Taiwan, Norway and Sweden, with lower masculine cultures, tend to collapse gender distinction and overlap gender role, the emphasis placed on security, taking care of others, and the environment.

• Uncertain avoidance (UAI)

This refers to the extent to which people want to avoid uncertain conditions. People from countries like UK, Jamaica and Singapore, with low uncertainty avoidance cultures are more comfortable with uncertain situations. On the other hand, people from countries like Taiwan, Greece and Portugal, are cultures with higher uncertainty avoidance and tend to prefer rules, reject change, and uncertainty may result in anxiety.

• Long-term orientation vs. short-term orientation (LTO)

Long-term time orientation played an important part in Asian countries (e.g., Taiwan, China, Hong Kong, Singapore) that had been impacted by Confucianism. People in these countries believe strongly that unequal relationship is required to keep a society stable, clear hierarchical relationship is needed to keep family and society in harmony, virtuous behaviours are identified as working hard and being perseverant. People in countries like UK, Germany and U.S.A., with short-term time orientation tend to prefer equal relationships, place emphasis on individualism, treating other people as they would like to be treated, and get fulfilment through creativity and real action.

5.2.3 Selection of websites for this audit

According to Barber and Badre (1998), websites of the government genre are chosen. Local county and city government sites offer many sufficient sample sizes for each country. It is expected that the selected sites are not influenced by external factors to the organisation. Local government websites were selected to avoid the influence of corporate branding or company image. It is expected that the websites chosen in this audit would be less influenced by external designers or attributes. Generally, local government websites are designed by local designers mostly, and the design elements which are applied by the local designer will be an indication of custom, norm, value, bias, and preferences of local culture subconsciously.

5.2.4 The procedure of local website audit

Step 1: Foraging Websites

25 local city government websites in each country (Taiwan and UK) were selected. The detailed introduction to how websites are scoped will be presented in Section 5.3.

Step 2: Identification of Web design characteristics:

Web design characteristics (which are referred as "cultural markers" by Barber & Badre, 1998) are found in webpages, and become cultural markers when they are proven to be highly frequently used in a particular cultural area (or within a particular group of people) and less prevalent in another group. The detailed introduction to how the websites design characteristics are identified will be presented in Section 5.4.

Step 3: Identification of culturally preferred design elements

The cultural design characteristics preferences of local users are identified. All websites are inspected manually by two experts, one from Taiwan and the other one from UK. Taiwanese websites are checked by the Taiwanese expert and British websites are inspected by the UK expert.

5.3 Foraging Websites

The web audit involves examining outstanding and successful websites that contain

representative images, colour, layout, and content. Twenty-five county government

websites in Taiwan and the top twenty-five populated city council websites in UK were

selected. The twenty-five county selected government websites of Taiwan are listed

below:

Table 5.2 Local government websites in Taiwan

The name of the local government	Web Address
1. Keelung county government	http://www.klcg.gov.tw
2. Taipei municipal government	http://www.taipei.gov.tw
3. Taipei county government	http://www.tpc.gov.tw
4. Taoyuan county government	http://www.tycg.gov.tw
5. Hsinchu county government	http://www.hsinchu.gov.tw
6. Hsinchu municipal government	http://www.hccg.gov.tw
7. Miaoli county government	http://www.miaoli.gov.tw
8. Taichung county government	http://www.taichung.gov.tw
9. Taichung municipal government	http://www.tccg.gov.tw
10.Changhua county government	http://www.chcg.gov.tw
11.Nantou county government	http://www.nantou.gov.tw
12.Yunlin county government	http://www.yunlin.gov.tw
13.Chiayi county government	http://www.cyhg.gov.tw
14.Chiayi municipal government	http://www.chiayi.gov.tw
15.Tainan county government	http://www.tainan.gov.tw
16.Tainan municipal government	http://www.tncg.gov.tw
17.Kaohsiung county government	http://www.kscg.gov.tw
18.Kaohsiung municipal government	http://www.kcg.gov.tw
19.Taitung county government	http://www.taitung.gov.tw
20.Pingtung county government	http://www.pthg.gov.tw
21.Hualien county government	http://www.hl.gov.tw
22.Yilan county government	http://www.e-land.gov.tw
23.Kinmen county government	http://www.kinmen.gov.tw
24.Matsu county government	http://www.matsu.gov.tw
25.Penghu county government	http://www.penghu.gov.tw

The top twenty-five populated city council websites of UK are listed below:

Table 5.3 Top 25 populated cities websites in UK

The name of the city	Web address
1. London	http://www.london.gov.uk
2. Birmingham	http://www.birmingham.gov.uk
3. Leeds	http://www.leeds.gov.uk
4. Glasgow	http://www.glasgow.gov.uk
5. Sheffield	http://www.sheffield.gov.uk
6. Bradford	http://www.bradford.gov.uk
7. Liverpool	http://www.liverpool.gov.uk
8. Edinburgh	http://www.edinburgh.gov.uk
9. Manchester	http://www.manchester.gov.uk
10. Bristol	http://www.bristol.gov.uk
11. Kirklees	http://www.kirklees.gov.uk
12. Fife	http://www.fife.gov.uk/orgs
13. Wirral	http://www.wirral.gov.uk
14. North Lanarkshire	http://www.northlan.gov.uk
15. Wakefield	http://www.wakefield.gov.uk
16. Cardiff	http://www.cardiff.gov.uk
17. Dudley	http://www.dudley.gov.uk
18. Wigan	http://www.wigan.gov.uk
19. East Riding	http://www.eastriding.gov.uk
20. South Lanarkshire	http://www.southlanarkshire.gov.uk
21. Coventry	http://www.coventry.gov.uk
22. Belfast	http://www.belfastcity.gov.uk
23. Leicester	http://www.leicester.gov.uk
24. Sunderland	http://www.sunderland.gov.uk
25. Sandwell	http://www.sandwell.gov.uk

5.4 Identification of Web design characteristics

Web design characteristics found in web pages become cultural markers when they prove to be frequently used in a particular cultural group. There are three steps to identifying Web design characteristics in this study.

Firstly, previous research is consulted, such as those of Barber & Badre (1998) Marcus and Gould (2000), Sun (2001), Cyr & Trevor-Smith (2004), and Würtz (2005). Barber & Badre (1998) identified cultural markers (see table 5.4) as colour, language, motion, fonts, flag, sound, link, regional, grouping, shape, icon/metaphor, geography, architecture, and human figure. Cyr & Smith (2004) identified web design features as language, layout, symbol, content and structure, navigation, link, multimedia, and colour. Sun identified cultural attractors such as language, visual, colour, and page layout. Marcus and Gould (2000) defined five web interface design elements to access effective communication. They are metaphors, mental model, navigation, interaction, and appearance. Würtz (2005) discussed the tendency of web interface features (i.e., animation, level of transparency, linear vs. parallel navigation, images) in high context and low context cultures.

Secondly, observing the real features in websites that have been selected.

Finally, based on Hofstede's (2005) cultural dimension and Hall and Halls' (1990) high and low context dimension, web design characteristics (cultural markers) are identified by integrating with the elements from previous research as well as detailed inspection of the scope websites.

Table5.4 Cultural Markers from Barber and Badre (1998)

HTML Specific	Icons/Metaphors	Colours	Specific Colours	Grouping
# of lines # of centers # of images # of links # of internal links # of external links link colour visited link colour horizontal bars tables bold italics underlines frames audio video background image background colour text colour	international local clocks newspapers books pages homes stamps envelopes musical notes paperclips thumbtacks other	red blue green purple pink black yellow gold teal white multiple	flag graphics pictures borders background	symmetrical asymmetrical proximity alignment boundary enclosure connection
Flag	**Language**	**Geography**	**Orientation**	**Sound**
native foreign multiple	native foreign multiple	maps outline globe	centered left-right right-left	music voice
Font	**Links**	**Regional**	**Shapes**	**Architecture**
cursive italics bold size shading	color embedded stand alone internal external	foliage animals landscape water desert	squares circles triangles rectangles lines arrows	state building house church office cityscape

The web design characteristics in this research are categorised into eight categories. At this stage, the examination is focused on these eight major categories of Web design characteristics: visual representation, colour, multimedia, navigation, language, content & structure, links, and layout. The web design characteristics identified for this study are presented in Table 5.5.

●**Visual representations**:

Visual representations include different categories of images and symbols:

Images of region, images of architecture

Image and symbol: city logos, symbolic icons, cute style icons, leader images, images of young individuals, images of groups, images of multi-race, and images of action

Regional: foliage, animals, landscape, water

Architecture: house, church (temple), office, cityscape

●**Colour**: the primary colour of the homepage, including background white, background pale blue, background grey, and multicolour

●**Multimedia**: streaming video, sound, text in motion, and flash animation

●**Navigation**: dropdown menus, vertical menus, horizontal menus, return to home button, and keyword search

●**Language**: availability of a translation , headlines, left to right, and top to bottom

●**Content & Structure**: index features, city slogan, mayor column, availability of help functions, site map features, and commercial banner ad

●**Links**: indicate clickable, internal links, external links, symbol used for links, and text links

●**Layout**: menu on right, menu on left, menu on top, search top left, search top right, more white space, symmetrical, asymmetrical, proximity, and alignment

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Table 5.5 Web design characteristics identified in this research

Categories	Sub categories	Variables of Web Design characteristics
Visual representation	Image & symbol	city logo symbolic icon cartoon style icon leader image images of young individuals images of groups images of multi-race images of action
	Regional	foliage animals landscape water
	Architecture	house church(temple) office cityscape
Colour		background white background pale blue background grey multicolour
Multimedia		streaming video sound text in motion flash animation
Navigation		dropdown menus vertical menus horizontal menus return to home button keyword search
Language		availability of translation headlines left to right top to bottom
Content & Structure		availability of help functions site map features commercial banner ad index features city slogan mayor column

Categories	Sub category	Variables of Web Design characteristics
Links		indicate clickable internal links external links symbol used for link text links
Layout		menu on right menu on left menu on top search top left search top right more white space symmetrical asymmetrical proximity alignment

5.5 Identification of culturally preferred design elements

As introduced in the previous section, all variables are divided into eight categories referring to Barber & Badre's (1998) cultural markers, Sun's (2001) cultural attractor, Cyr & Trevor-Smith's (2004) web site design characteristics, and the real inspection of the selected websites. If the characteristic is not present in the web page, it will be given a 0 for categorical variables, but if the characteristic is present, it will be given a 1. For example, if the homepage of the sites had an A-Z index feature, the expert will add a 1 for that categorical variable, thus a 1 means the homepage of the website has the feature, whilst a 0 means the website does not have the feature.

The local web audit is carried out by design experts who come from the target culture, and therefore has a deep understanding of the target culture through first-hand personal experiences.

Two design experts are invited to be the evaluators. One is a Taiwanese, who is undertaking a PhD in design research at Brunel University and has 5 years experience at a website design company in Taipei, has lectured in computer graphics and web design in Taipei, as well as part-time lecturing visual communication and web design at Brunel University. The other expert is an English, who is also undertaking a PhD in design research in Brunel University and works as a design consultant in central London. The experts reviewed 25 local government web homepages from their own country, providing ratings by nations. The analysis tool SPSS is applied to perform the cross-

tabulation comparisons to check whether there are significant differences between UK and Taiwan in each category.

The result of all categories of variables are presented from table 5.6 to table 5.15. In each variable, the actual counts are presented, and the number of the sites that has the variable present is depicted. There is a maximum possible value of 25 (N=50) in all country cells.

Table 5.6 Visual representation-Image & symbol

Image & symbol variables	Taiwan(n=25)		UK(n=25)		Expected count	Chi-square	Df	Sig. level
	Actual count	%within	Actual count	%within				
city logo	19	76%	23	92%	21	2.38	1	.123
symbolic icon	15	60%	9	36%	12	2.89	1	.890
cartoon style icon	18	72%	2	8%	10	21.33	1	.000
leader image	12	48%	2	8%	7	9.92	1	.002
images of young individuals	3	12%	14	56%	8.5	10.78	1	.001
images of groups	15	60%	8	32%	11.5	3.95	1	047
images of multi-race	0	0%	5	20%	2.5	5.56	1	.018
images of action	5	20%	16	64%	10.5	9.93	1	.002

From Table 5.6, the image & symbols characteristics mostly differ across two cultures.

●The cartoon style icons are highly popular in Taiwanese local government websites, with 72% of selected websites utilising this, whilst only 8% of UK websites use this (p<0.05).

● 48% of selected websites have a leader image feature in Taiwan, whilst only 8% of websites have this in UK (p<0.05).

● 12% of selected Taiwanese websites have images of young individuals , whilst 56% of UK websites use these (p<0.05).

- 60% of selected Taiwanese websites have images of groups, whilst 32% of selected websites in UK use these ($p<0.05$).

- 0% of selected Taiwanese websites have multiracial images, whilst 20% of selected UK websites use these ($p<0.05$).

- 20% of selected Taiwanese websites have images of action in Taiwan , whilst 64% of selected UK websites use these ($p<0.05$).

Table 5.7 Visual representation-Regional

Regional variables	Taiwan(n=25)		UK(n=25)					
	Actual count	%within	Actual count	%within	Expected count	Chi-square	Df	Sig level
foliage	13	52%	3	12%	8	9.19	1	.002
animals	4	16%	1	4%	2.5	2.00	1	.157
landscape	4	80%	7	28%	13.5	13.61	1	.000
water	12	48%	3	12%	7.5	7.71	1	.005

Analysis of the results from Table 5.7 yields the following observations:

- 52% of selected Taiwanese websites use images of foliage, whilst 12% of selected UK websites use these. Sig. level is $p<0.05$.

- 80% of selected Taiwanese websites use images of landscape, whilst 28% of selected UK websites use these. Sig. level is $p<0.05$.

- 48% of selected Taiwanese websites use images of water, whilst 12% of selected UK websites use these. Sig. level is $p<0.05$.

Table 5.8 Visual representation-Architecture

Architecture variables	Taiwan(n=25)		UK(n=25)					
	Actual count	%within	Actual count	%within	Expected count	Chi-square	Df	Sig level
house	5	20%	4	16%	4.5	0.14	1	.713
church(temple)	3	12%	0	0%	1.5	3.19	1	.074
office	3	12%	0	0%	1.5	3.19	1	.074
cityscape	10	40%	18	72%	14	5.20	1	.023

Analysis of the results from Table 5.8 yields the following observation:

- 40% selected Taiwanese websites use images of cityscape, whilst 72% of selected UK websites use these (p<0.05).

Table 5.9 Colour

Colour variables	Taiwan(n=25)		UK(n=25)					
	Actual count	%within	Actual count	%within	Expected count	Chi-square	Df	Sig level
background white	24	96%	20	80%	22	3.03	1	.082
background pale blue	1	4%	5	20%	3	3.03	1	.082
backgroundgray	5	20%	5	20%	5	1.02	1	.312
multicolour	16	64%	5	20%	10.5	9.93	1	.002

Analysis of the results from Table 5.9 yields the following observation:

- 64 % of selected Taiwanese websites have a variety of colour, whilst 20% of websites in UK have this (p<0.05).

Table 5.10 Multimedia

Multimedia variables	Taiwan(n=25)		UK(n=25)					
	Actual count	%within	Actual count	%within	Expected count	Chi-square	Df	Sig. level
streaming video	3	12%	0	0%	1.5	3.19	1	.074
sound	2	8%	3	12%	2.5	0.22	1	.637
text in motion	10	40%	0	0%	5	12.5	1	.000
flash animation	16	64%	0	0%	8	23.53	1	.000

Analysis of the results from Table 5.10 yielded the following observations:

● 40% of selected Taiwanese websites have the text in motion feature, whilst 0% of selected UK websites have this (p<0.05).

● 64% of selected Taiwanese websites have the flash animation feature, whilst none of UK websites have this (p<0.05).

Table 5.11 Navigation

Navigation variables	Taiwan(n=25)		UK(n=25)					
	Actual count	%within	Actual count	%within	Expected count	Chi-square	Df	Sig. level
dropdown menus	12	48%	5	20%	8.5	4.37	1	.037
vertical menus	21	84%	21	84%	21	0	1	1
horizontal menus	17	68%	24	92%	20.5	6.64	1	.010
return to home button	14	56%	18	72%	16	1.9	1	.239
keyword search	24	96%	24	96%	24	0	1	1

Analysis of results from Table 5.11 yielded the following observations:

● 48% of selected Taiwanese websites have dropdown menus, whilst 20% of UK selected websites have these (p<0.05).

● 68% of selected Taiwanese websites have horizontal menus, whilst 92% of UK selected websites have these (p<0.05).

Table 5.12 Language

Language variables	Taiwan(n=25)		UK(n=25)		Expected count	Chi-square	Df	Sig. level
	Actual count	%within	Actual count	%within				
availability of translation	25	100%	10	40%	17.5	21.43	1	.000
headlines	25	100%	25	100%	25	-	-	-
left to right	25	100%	25	100%	25	-	-	-
top to bottom	25	100%	25	100%	25	-	-	-

Analysis of the results from Table 5.12 yielded the following observation:

• 100% of selected Taiwanese websites have a translation feature, whilst 40% of selected UK websites have this ($p<0.05$). There is a significant difference between UK and Taiwan. All Taiwan local city governments provided translations into another language, thus Taiwan has a greater availability for translation than UK.

Table 5.13 Content & Structure

Content &Structure Variables	Taiwan(n=25)		UK(n=25)		Expected count	Chi-square	Df	Sig. level
	Actual count	%within	Actual count	%within				
availability of help functions	0	0%	14	56%	7	19.44	1	.000
site map features	23	92%	17	68%	20	4.5	1	.034
commercial banner ad	21	84%	1	4%	11	32.47	1	.000
index features	0	0%	23	92%	11.5	42.59	1	.000
city slogan	7	28%	0	0%	3.5	8.14	1	.004
mayor column	13	52%	0	0%	6.5	17.57	1	.000

Analysis of the results from Table 5.13 yielded the following observations:

• None of local government websites in Taiwan had help functions, whilst 56% of UK selected websites have this ($p<0.05$).

• 92% of selected Taiwanese websites have site map, whilst 68% of selected websites in UK have this ($p<0.05$).

• 84% of selected Taiwanese websites have a commercial banner advertisement, whilst 4% of selected UK websites have this ($p<0.05$).

- 0% of selected Taiwanese websites have index features, whilst 92% of selected

websites in UK have this (p<0.05).

- 28% of selected Taiwanese websites have city slogans, whilst 0% of selected UK

websites have this (p<0.05).

- 52% of selected Taiwanese websites have a mayor column, whilst 0% of selected UK

websites have this (p<0.05).

Table 5.14 Links

Links variables	Taiwan(n=25)		UK(n=25)					
	Actual count	%within	Actual count	%within	Expected count	Chi-square	Df	Sig. level
indicate clikable	25	100%	25	100%	25	-	-	-
internal links	25	100%	25	100%	25	-	-	-
external links	22	88%	7	28%	24.5	18.47	1	.000
symbol used for link	9	36%	13	52%	11	1.30	1	.254
text links	25	100%	25	100%	25	-	-	-

Analysis of results from Table 5.14 yielded the following observation:

- 88% of selected Taiwanese websites have external links, whilst 28% of selected UK

websites have this (p<0.05).

Table 5.15 Layout

Layout variable	Taiwan(n=25)		UK(n=25)		Expected count	Chi-square	Df	Sig. level
	Actual count	%within	Actual count	%within				
menu on right	11	44%	18	72%	14.5	4.02	1	.045
menu on left	22	88%	24	96%	23	1.09	1	.297
menu on top	19	76%	25	100%	22	6.82	1	.009
search top left	4	16%	5	20%	4.5	0.14	1	.713
search top right	17	68%	20	80%	18.5	0.94	1	.333
more white space	6	24%	14	56%	10	5.33	1	.021
symmetrical	23	92%	17	68%	20	4.5	1	.034
asymmetrical	2	8%	8	32%	5	4.5	1	.034
proximity	25	100%	25	100%	25	-	-	-
alignment	24	96%	25	100%	24.5	1.02	1	.312

Analysis of results from Table 5.15 yielded the following observations:

● 44% of selected Taiwan websites have the menu on the right, whilst 72% of selected UK websites have this (p<0.05). Thus the UK exhibits a much higher occurrence of menu on the right.

● 76% of selected Taiwanese websites have the menu on top, whilst 100% of selected UK websites have this (p<0.05). Thus the UK shows a much higher occurrence in having the menu on top.

● More white space is found in many more of the UK websites.24% of selected Taiwanese websites have this, compared with the 56% of selected UK websites that have this (p<0.05).

●Symmetry is exhibited in many more of the Taiwanese websites.

92% of selected Taiwanese websites have this, compared with 68% of selected UK websites (p<0.05).

5.6 Results of the local website audit

Tables 5.6 to 5.15 present the differences in web culturally preferred design characteristics between UK and Taiwan. Based on the results presented in the previous section, the main findings for the web culturally preferred design characteristics between UK and Taiwan are displayed in Table 5.16:

Table 5.16 Culturally preferred design elements

Culturally Preferred web characteristics	Taiwan	UK
Visual representation Image &symbol style	■cartoon style symbol ■leader image ■images of groups	■ images of young individuals ■ images of multi-race ■ images of action
Regional	■foliage ■landscape ■water	
Architecture		■cityscape
Colour	■multiple colour	
Multimedia	■flash animation ■text in motion	
Navigation	■dropdown menus	
Content & Structure	■city slogan ■mayor column ■sitemap feature ■commercial banner ad	■index feature ■help function available
Layout	■symmetrical	■asymmetrical ■menu on right ■menu on top ■more white space
Links	■external links	
Language	■availability of translation	

5.6.1 Findings

There are some significant differences in preferences of web characteristics that need to be elaborated further:

● **In visual representation category**

The preference in Taiwan for cartoon style symbols is nine times that of UK. 72% of Taiwan web homepages are embedded with this kind of cartoon style, a very cute icon of local style design that is usually influenced by Japanese comics. Usually these kinds of icons are not found in government websites, which are regarded as formal organisations.

Taiwan shows a much higher occurrence of leader images (48%), preferring this attribute six times more often than UK (8%). Images with groups, foliage, landscape and water appear more frequently in Taiwan than in UK.

56% of UK city council web homepages show a high frequency in usage of image of young people, compared with Taiwan (12%).

64% of UK city council web pages show a high frequency in usage of images of action, compared with Taiwan (20%). Attributes such as images of multiracial and cityscape appear more frequently in UK.

● **In colour category**

Multi-colour appears highly frequently in Taiwan (64%), compared with UK (20%).

The colours applied in Taiwanese webpages are usually very vivid. In this survey, there are some similarities in using white as the web background colour.

● In multimedia category

Flash animation and text in motion appear frequently in Taiwan compared with UK. Usually these attributes will not appear in the government website, but flash animations are used to a great extent in Taiwan local government homepages, with 64% of Taiwan websites having this, especially those produced very delicately and showing the most interesting and representative aspects of the city. The other particular issue is the text in motion attribute, with 40% of Taiwanese web homepages applying this feature, where events or news regarded as very important are shown this way. None of UK city council homepages have flash animation, and static images are generally used to represent the key aspects of the cities. Text in motion is not found in UK, with all the important events or key issues displayed in static text.

● In navigation category

Dropdown menus are used to a great extent in 48% of Taiwanese local government websites, compared with UK (20%). Horizontal menus appear more frequently in UK than in Taiwan.

● In language category

Taiwan web homepage show a specific high occurrence of availability for translation, compared with UK. 100% of Taiwanese web homepages provide a language translate function, but only 40% of UK websites have this. Where a UK website has a language translation function, an Arabic or Chinese language version is mostly provided, whilst websites in Taiwan mostly provide English and Japanese language versions.

- **In content & structure category**

Taiwan utilises the mayor column and this occurs in 52% of local government websites. The mayor column is used to introduce the background and achievements of the mayor, however, none of UK websites have it. Commercial banner advertisement is used in 84% of Taiwanese websites, however, only 4% of UK city councils apply this. The feature of city slogan appears in 28% of Taiwanese local government web homepage. City slogan mentions the quality of the city and used to formulate an image of it. None of UK city council web homepage have this. A sitemap feature appears frequently in Taiwan, compared with UK. The index feature (100%) and help function (56%) both appear frequently in UK websites, compared with Taiwan (where 0% of websites have these two features).

- **In links category**

External links appears more frequently in Taiwan compared with UK.

- **In layout category**

Symmetry appears more frequently in Taiwan, compared with UK. It implies that Taiwan users prefer an evenly distributed layout.

Asymmetry appears in 32% of UK city council homepages, which suggests that UK users prefer an uneven distributed layout. More white space occurs in 56%of UK websites, whilst only 24% of Taiwanese local government websites have this. Menu on right and menu on top appear more frequently in UK, compared with Taiwan.

5.6.2 Discussion

●The results of the audit provide statistically significant evidence to support the hypotheses that design preferred characteristics differ across cultures (Taiwan and UK)

●Different preferred design attributes across cultures indeed exist. It is found that the preferences between Taiwan and UK are different, and the culturally preferred web interface design characteristics (cultural markers) are identified and categorised into eight aspects, namely, visual representation, colour, multimedia, layout, navigation, links, content & structure, and language.

●Some of the cultural markers identified in this research are different to Barber & Badre's (1998) cultural markers. The findings in their study present the cultural markers only in parts of cultures and these are quite generalised. This reveals that there are some limitations in their findings as Sun (2001: p.101) criticised, "The set of cultural markers they developed represent just the tip of the iceberg. They usually present only the dominant culture patterns or mainstream patterns in a specific culture, while the sub-culture groups or minorities are often underrepresented".

5.6.3 Implications

• If web sites are incorporated with appropriate and culturally preferred elements, it is expected that users will have increased access to information, thus enriching their experience.

• Based on the outcome of the local website audit, the cultural preferences of Taiwan and UK are different. It is proposed if the web interface design is to be embedded with the culturally specific preferred design elements, to reflect the user's culture, it can be more effective in communication.

• In considering the results more specifically, some categories have extremely contrasting results between Taiwan and UK, and the connection between cultural markers and cultural dimension (or culture context) is very apparent. This implies that different cultures prefer a specific mode of design elements (Please refer to Table 6.1 of Chapter 6).

• Various web design elements must be considered in the context of culture.

5.6.4 Summary of main findings and the next step

• Significant model differences of the culturally preferred design elements were found in each category (Table5.16). It indicates that Taiwan culture with collectivism, long-term time orientation, high context, higher power distance, lower masculinity have their culturally preferred web design characteristics, whilst UK culture with Individualism, long-term time orientation, high context, lower power distance, and higher masculinity have their culturally preferred web design characteristics (Please refer to Table 6.1 Of Chapter 6).

• Based on the implication of the local web audit, the second related hypotheses are formulated, the results from the local websites audit are applied to the web experiment, which is conducted to test the second related hypotheses "These cultural differences can improve the web usability and facilitate the effective communication." The details of the related hypotheses are presented in Chapter 6.

• Based on the differences of culturally preferred design elements, the elements are incorporated into the web experiment to formulate the questionnaire, task, and evaluate web usability.

• The next step is to conduct the usability test, to set up websites which are embedded with these culturally preferred design attributes, and to evaluate if a website reflects the user's culture, so that it can be more effective for the target culture users.

• Another further step is to understand how cultural differences impact the performance, behaviours and practice. This further exploration is necessary to validate the theoretical model

Chapter 6 Web Experiment

6.1 Introduction

This chapter consists of several main parts: the second related hypotheses, method, experiment procedure, result, discussion, and conclusion. Based on the results of the local websites audit, this indicates that Taiwanese culture has preferred web design characteristics of collectivism, long-term time orientation, high context, higher power distance and lower masculinity, whilst British culture has culturally preferred web design characteristics of individualism, long-term time orientation, high context, lower power distance, and higher masculinity. The cultural web design preferred elements are different across cultures (between Taiwan and the UK). The significantly different culturally preferred web design elements are shown in Table 6.1.

However, the further important question in culture and web design must be asked from the perspective of the users: "Do the different culturally preferred design characteristics based on the cultural dimension make them work more efficiently, satisfy users more and improve the effective communication?" Therefore, the web experiment is constructed to evaluate if the effectiveness of communication (web usability) is improved. Do the users perform better in websites that are incorporated with culturally preferred design characteristics. In the experiment, there are some assigned tasks that need to be carried out by the users and the questionnaire is designed to obtain the response from users. The assigned tasks are used to evaluate if the performance of the users is improved or not. Questionnaires are designed to evaluate the satisfaction, comprehension, desirability, and cultural variables.

Eventually, the British and Taiwanese participants are recruited to participate in the web usability test (the evaluation of effective communication).

6.2 Hypotheses

The "cultural marker" (Barber and Badre, 1998) approach is adopted in Chapter 5 to construct the local website audit. Such culturally preferred design elements can signify cultural association and conventionalised use of the attribute in the website. It is also declared that cultural preferences and biases (i.e., visual representation, colours, navigation, layout, structure etc) affect what is deemed user friendly. (Barber and Badre, 1998) Based on the findings of the local website audit, people from different cultural backgrounds prefer different cultural markers. The culturally preferred elements of Taiwan and the UK are shown in Table 6.1.

Table 6.1 Culturally preferred web characteristics and cultural background

Culturally Preferred web characteristics	Cultures of origin	Cultural background (variables)	Cultures of origin	Cultural background (variables)
	Taiwan		UK	
Visual representation Image &symbol style	■leader image ■images of groups ■cartoon style icons	Collectivism Collectivism	■ image of young individuals ■ images of action ■ images of multi-race	Individualism Individualism
Regional	■foliage ■landscape ■water			
Architecture			■cityscape	Masculinity
Colour	■multiple colour			
Multimedia	■flash animation ■text in motion	High context High context		
Navigation	■dropdown menus	Long-term time orientation		
Content & Structure	■city slogan ■mayor column ■sitemap feature ■commercial banner ad	Collectivism Collectivism Uncertain avoidance	■index feature ■availability of help functions	Individualism, short-term time orientation, Low context
Layout	■symmetrical	High power distance	■asymmetrical ■more white space ■menu on right ■menu on top	Low power distance Low context
Links	■more external links	Femininity		Masculinity
Language	■availability of translation	High context		

Based on the local website audit, audiences from different cultures (Taiwanese and British) have their own preferred web design elements. Viewing the results more specifically, some attributes have extremely contrasting results between Taiwan and the UK, and there is a clear connection between cultural preferred design elements and cultural dimensions (see Table 6.1). The results of the local websites audit reveal that participants from Taiwanese culture have culturally preferred web design characteristics comprising of collectivism, long-term time orientation, high context, higher power distance and lower masculinity, whilst participants from British culture have culturally preferred web design characteristics comprising of individualism, short-term time orientation, low context, lower power distance, and higher masculinity. To sum up, the users from different cultural dimensions have different culturally preferred elements. If different cultural dimensions of the culturally preferred elements can be applied properly, can it improve web usability? Of course, the answer needs to be obtained from real user experiences.

Furthermore, the second related hypotheses are formulated and listed as below.

If the web interface design can reflect the user's culture, it can be more effective in communication. In other words, if the websites are embedded with the culturally preferred characteristics based on their cultural dimension, it can be more effective in communication. Therefore the hypotheses are formulated as below.

1. If the typical Liverpool based website is embedded with British culturally preferred design elements (reflecting British culture), it can be more effective in communication for British users.

2. If the typical Taichung based website is embedded with Taiwanese culturally preferred design elements (reflecting Taiwanese culture), it can be more effective in communication for Taiwanese users.

3. If the modified Liverpool based website is embedded with Taiwanese culturally preferred design elements (reflecting Taiwanese culture), it can be more effective in communication for Taiwanese users.

4. If the modified Taichung based website is embedded with British culturally preferred design elements (reflecting British culture), it can be more effective in communication for British users.

So, in this web experiment, specific culturally preferred design elements are embedded into the controlled websites. Two different versions of two websites are constructed, one for each city. The first version represents the typical one and second version is the modified one. The typical versions are based on the typical style from the original websites, but is produced by the researcher. The reasoning behind why the Liverpool city and Taichung county websites are selected, and why these culturally preferred design characteristics are incorporated into the websites are explained in Section 6.3.3.

6.3 Method

The user testing approach is used in this experiment. In the following sections. the experimental websites design, lab setting, experiment procedure, sample size. data collection instrument, data analysis tool and method, results, as well as discussion, are depicted.

6.3.1 Culture categories

The culture categories used in this research are based on national culture. The UK and Taiwan are selected for comparison in this research. Two nationalities (British & Taiwanese) of their cultural orientation (or cultural variables) in this research are adopted from Hofstede (2005) and Hall & Hall (1990). The detailed introduction of Hofstede and Hall & Hall is in Chapter 2. The distinct tendencies in the cultural variables are depicted in Chapter 2. The difference in each orientation for the two cultures involved in the research are described in literature review.

6.3.2 City Websites selection criteria

- Websites of the government genre are chosen based on the selection in Chapter 5.

- The Taichung county government website is selected as one of the templates to develop the website. This is because the Taichung county government website represents typical Taiwanese cultural features based on Hofsted's (2005) cultural dimension model, Hall and Halls'(1990) cultural model, and the cultural web model. (Marcus & Gould, 2000)

The Liverpool city council website is selected as the other template to develop the website. This is because the Liverpool city council website represents typical UK

cultural features based on Hofsted's(2005) cultural dimension model, Hall and Halls'(1990) cultural model, and the cultural web model. (Marcus & Gould, 2000)

● The content of the experimental websites is adopted from real information from the Liverpool city council and Taichung county government websites. The quantity of information from both selected websites was scaled down.

6.3.3 Experimental websites

Based on the second related hypotheses, the culturally preferred features are embedded into four websites.

So in this web experiment, specific culturally preferred design elements are embedded into the controlled websites. The Liverpool city council website is selected as the representative website that reflects British culture and the Taichung county government website is selected as the representative website that reflects Taiwanese culture. The real city logos, some pictures, news, events, information are adopted from both of the websites, but the visual representation, colour, layout, navigation, structure are modified and British culturally preferred deign characteristics are incorporated into two of the websites (the typical Liverpool based site and modified Taichung based site), whilst the Taiwanese culturally preferred design characteristics are incorporated into the other two websites (typical Taichung based website and modified Liverpool based site). The creating details and process are introduced in the following section.

6.3.3.1 Websites construction

In this section, the reasoning behind why the typical Taichung and Liverpool websites have been designed in the way they have, and why the modified Taichung and Liverpool websites have been designed the way they have, is explained. The content of the selected websites (Liverpool city council and Taichung county government) are applied to create typical and modified versions for each city.

Firstly, the typical version of the Liverpool city council and the Taichung county government websites are designed based on the local website audit and the cultural dimension model (Hofstede, 2005; Hall & Hall, 1990), as well as, the cultural web model (Marcus & Gould, 2000). The typical version websites incorporated the features based on the result of the local website audit (between the UK and Taiwan) and the cultural web model, which suggests the Web design tendencies in the UK having a low context culture, lower uncertain avoidance, individualism, and short-term time orientation, whilst those in Taiwan have a high context culture, higher uncertain avoidance, collectivism, and long-term time orientation. The web design features are listed in Table 6.1. For example, the UK having a low context culture prefer the web attributes, (i.e.,asymmetrical and more white space) and Taiwan having a high context culture prefer the web features (i.e., flash animation and text in motion). The UK having individualistic dimension prefer image of young individuals and images of action, whilst Taiwan having collectivistic dimension prefer leader image and images of groups.

Secondly, the modified version websites of the Liverpool city council and the Taichung county government are created. Both of these websites have the same content as the typical version website, but the UK culturally preferred web elements are embedded into the Taichung county government website (which has been named the Taichung based modified website), whilst the Taiwan culturally preferred web design characteristics are embedded into the Liverpool city council website (which has been named the Liverpool based modified website). The web design features are listed in Table 6.1.

Thirdly, there are two contrast style versions of the website for each city. They are the typical Liverpool based website which reflects the typical British culture (embedded with British culturally preferred design elements), the modified Liverpool based website which reflects Taiwanese culture (embedded with Taiwanese culturally preferred design elements), the typical Taichung based website which reflects the conventional Taiwanese culture (embedded with Taiwanese culturally preferred design elements), and the modified Taichung based website which reflects the conventional British culture (embedded with British culturally preferred design elements).

Eventually, four experimental websites are constructed. The Web interfaces are shown in Figures 6.1 - 6.4.

A typical Liverpool based website is:

- http://culturalweb.myweb.hinet.net/livenglish/liverpoolenglish.html

A modified Liverpool based website is:

- http://culturalweb.myweb.hinet.net/livmodified/liverpoolmodified.html

A typical Taichung based website is:

- http://culturalweb.myweb.hinet.net/taienglish/taichungenglish.html

A modified Taichung based website is:

- http://culturalweb.myweb.hinet.net/taimodified/Taichungmodified.html

Let us review how these culturally preferred design characteristics are identified. Firstly, the cultural design preferences approach and the cultural web models are consulted, such as those of Barber & Badre (1998) Marcus and Gould (2000), Sun (2001), Cyr & Trevor-Smith (2004), and Würtz (2005). Furthermore, observing the real attributes in websites that have been selected. Eventually, based on Hofstede's (2005) cultural dimension and Hall and Halls' (1990) high and low context dimension, web design characteristics (cultural markers) are identified by integrating with the elements from cultural design preferences approaches and cultural web models, as well as detailed inspection of the scope websites.

How cultural variables might influence the web attributes are presented detailedly in Section 2.2 of Chapter 2 and Section 5.4 of Chapter 5, and the following paragraph show what cultural dimension these attributes incorporated into each website reflect. (All these attributes are listed in Table 6.1)

Figure 6.1 The interface of the typical Liverpool based website
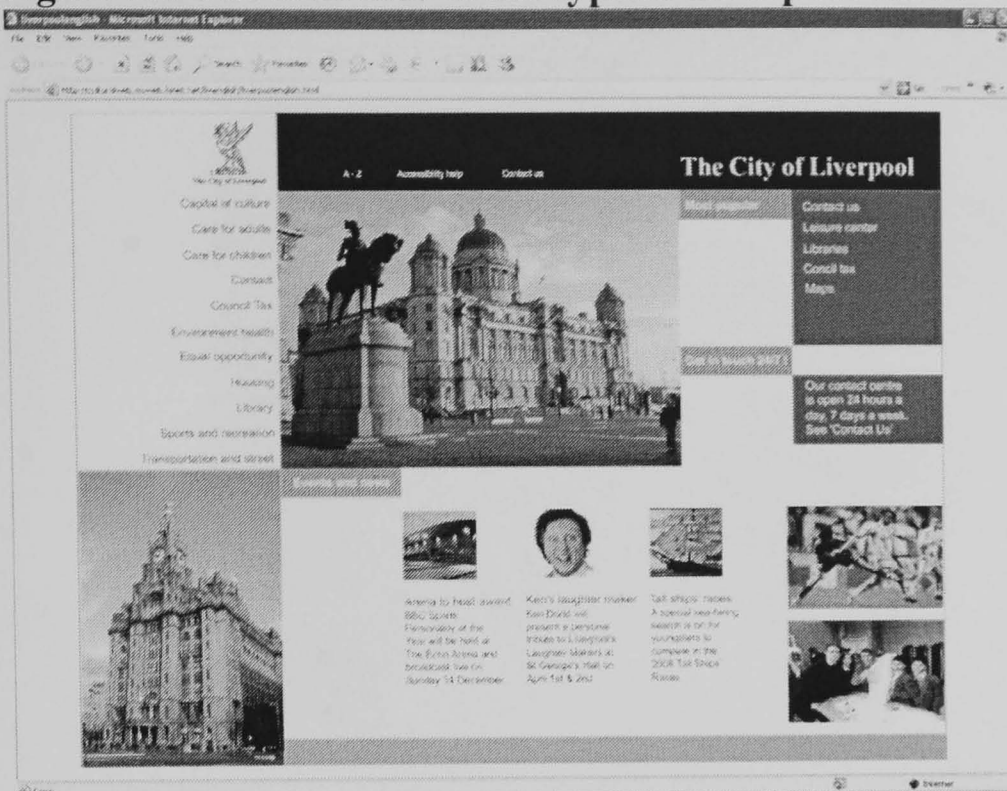
This website is embedded with the culturally preferred web characteristics for British culture. The typical Liverpool version websites incorporates the features based on the result of the local website audit (between the UK and Taiwan) and the cultural web model, which suggests the Web design characteristics in the UK having a low context culture, lower uncertain avoidance, individualism, and short-term time orientation.

These features are shown below.

●**Visual representation:**
image of young individuals reflects individualistic culture.
images of action reflect individualistic culture.
images of multi-race are based on the real inspection.
cityscape reflects masculistic culture.

●**Content & Structure:**
index feature reflects individualistic culture and short-term time orientation culture.
availability of help functions reflects low context culture

●**Layout:**
asymmetrical reflects low power distance
menu on right is based on the real inspection
menu on top is based on the real inspection
more white space reflect low context culture

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Figure 6.2 The interface of the modified Liverpool based website
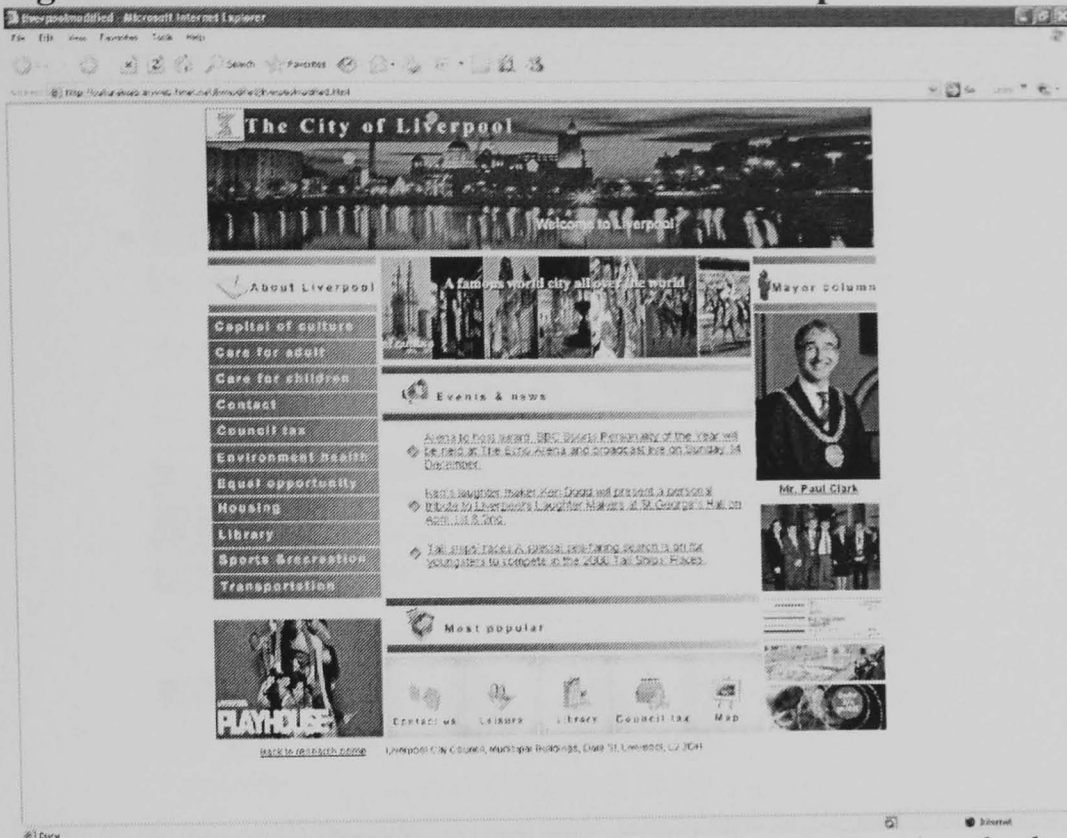
This website is embedded with the culturally preferred web characteristics for

Taiwanese culture. The modified Liverpool version websites incorporates the features

based on the result of the local website audit (between the UK and Taiwan) and the

cultural web model, which suggests the web design characteristics in Taiwan having a

high context culture, higher uncertain avoidance, collectivism, and long-term time

orientation. These features are shown below.

- **Visual representation**:
  cartoon style icon is based on the real inspection.
  leader image reflects collectivistic culture
  images of groups reflect collectivistic culture
  foliage is based on the real inspection and Bareber & Badres' cultural markers (1998)
  landscape is based on the real inspection and Bareber & Badres' cultural markers (1998)
  water is based on the real inspection and Bareber & Badres' cultural markers (1998)
- **Colour**: multiple colour is based on the real inspection
- **Multimedia**: flash animation reflects high context
  text in motion reflects high context
- **Navigation**: dropdown menus reflect long-term time orientation
- **Content & Structure**: city slogan reflects collectivistic culture
  mayor column reflects collectivistic culture
  sitemap feature reflects uncertain avoidance culture
  commercial banner ad is based on the real inspection
- **Layout**: symmetrical reflects high power distance
- **Links**: external links reflect femininistic culture

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Figure 6.3 The interface of the typical Taichung based website

This website is embedded with the culturally preferred web characteristics for

Taiwanese culture. The typical Taichung version websites incorporates the features

based on the result of the local website audit (between the UK and Taiwan) and the

cultural web model, which suggests the web design characteristics in Taiwan have a

high context culture, higher uncertain avoidance, collectivism, and long-term time

orientation. These features are shown below.

- **Visual representation**:
cartoon style icon is based on the real inspection.
leader image reflects collectivistic culture
images of groups reflect collectivistic culture
foliage is based on the real inspection and Bareber & Badres' cultural markers (1998)
landscape is based on the real inspection and Bareber & Badres' cultural markers (1998)
water is based on the real inspection and Bareber & Badres' cultural markers (1998)
- **Colour**: multiple colour is based on the real inspection
- **Multimedia**: flash animation reflects high context
  text in motion reflects high context
- **Navigation**: dropdown menus reflect long-term time orientation
- **Content & Structure**: city slogan reflects collectivism
  mayor column reflects collectivism
  sitemap feature reflects uncertain avoidance
  commercial banner ad is based on the real inspection
- **Layout**: symmetrical reflects high power distance
- **Links**: external links reflect femininistic culture

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Figure 6.4 The interface of the modified Taichung based website
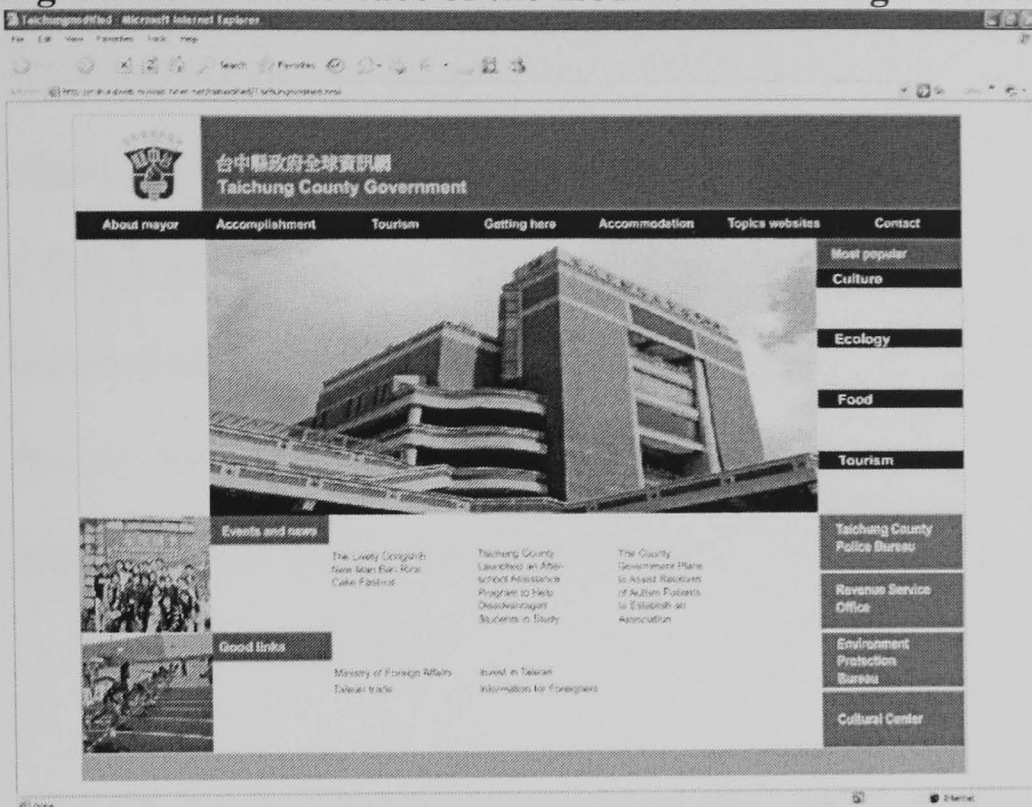
This website is embedded with the culturally preferred web characteristics for British culture. The modified Taichung version websites is incorporates the features based on the result of the local website audit (between the UK and Taiwan) and the cultural web model, which suggests the Web design tendencies in the UK having a low context culture, lower uncertain avoidance, individualism, and short-term time orientation and these features are shown below.

• Based on the real Taichung wesite, there is no index feature, because Chinese characters have no alphabetical root.

●**Visual representation:**
image of young individuals reflects individualistic culture.
images of action reflect individualistic culture.
images of multi-race are based on the real inspection.
cityscape reflects masculist culture.

●**Layout:**
asymmetrical reflects low power distance
menu on right is based on the real inspection
menu on top is based on the real inspection
more white space reflect low context culture

6.3.3.2 Software applied to Web design and production

In the production of the four websites, Adobe Photoshop CS, Illustrator CS, Flash MX,

Dreamweaver MX software applications are used. Adobe Photoshop CS and Illustrator

CS are used to create, modify, and compress the images, and then the images are

imported into Flash MX and Dreamweaver MX. Flash MX and Dreamweaver MX are

used to create the html format. Furthermore, server space at Hinet Telecom was rented

before the html format was finally uploaded to the server.

6.3.4 Laboratory setting

● The web experiments are conducted in the same testing environment

(Computer Laboratory TA403)

● **Location**: Laboratory TA403, School of Engineering and Design, Brunel University

● **Experimenter**: Hsiu Ching Hsieh

● **Computer configuration**

Hardware: Intel Pentium 4, 3.20GHz, RAM 0.98GB

OS and version: Microsoft Windows XP, Professional version 2002

Browser and version: Internet Explorer 7

● **Two nationalities**: Taiwanese and British

● **Four websites:**

A Typical Liverpool based website.:

http://culturalweb.myweb.hinet.net/livenglish/liverpoolenglish.html

(see Figure 6.1)

A Modified Liverpool based website:

http://culturalweb.myweb.hinet.net/livmodified/liverpoolmodified.html

(see Figure 6.2)

A Typical Taichung based website:

http://culturalweb.myweb.hinet.net/taienglish/taichungenglish.html

(see Figure 6.3)

A Modified Taichung based website:

http://culturalweb.myweb.hinet.net/taimodified/Taichungmodified.html

(see Figure 6.4)

• **Dependable variables**: The culturally preferred Web design characteristics between

the UK and Taiwan (see Table 6.1)

Other equipment: Stopwatch, digital video camera

• **Materials**:

Consent form

Instruction sheet

Demographics sheet

Task list

Questionnaire

6.3.5 Materials

The materials (data collection instrument) consisted of instructions (see the Appendix

A), demographic questions (see the Appendix A), consent form (see the Appendix A),

task assigned (see the Appendix B), questions for usability (see the Appendix B),

questionnaire for cultural variable (Appendix C), and questionnaire for desirability

(Appendix C). A four-page questionnaires and assigned tasks are designed. The users

first carry out the tasks, and then answer the questions based on their experience of

executing the tasks. The time taken to carry out each task within each website is

calculated by stopwatch. Each user has to navigate four websites one by one. The

assigned tasks are used to evaluate the performance of users. The questionnaire is

designed to evaluate the usability of web. Usually, the responses to the subjective

questions were useful in assessing the impressions and preferences from the participants

about the features that were incorporated in designing each website. The effective

communication will be evaluated by performance and the response of the questionnaire from the users.

These questions, with a 5 point answer scale, are designed in the questionnaire to assess participants, where 1 means strongly disagree, 2 means disagree, 3 means neutral, 4 means agree, and 5 means strongly agree. The questions are designed to evaluate comprehension, satisfaction, desirability, cultural variables.

6.3.5.1 Task assigned

Following method of Spool et al. (1999), there are two types of question designed for the tasks assigned. The tasks are assigned to get the right answer for each question. One kind of question is designed to get the answer comprised as a single fact, and there is only one correct answer (i.e. Can you find out the address of Central Library in Liverpool?). The other kind is the judgement questions (i.e. "Which station, Lime St station or Central station is nearer the central library?"). On each website, there is one task designed to get the answer for the judgement question and three tasks designed to get the right answer for looking for a single fact.

- Four sets of tasks are constructed for each website and the tasks are equivalent for the typical and modified websites of each city. Four tasks are designed on each website, which comprise of getting the correct address of an organisation, seeking the telephone number of some offices or hotels, finding the e-mail address of an organisation, and judging the distance between two locations based on the street map.

- Two groups of participants need to locate requested pages on both versions of each website. When the participant carries out the assigned task in the typical Liverpool website, all the tasks need to be executed through text links, menu on right and logical

layout(asymmetrical), more white space. These features above are British cultural preferences. The graphics are reduced and less colours are used on this site. The users would experience and navigate on this website incorporated with British culturally preferred attributes when they carried out the assigned tasks. Based on the users' real interaction with these culturally preferred attributes, the performance of two groups are evaluated.

Conversely, when the participant carries out the assigned task in the modified Liverpool website, all the tasks need to be executed through multiple colour, cartoon style icon links, symmetrical layout, and the left menu (text link). These features above are Taiwanese cultural preferences. The users would navigate on this website incorporated with Taiwan culturally preferred attributes when they carried out the assigned tasks. Based on the users' real interaction with these culturally preferred attributes, the performance of two groups are evaluated.

When the participant carries out the assigned task in the modified Taichung website, all the tasks need to be executed through menu on right, menu on top, more white space, asymmetrical layout, text links. These features above are British cultural preferences. The graphics are reduced and less colours are used on this site. The users would navigate on this website incorporated with British culturally preferred attributes when they carried out the assigned tasks. The performance of two groups are evaluated, based on the users' real interaction with these culturally preferred attributes.

Conversely, when the participant carries out the assigned task in the typical Taichung website, the tasks need to be executed through multiple colour, cartoon style icon links, drop down menu(parallel navigation), symmetrical layout, and the gif banner advertisement. These features above are Taiwanese cultural preferences. The users would navigate on this website incorporated with Taiwan culturally preferred attributes when they carried out the assigned tasks.

All these tasks are design to test if the cultural preferences would affect the performance of users from the respective culture.

- The clicks and the time taken for each participant to carry out each task are measured and recorded.

- **The assigned tasks in the Liverpool city council website (typical version) are shown below.**

1. Can you find out the address of Edge Hill Library in Liverpool ?

2. Which station, Lime St station or Central station is nearer the central library?

3. If you have a housing problem in Liverpool city, which number can you call?

4. If you need environmental health service, which e-mail address can you contact?

- **The assigned tasks in the Liverpool city council website (modified version) are shown below.**

1. If you have a council tax problem in Liverpool city, which specific number can you call?

2. Can you find out the address of Central Library in Liverpool?

3. Can you find out the e-mail address of the Liverpool City Council?

4. Which building, Municipal Building or Millennium House is nearest St. George's Hall?

•The assigned tasks in the Taichung county website (typical version) are shown below.

1. Can you find out the contact number of Royal Resort Hotel?

2. Can you find out which road is nearer the Taichung county government, Jhongjheng Rd or National highway?

3. Can you find out the e-mail address of the Environmental Protection Bureau?

4. Can you find out the address of the Taichung county cultural centre?

•The assigned tasks in the Taichung county website (modified version) are shown below.

1. Can you find out the address of the Taichung county government?

2. Can you tell me which road is nearer the Taichung county government, Bo-ai Street or Sanfen Rd?

3. Can you find out the contact number of New plaza Hotel?

4. Can you find out the e-mail address of the Taichung county police Bureau?

6.3.5.2 Questionnaire design

Based on the results of local websites audit, there are two sets of culturally preferred design characteristics, one for Taiwanese culture, and the other set for British culture. The different set of culturally preferred elements are incorporated into two versions site of each city. Therefore, most of the questions in the questionnaire are the same, only a few of them are different based on the differences of two sets of cultural preferences.

Finally, two sets of questionnaire are designed, and all the questions are regarding with

visual representations, layout, navigation, colours, multimedia, content and structures.

There are more questionnaire for modified Liverpool site and typical Taichung site.

There are more questions designed to assess the users' response to visual

representations (i.e. cartoon style icon, image of leader, images of foliage, landscape,

water), multimedia(flash animation, text in motion), navigation(pop-up window),

content and structure(i.e. city slogan, mayor column, commercial banner advertisement).

These questionnaires are developed based on the previous usability research (i.e.

Nielsen, 1993; Spool et al., 1999; Brinck et al., 2002).

● **Questionnaire for the typical Liverpool and modified Taichung websites**

The questionnaire design for the typical Liverpool and the modified Taichung websites

are shown in Table 6.2. Questions are designed to measure the satisfaction,

comprehension, and desirability through the users' interaction with the experimental

websites. These questionnaires are introduced as below.

Question 1 is used to evaluate if the content and structure is properly presented across

two cultures. Questions 2-3 are used to assess whether the participants think the

interface style reflects their native culture? Questions 4-6 are used to evaluate if the

visual representations are easy to comprehend and appeal to the users. Questions 7-8 are

used to assess if the layout style is suitable for the users from two distinct cultures.

Question 9 is used to evaluate if the layout can ease the navigation between two groups.

Questions 10-16 are designed to assess the overall usability. Questions 12-13 are

designed to measure comprehension.

Table 6. 2 Questionnaire for the Typical Liverpool and the modified Taichung websites

	Typical Liverpool based site question Modified Taichung based site question
Culture	Q 2. Do the graphics reflect your culture attributes? Q 3. Do the colours appropriately represent your culture?
Visual representations	Q 4. Are there too many colours used? Q 5. Are visual representations easy to understand? Q 6. Overall, visually pleasing?
Layout	Q 7. Do you think elements are grouped properly? Q 8. Is it clear where to go next?
Navigation	Q 9. Does the layout fit appropriately to your navigation?
Usability	Q 10. Overall, easy to learn how to use this web? Q 11. Ease of finding specific information you seek? Q 12. Ease of understanding information? Q 13. I do not have doubts about finding the right information? Q 14. Will you be willing to view this website again? Q 15. Overall, were you satisfied in using this website? Q 16. Do you feel comfortable with the task?
Content& structure	Q 1. Should an index feature be added in this website?

●**Questionnaire for Liverpool modified version and Taichung typical version websites**

The questionnaire design in the modified Liverpool and the typical Taichung websites are shown in Table 6.3. Questions 1, 2 and 16 are used to evaluate if the content and structure is properly presented for each group. Question 3 is used to assess whether the participants think the interface style reflects their native culture. Questions 4-9 are used to evaluate if the visual representations are easy to comprehend and appeal to the users. Questions 10-11 are designed to understand the preferences for multimedia. Questions 13-14 are used to assess if the layout style is suitable for the users from two distinct cultures. Questions 12, 15 are used to evaluate if the layout is easy to navigate. Questions 17-22 are designed to assess the overall experiences (usability). Questions 19-20 are designed to measure comprehension.

Table 6.3 Questionnaire for the Modified Liverpool and the Typical Taichung websites

	Modified Liverpool based site question Typical Taichung based site question
Culture	Q 3. Do the graphics reflect your culture attributes?
Visual representations	Q 4. Can icons be easily be associated with their functions? Q 5. Are there too many colours used? Q 6. Are visual representations easy to understand? Q 7. Overall, visually pleasing? Q 8. Do you like to see the image of city mayor in the interface? Q 9. Do those foliage, landscape, water images make you familiar with the interface and stimulate you keep on exploring?
Multimedia	Q 10. Does the flash animation attract you to navigate in the web? Q 11. Do the text in motion attract you to read the information?
Layout	Q 13. Do you think elements are grouped properly? Q 14. Is it clear where to go next?
Navigation	Q 12. Does the website use pop-up windows properly to help manage screen real estate? Q 15. Does the layout fit appropriately to your navigation?
Usability	Q 17. Overall, easy to learn how to use this web?? Q 18. Ease of finding specific information you seek? Q 19. Ease of understanding information? Q 20. I do not have doubts about finding the right information? Q 21. Overall, were you satisfied in using this website? Q 22. Do you feel comfortable with the task?
Content& structure	Q 1. Does the city slogan convince you it is a nice city? Q 2. Are you interested in reading the introduction about mayor? Q 16. Do you pay attention on the commercial banner ad and know what it is on the banner?

● Questionnaire designed for the cultural variables

A 5-scale questionnaire, designed to evaluate the cultural variables, are shown below.

To assess the cultural variable of Uncertain avoidance, the question is designed as below.

"1. I get very anxious when the web does something strange and I am uncertain of what to do next."

To assess the cultural variation in Individualism & collectivism, the question is designed as below.

"2. I would like to view the personal information about the mayor and the accomplishments of a group."

To assess the cultural variation in High context & Low context, the question is designed as below.

"3. I prefer to read detailed instructions in text on the display, instead of symbolic information in pictures."

To assess the cultural variation in paralled & sequential action, the question is designed as below.

"4. I would like to open different applications and carry out different tasks at the same time."

To assess the cultural variation in monochronic & polychronic (long term time orientation & short term time orientation), the question is designed as below.

"5. I would like to navigate in parallel structure, and read information shown in the pop up window."

● **Questionnaire designed for evaluating desirability**

This is based on the users' real interaction experience in response to the questions.

Questionnaire is designed to evaluate the desirability are shown as below.

1. Compare typical and modified versions of the Liverpool city council website, which one do you prefer? □ typical version   □ modified version

2. Please state the reason for your choice in the above question?

□Visually pleasing   □Graphics are familiar to me   □Ease of finding specific information   □ Ease of reading information   □Overall easy of use

3. Compare typical and modified versions of the Taichung county government website, which one do you prefer? □ typical version   □ modified version

4. Please state the reason for your choice in the above question?

□Visually pleasing   □Graphics are familiar to me   □Ease of finding specific

information   □ Ease of reading information   □Overall easy of use

6.3.5.3 Statistics analysis

After the data collection from the experiment, SPSS is applied to perform the statistical

analysis, paired-samples p-test, and independent t-test are used, as well as the general

linear model analysis are used to compare the interaction effect by city and by websites

between the UK and Taiwan.

6.3.6 Recruiting participants

6.3.6.1 Participants characteristics

Taiwanese and British participants are unfamiliar with both the locations of Liverpool

and Taichung as well as their respective websites. All of the participants recruited are

familiar with the Web Browser, Internet Explorer 7.

● **Taiwanese participants**

The 15 Taiwanese participants recruited for this experiment are international graduate

students from Brunel University and are Chinese native speakers. Their average age is

27 years old. All of them use the Internet everyday and have been staying in the UK for

7 months. All of them are born in Taiwan and are studying a master degree at Brunel

University. There are 10 females and 5 males in this group.

● **British participants**

The 15 British participants recruited in this experiment are native English people,

comprising staff and PhD students from Brunel University. Their average age is 37

years old. All of them use the Internet everyday. There are 5 females and 10 males in this group.

6.3.6.2 Sample size

Finally, 15 participants from each culture are selected. Totally 30 participants are recruited to participate this web experiment.

6.3.7 Experimental procedure

Each participant is invited to computer laboratory TA403 to participate in the web experiment from March 10th to March 31st, 2008. At first, the experimenter asked each participant to read the instructions, explained them to make sure that they knew what they are going to do, and showed them the consent form, before completing the demographic form. Next, each participant was asked to carry out the tasks assigned on four of the websites based on the instruction. When each participant executes the tasks, he or she interacts with and navigates the websites. Each participant of two groups is asked to perform the tasks of each website shown on the tasks list, and the time and clicks for each task are captured and recorded. Finally the usability questionnaires are used to get the response, subjective opinions, and satisfaction from the participants based on their real interaction experiences within each website. While the participants are navigating and interacting with the websites, the experimenter minimised any interaction with them. The think aloud approach is not applied, but what the user has done and expressed are recorded by notes and digital video camera. The participants navigate and interact with the websites one by one, and after they have carried out the

four tasks for each website they immediately answer the questionnaire within the same website. The total experiment duration is 50 minutes for each participant.

6.4 Results

To facilitate the interpretation of the findings and evaluation, the following guide table shows connection between the section which report the data and the section where address interpretation.

Table 6.4 Connections between data and data interpretation

Data	Interpretation
6.4.1.1 Performance of timing between Taiwan and the UK ⟶	6.5.2 Efficiency
6.4.1.2 Performance of clicks between Taiwan and the UK ⟶	6.5.1 Learnability
6.4.1.3 Error rate ⟶	6.5.3 Errors
6.4.2.1 Average mean of subjective opinion ⟶	6.5.4 Satisfaction
6.4.2.2 Average mean of comprehension questions ⟶	6.5.5 Comprehension
6.4.2.5 Overall preference-Desirability ⟶	6.5.6 Desirability

In the following sections 6.4.1.1 - 6.4.2.5, the acronyms which are applied in the figures are defined as below.

LM means the modified Liverpool website.

LT means the typical Liverpool website.

TM means the modified Taichung website.

TT means the typical Taichung website.

6.4.1 Performance between Taiwanese and British participants

In this part, the time and clicks each participant takes is evaluated and recorded. The results are shown in the figures below. Three types of analytical methods are applied to compare the performance between Taiwanese and British participants. They are the paired sample t-test, the independent samples t-test, and the general linear model analysis.

The paired sample t-test is applied to compare the performances of participants from the same country between typical and modified websites of each city.

The independent samples t-test is applied to compare the performances within the same version of the website between Taiwan and the UK. The general linear model analysis is applied to compare the interaction effect by city and by websites across Taiwan and the UK.

6.4.1.1 Performance of timing between Taiwan and the UK

The results of the performance of timing between Taiwan and the UK are used to

interpret the evaluation of "Efficiency" (see Section 6.5.2).

The below figure shows the average time to carry out each task on each website by

Taiwanese and British participants.

Figure 6.5 Performance of timing between Taiwan and the UK

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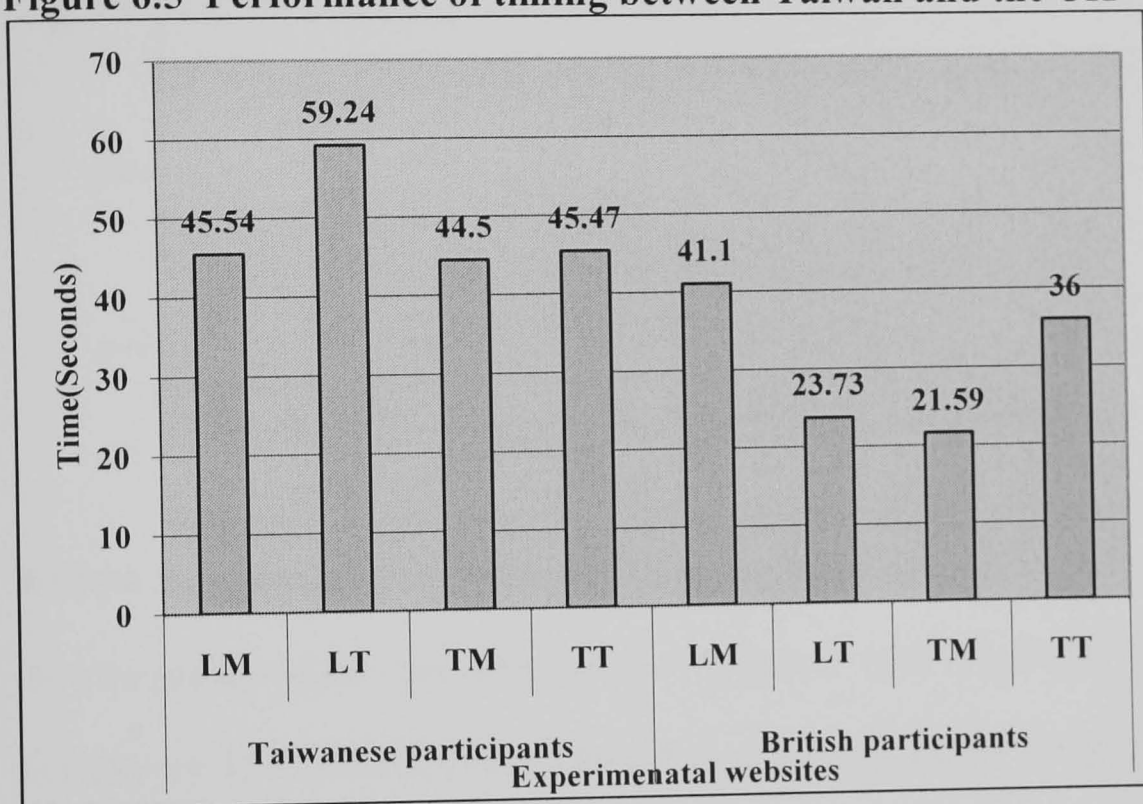
Figure 6.6 Average time of executing tasks within each website
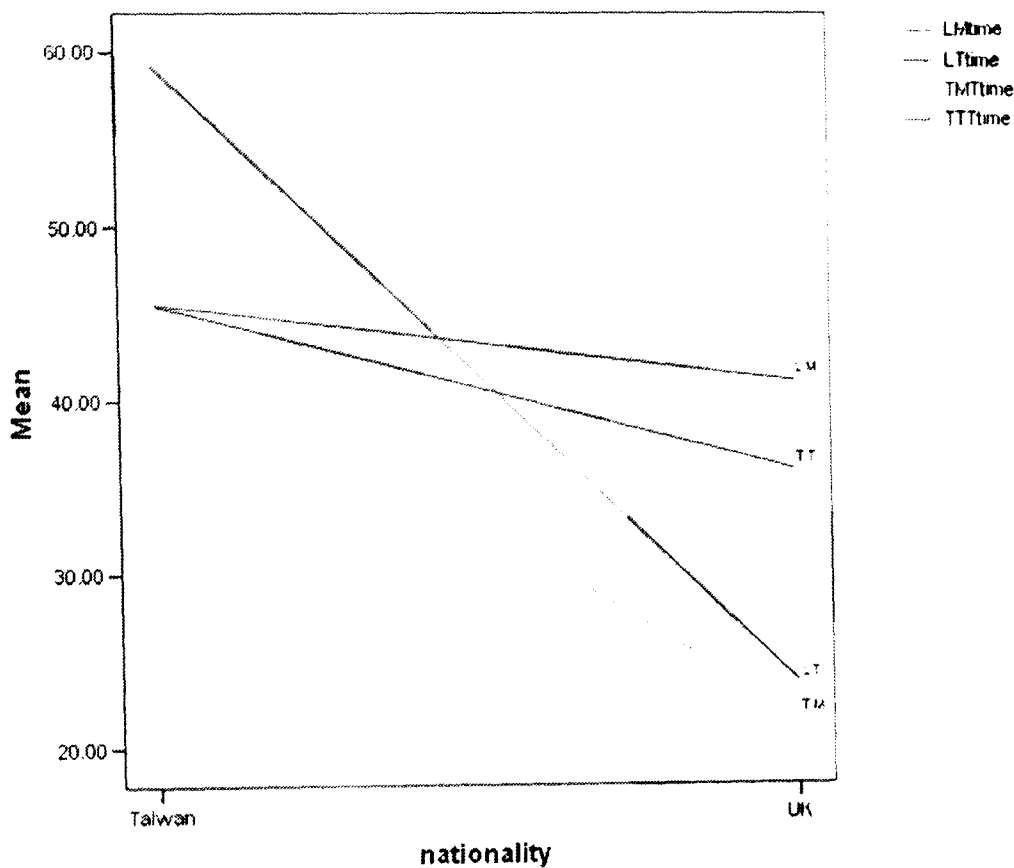
• From the general linear model analysis, the result of the time performance between

the two groups within two versions of websites of each city is shown below.

$F(1.28)=10.157$, $p<0.05$. (Sig=0.04). A post hoc test shows a significant difference, for

the time performance by two cities and by two websites, in interaction effect between

the UK and Taiwan (refer to Figure 6.6). The detailed analysis can be referred to in

Appendix D.

Comparing the time performance of British participants within two versions of two

websites, the general linear model analysis shows the result as follows, $F(1.14)=17.121$,

$p<0.05$ (Sig=0.001). This indicates that British users have significant different

performances between the typical and modified Liverpool versions, as well as the

typical and modified Taichung versions. The modified Taichung version and the typical

Liverpool version really benefits British users because they take very short time to

execute tasks. Looking at Figure 6.6, there are some significant differences. The detail

can be referred to in Appendix D.

● From the paired sample t-test analysis, it is found that the average time to perform

each task by British participants between typical and modified versions of each website

has a significant difference. The details are shown in the table below.

Table 6.5 Paired sample t-test analysis of time performance-British participants

Between the modified and typical versions of the Liverpool website, British participants improved performance in the typical Liverpool website.	P <0.05 (Sig = 0.013)
Between the modified and typical versions of the Taichung website, British participants improved performance in the modified Taichung website.	p<0.05. (Sig = 0.002)
Between the modified Liverpool website and the modified Taichung website, British participants had the best performance in the modified Taichung website and the worst performance in the modified Liverpool website.	p<0.05 (Sig= 0.001)

● From the independent samples t-test analysis, it is found that there are significant

differences between the average time to perform each task, within each website between

the UK and Taiwan, as shown in the table below.

Table 6.6 Independent samples t-test analysis of time performance between the UK and Taiwan

In the typical Liverpool version website, British participants had good performance, whilst Taiwanese participants have the worst performance.	p<0.05 (Sig =0.000)
In the modified Taichung version website, British participants took the shortest time to execute tasks, whilst Taiwanese participants took double the time to execute tasks than British users.	p<0.05 (Sig= 0.008)

This result indicates that the time performance has significant differences on the typical

Liverpool version and the modified Taichung version across British and Taiwanese

cultures.

6.4.1.2 Performance of clicks between Taiwan and the UK

The results of the performance of clicks between Taiwan and the UK are used to

interpret the evaluation of "Learnability" (see Section 6.5.1).

The table below shows the average clicks made to carry out all tasks on each website by

Taiwanese and British participants.

Figure6.7 Performance of clicks between Taiwan and the UK
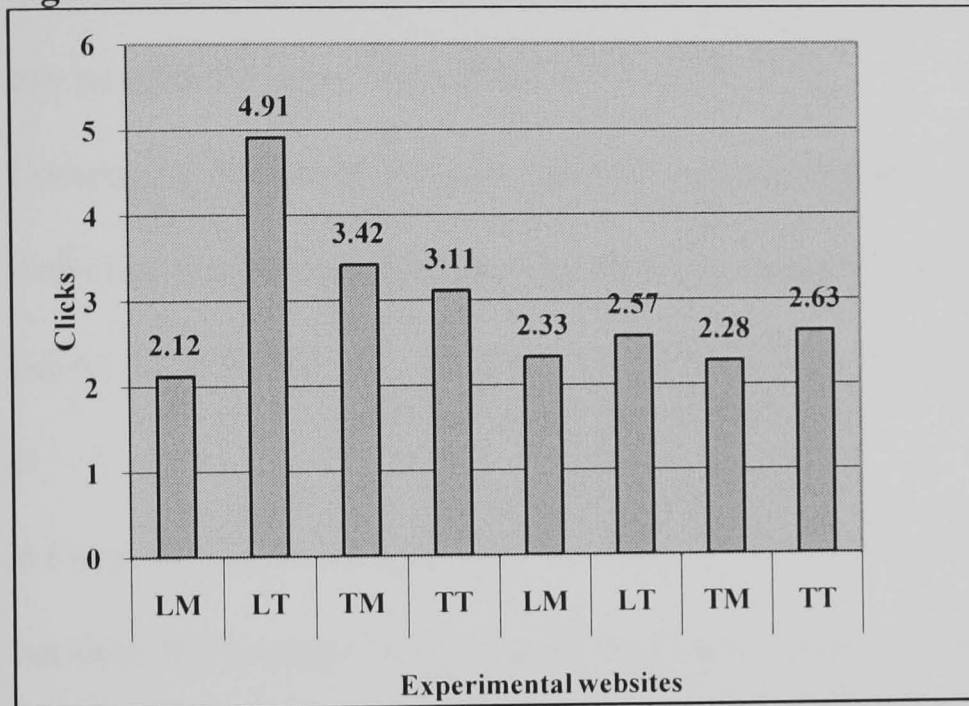
Figure 6.8 Average clicks of executing tasks within each website
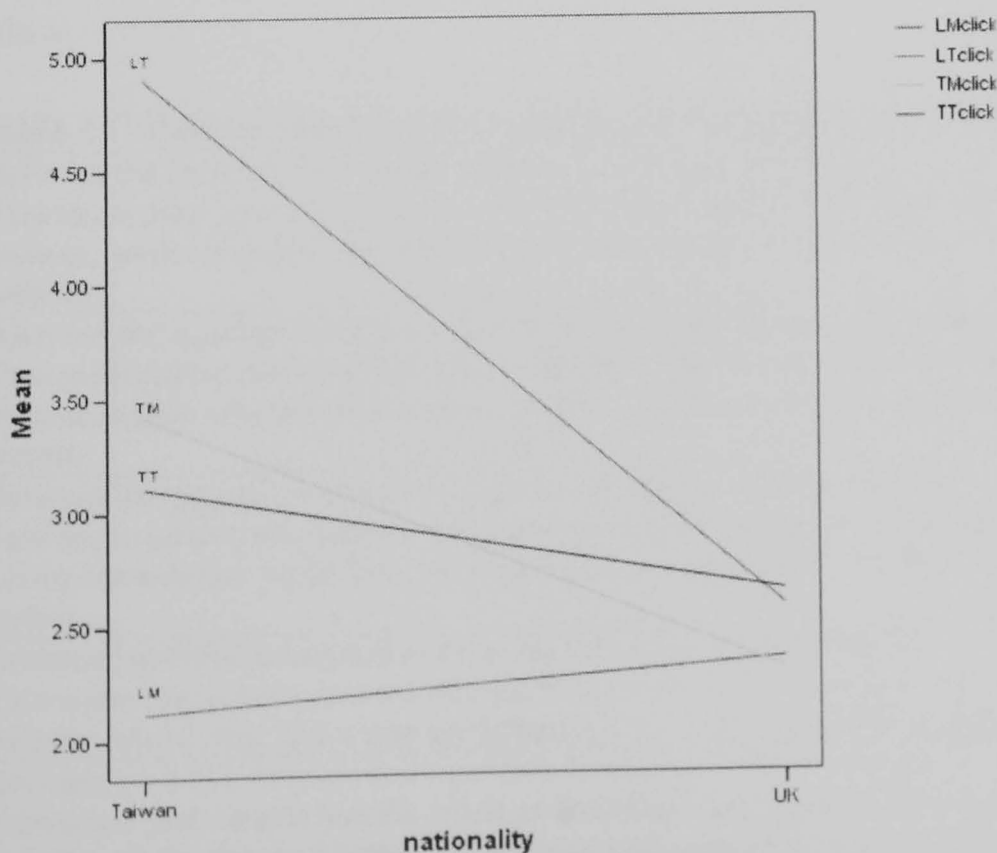
● From the general linear model analysis, the result of the clicks performance between

two nationalities within two website versions of each city is shown below.

$F(1.28)=17.287$, p<0.05 (Sig=0.000). The result indicates that there are significant

difference for the clicks performance within four different versions of the website

between the UK and Taiwan. A post hoc test shows a significant effect for the clicks by

cultures, by city, and by website interaction (refer to Figure 6.8). The detailed analysis

can be referred to in Appendix D.

Comparing the clicks performance of Taiwanese participants within two versions of the

websites, the general linear model analysis method is applied and the result is shown

below, $F(1.14)=22.371$, p<0.05 (Sig=0.000). The details can be referred to in Appendix

D.

● From the paired sample t-test analysis, it is found that there are significant differences

between the average clicks made to perform 4 tasks by Taiwanese participants, between

the typical and modified versions of websites of each city. These are shown in the table

below.

Table 6.7 Paired sample t-test analysis - Taiwanese participants

Between the modified and typical versions of Liverpool website Taiwanese participants had the best performance (used least clicks) in the modified Liverpool website, whilst they had the worst performance (used the most clicks) in the typical Liverpool website.	p<0.05 (Sig = 0.000)
Between the modified Liverpool and modified Taichung versions website Taiwanese participants had the best performance (used least clicks) in the modified Liverpool website, whilst they had worse performance (used more clicks) in the modified Taichung website.	p<0.05 (Sig =0.027)
Between the typical Liverpool and typical Taichung versions website Taiwanese participants had the worst performance (used the most clicks) in the typical Liverpool website, whilst they had better performance (used less clicks) in the typical Taichung website.	p<0.05 (Sig = 0.006)
Between modified Liverpool and typical Taichung versions website Taiwanese participants had the best performance (use least clicks) in the modified Liverpool website, whilst they had worse performance (use more clicks) in the typical Taichung website.	p<0.05 (Sig = 0.007)
Between typical Liverpool and modified Taichung versions website Taiwanese participants had the worst performance (used more clicks) in the typical Liverpool website, whilst they had better performance (used less clicks) in the modified Taichung website.	p<0.05

- From the independent samples t-test analysis, it is found that there are significant differences between the average clicks required to perform 4 tasks within each website between the UK and Taiwan, as shown in the table below.

Table 6.8 Independent samples t-test analysis of clicks performance between British and Taiwanese participants

In the typical Liverpool version website, British participants used less clicks, whilst Taiwanese participants had the worst performance (used the most clicks),	$p<0.05$ (Sig =0.000)
In the modified Taichung version website, British participants had the best performance (used least clicks), whilst Taiwanese participants used more clicks than British participants.	$p<0.05$ (Sig= 0.016)

Based on this results, comparing the average clicks to perform each task within each website between the UK and Taiwan, there are significant difference on the typical Liverpool version, and the modified Taichung version

6.4.1.3 Error rate

The results of the error rate between Taiwan and the UK are used to interpret the evaluation of "Error" (see Section 6.5.3).

Minimum clicks for each website are defined as below, the minimum clicks are 1.25 on modified Liverpool website, the minimum clicks are 2 on typical Liverpool website, the minimum clicks are 1.75 on modified Taichung website, and the minimum clicks are 1.5 on typical Taichung website. The average click performance of users and minimum clicks are depicted in the following figure.

Figure 6.9 Minimum clicks and average clicks on each websites
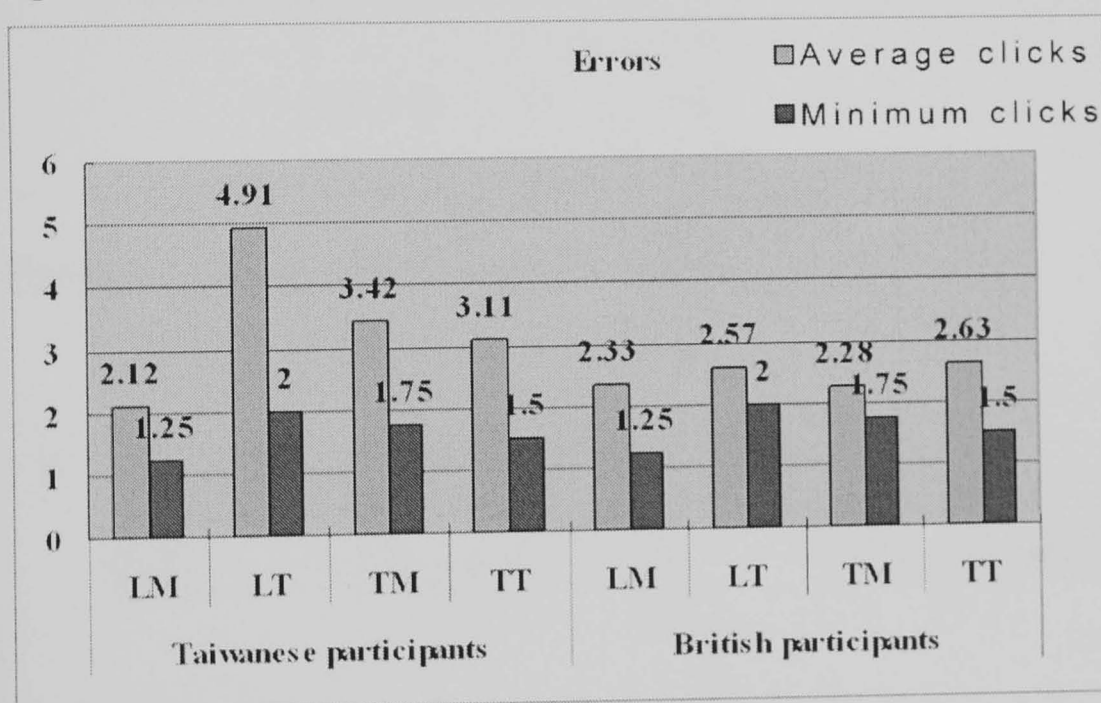
According to Nielsen (1993), the evaluation criteria of errors is defined as, "users should make as few errors as possible when using the website (computer system)." Nielsen's notion is adopted in this research. At first, the minimum clicks are defined and shown in Figure 6.9. Furthermore, the error ratio is calculated – the observed clicks are divided by the expected minimum click, and then 4 bar chart is illustrated to present the error ratio (total clicks) within each website between the UK and Taiwan. The Bar charts are shown below (refer to Figures 6.10 - 6.13).

Figure 6.10 Error rate in typical Liverpool website between Taiwan and the UK
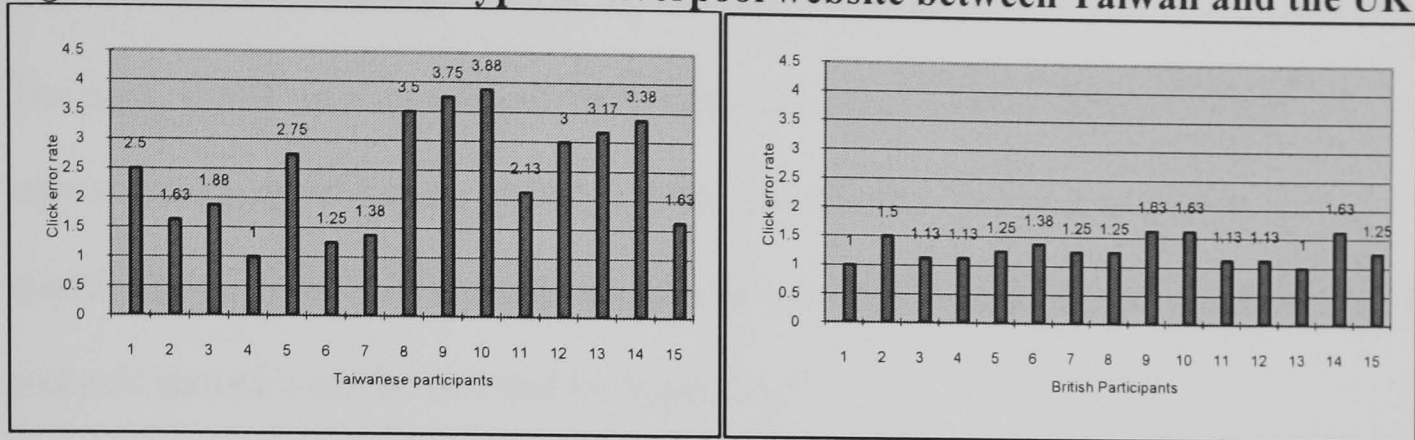
Figure 6.11 Error rate in modified Liverpool website between Taiwan and the UK
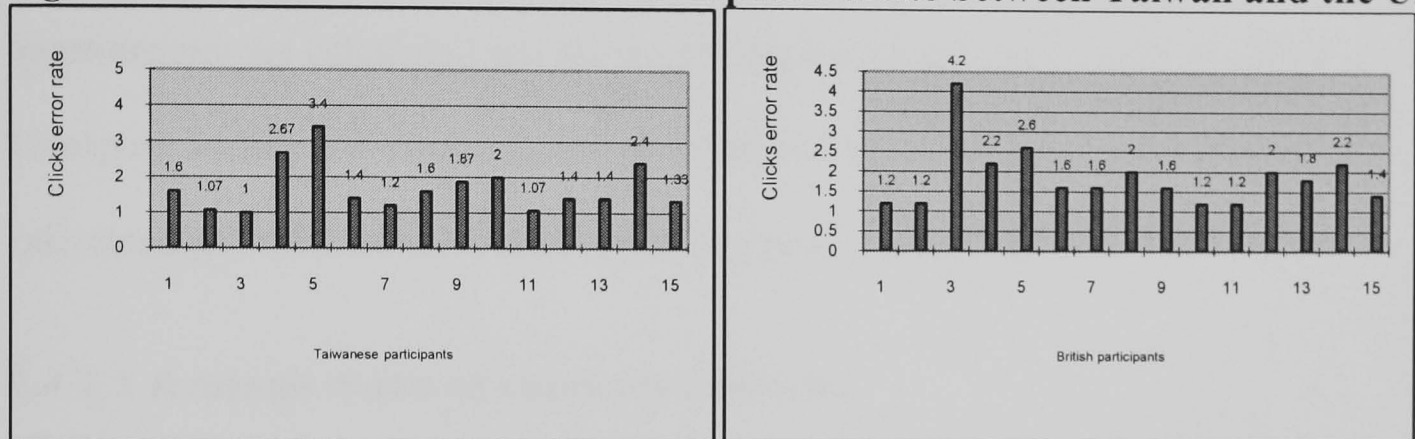
Figure 6.12 Error rate in typical Taichung website between Taiwan and the UK
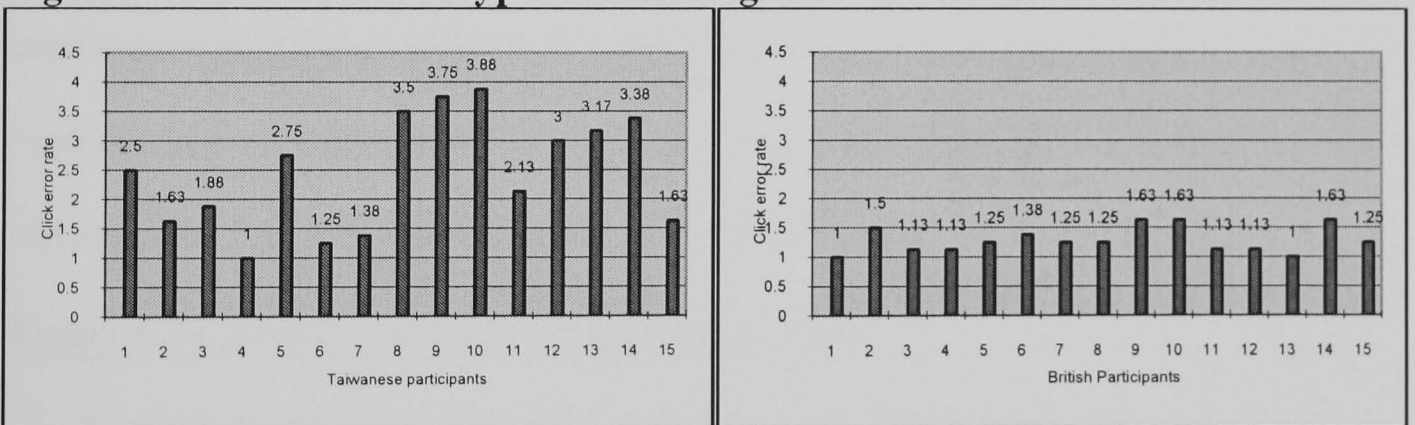
Figure 6.13 Error rate in modified Taichung website between Taiwan and the UK
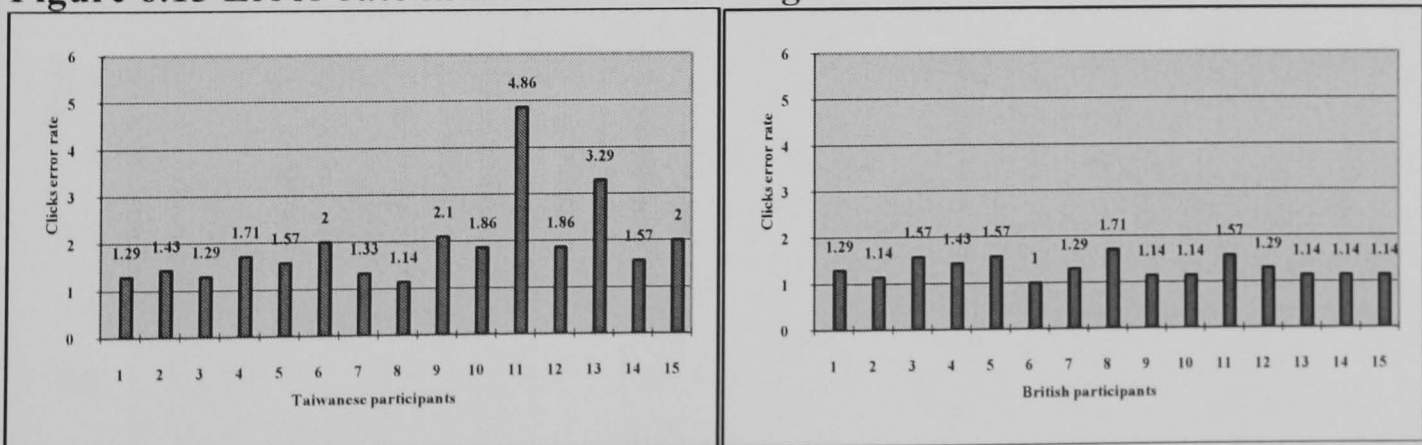
6.4.2 Subjective opinions from participants

The participants' opinions about Web interface characteristics such as, visual

representation, multimedia, layout, content and structure are acquired from the

questionnaire. Details of the response can be referred to Appendix E, and details of the

analysis statistics can be referred to Appendix F.

In the typical Liverpool and modified Taichung websites, the average means from the

questionnaire are calculated and shown in Figure 6.14 and 6.15. In the modified

Liverpool and typical Taichung websites, the average mean from questionnaire are

calculated and the results are also shown in Figure 6.14 and 6.15.

6.4.2.1 Average mean of subjective opinion

The results of the average mean of subjective opinion between Taiwan and the UK are

used to interpret the evaluation of "Satisfaction" (see Section 6.5.4).

Figure 6.14 shows the Taiwanese and the British users' subjective opinions on each

website. The higher value means the higher satisfaction.

Figure 6.14 Average mean of subjective opinion
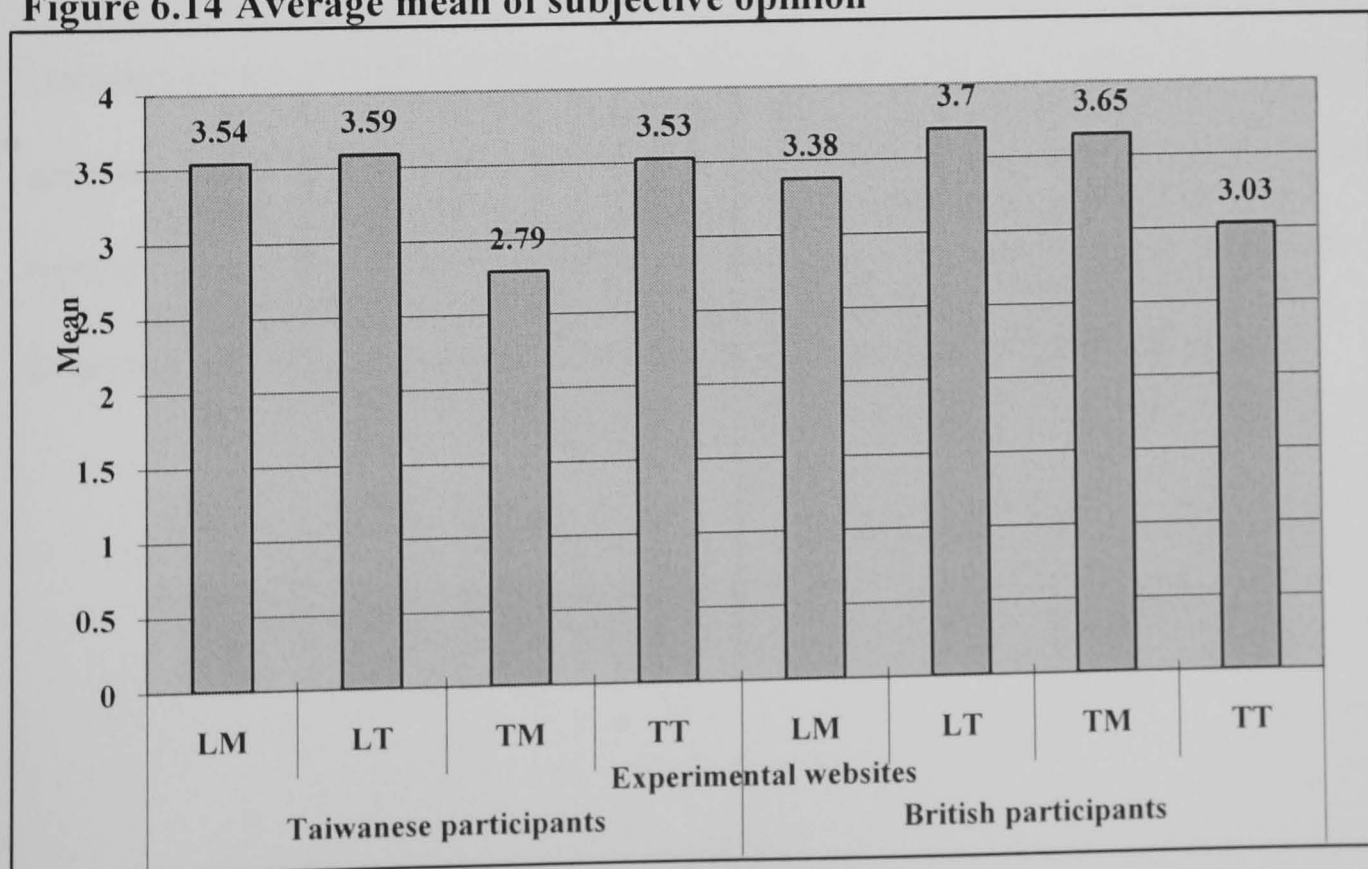
Figure 6. 15 Average mean of subjective opinion
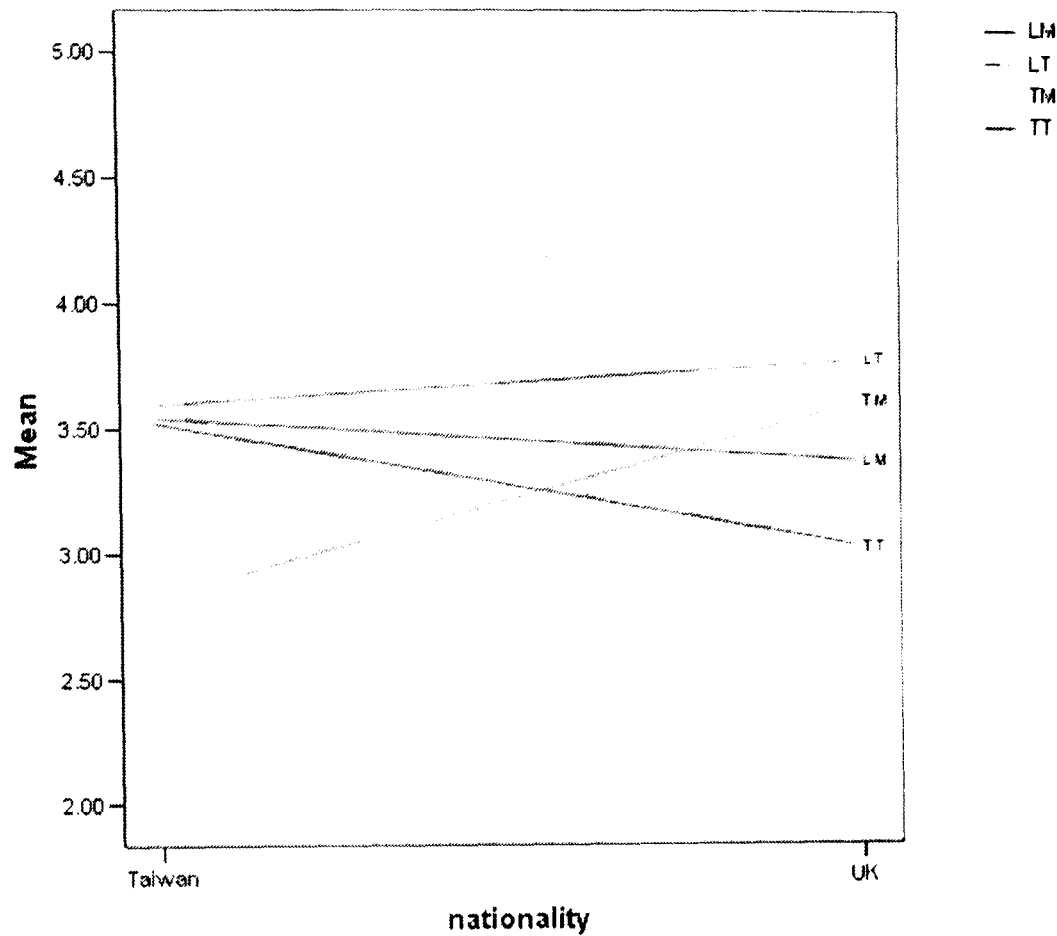
• From the linear genaral model analysis, $F(3.84)=7.335$, $p<0.05$, Sig=0.000. It

indicates that there are interaction effect by website and by cities between Taiwan and

the UK. The details can be referred to Appendix F.

The result shows a significant effect for the satisfaction by two cities and by two

websites across British and Taiwanese cultures. Looking at Figure 6.15, British users

are most satisfied with the modified Taichung version, and least satisfied with the

typical Taichung version. Taiwanese users are most satisfied with the modified

Liverpool version, and are least satisfied with the modified Taichung version.

• From the paired sample t-test, there are some significant differences for Taiwanese

participants as shown below. The details can be referred to Appendix F.

Table 6.9 Paired sample t-test analysis of subjective opinion - Taiwanese participants

Between the typical Taichung and modified Taichung versions website Taiwanese participants are quite satisfied with the typical Taichung website and there is significant satisfaction between the two websites.	P<0.05 (Sig = 0.001)
Between the typical Taichung and modified Liverpool versions Taiwanese participants are more satisfied with the modified Liverpool website, but there is no significance satisfaction between the two websites.	NS
Between the typical Liverpool and modified Liverpool versions There is no significant satisfaction between the two websites.	NS

• From the paired sample t-test, there are some significant differences for British

participants as shown below. The details can be referred to Appendix F.

Table 6.10 Paired sample t-test analysis of subjective opinion - British participants

Between the modified Taichung and typical Taichung versions British participants are very satisfied with the modified Taichung website and there is significant satisfaction between the two websites.	P<0.05 (Sig = 0.026)
Between the typical Liverpool and modified Taichung versions British participants are more satisfied with the typical Liverpool website, but there is no significance satisfaction between the two websites.	NS
Between the typical Liverpool and modified Liverpool versions There is no significant satisfaction between the two websites.	NS

Based on the results, Taiwanese users are more satisfied with the typical Taichung

version and less satisfied with the modified Taichung version, whilst the British

participants are highly satisfied with the modified Taichung version and less satisfied

with the typical Taichung version.

• From the independent sample t-test, there is significant difference in the modified

Taichung version between the British and Taiwanese users, where P<0.05. Comparing

the satisfaction across cultures, there is a significant contrast. British users are very

satisfied with the the modified Taichung version website, whilst Taiwanese users are

least satisfied with the modified Taichung website. The details can be referred to

Appendix F.

6.4.2.2 Average mean of comprehension questions

The results of the average mean of comprehension questions listed below are used to

interpret the evaluation of "Comprehension" (see Section 6.5.5).

The questions "Is it easy to understand the information?" and "I do not have doubts

about finding the right information?" are used to evaluate the comprehension, the

average mean of the above questions is calculated for each website and the data

analysis results are presented in Figure 6.16.

Figure 6.16 Average mean of questionnaire about comprehension
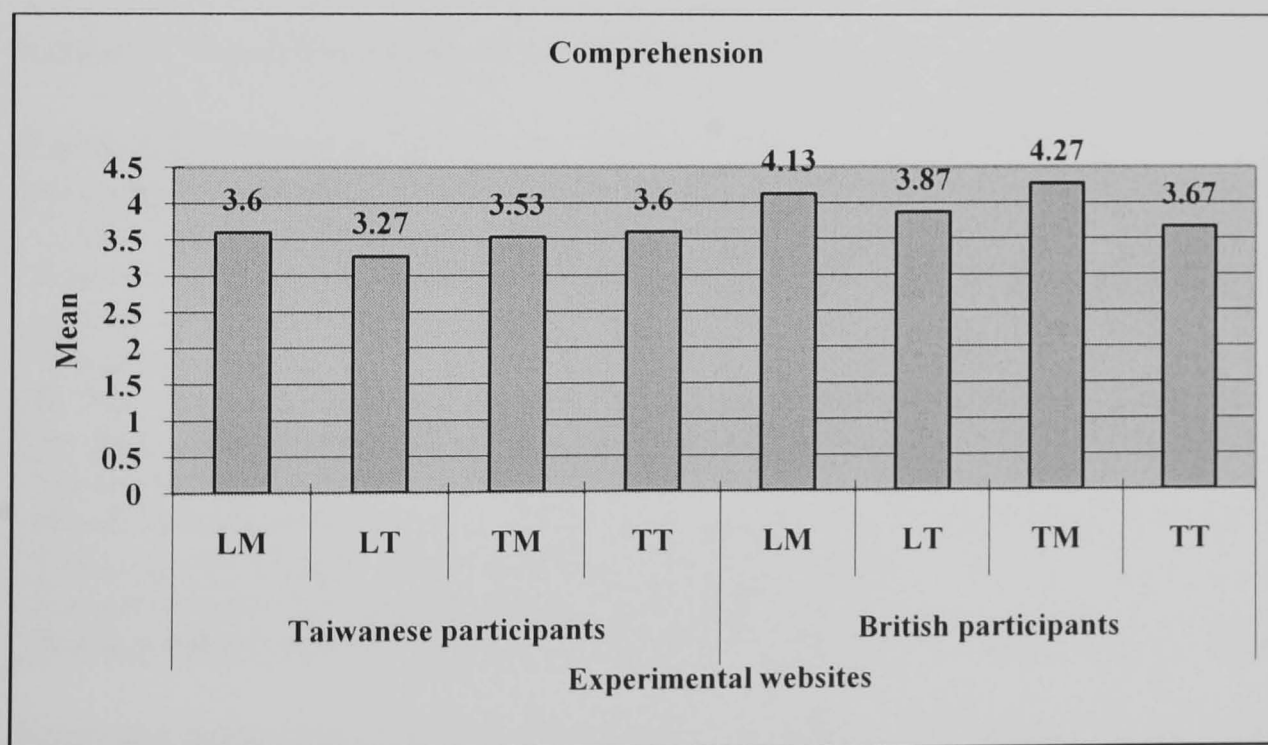
6.4.2.3 Average mean from specific questions

From the paired sample t-test analysis, there are some significant differences from

Taiwanese participants' subjective opinions between the modified and typical Taichung

versions. The detail can be referred to the table below and Appendix E.

Table 6.11 Paired sample t-test analysis from specific questions between the modified and typical Taichung versions - Taiwanese participants

Culture question "Do the graphics reflect your culture attributes?" Taiwanese participants think that the graphics in the typical Taichung website can reflect their culture attributes, compared with the modified Taichung website.	$P < 0.05$
Visual representation question "Overall, visually pleasing?" Taiwanese participants think that the typical Taichung website is visually pleasing, compared with the modified Taichung website.	$P < 0.05$
Layout question "Do you think elements are grouped properly?" Taiwanese participants think that the elements are grouped properly in the typical Taichung website, compared with the modified Taichung website..	$P < 0.05$

From the paired sample t-test analysis, there are some significant differences from

British participants' subjective opinions between the modified and typical Taichung

versions. The detail can be referred to the table below and Appendix E.

Table 6.12 Paired sample t-test analysis from specific questions between the modified and typical Taichung versions - British participants

Colours question, "Are there too many colours used? " British participants think that there are proper and sufficient colours in the modified Taichung website, compared with the typical Taichung website.	$p < 0.05$
Visual representation question "Are visual representations easy to understand?" British participants think that visual representations are easy to understand in the modified Taichung website, compared with the typical Taichung website.	$p < 0.05$
Layout question "Is it clear where to go next?" British participants think that the layout makes clear where to go next in the modified Taichung website, compared with the typical Taichung website..	$p < 0.05$
Navigation question, "Does the layout fit your navigation? " British participants think that the layout fits their navigation in the typical Taichung website.	$p < 0.05$

From the independent sample t-test analysis, there are some significant differences

within the modified Taichung version between British and Taiwanese participants.

The detail can be referred to the table below and Appendix E.

Table 6.13 Independent sample t-test analysis from specific questions within the modified Taichung version

Colours question, "Do the colours appropriately represent your culture?" In the modified Taichung website, British participants think that the colours appropriately represent their culture, whilst Taiwanese participants do not think so.	$P < 0.05$
Visual representation question, "Is the visual representation easy to understand?" In the modified Taichung website, British participants think that the visual representation is easy to understand, whilst Taiwanese participants do not think so.	$P < 0.05$
Layout question "Do you think elements are grouped properly?" In the modified Taichung website, British participants think that elements are grouped properly in the layout, whilst Taiwanese participants do not think so.	$P < 0.05$
Navigation question, "Does the layout fit your navigation?" In the modified Taichung website, British participants think that the layout fits their navigation, whilst Taiwanese participants do not think so.	$P < 0.05$

From the independent sample t-test analysis, there are some significant differences

within the typical Taichung version between British and Taiwanese participants.

The detail can be referred to the table below and Appendix E.

Table 6.14 Independent sample t-test analysis from specific questions within the typical Taichung version

Culture question "Do the graphics reflect your culture attributes?" In the typical Taichung website, Taiwanese participants think that the graphics reflect their cultural attributes, whilst British participants do not think so.	$P < 0.05$
Multimedia question, "Does the flash animation attract you to navigate in the web?" Taiwanese participants think that the flash animation attracts them to navigate in the web, whilst British participants do not think so.	$P < 0.05$
Navigation question, "Does the website use pop-up windows properly to help manage screen real estate?" Taiwanese participants think that the website use pop-up windows properly help manage screen real estate, whilst British participants do not think so.	$P < 0.05$

6.4.2.4 Cultural variables

UK N=15		Questionnaire about Cultural variables	Taiwan N=15		
Mean	SD	Questions	Mean	S D	Sig.
2.73	1.33	1.I get very anxious when the web does something strange and I am uncertain of what to do next	3.40	1.12	0.150
2.73	0.88	2. I would like to view the personal informations about the mayor and the accomplishments of a group	2.60	0.83	0.670
3.07	1.03	3. I prefer to read detailed instructions in text on the display, instead of symbolic information in pictures	2.27	0.96	0.037
3.73	1.03	4. I would like to open different applications and carry out different tasks in the mean time	3.33	1.05	0.301
3.20	0.86	5. I would like to navigate in paralled structure, read information shown in the pop up window	3.87	0.52	0.016

Table 6.15 Cultural variables between the UK and Taiwan

According to the above table, we can see there are significant levels (p<0.05) in

Questions 3 and 5. Question 3 is designed to know which cultural variable (high

context & low context) the two groups incline towards. Question 5 is designed to know

which cultural variable (long-term time orientation & short-term time orientation) the

two groups incline towards. There is no significant level in the rest of the questions in

this part.

6.4.2.5 Overall preference-desirability

The average mean of the questions listed below is used to interpret the evaluation of

"Desirability" (see Section 6.5.6).

Based on the questions, " Which version of the Liverpool website do you prefer?" and

"Which version of the Taichung county government website do you prefer?", the results

are shown in the Tables 6.5 and 6.6. Based on questions "Please state the reason for

your choice of the version of Liverpool you prefer" and "Please state the reason for your

choice of the version of Taichung you prefer", the reason why users prefer which

version of each site are explored and compared. The details can be referred to Appendix

E.5.

Table 6.16 Participants' desirability between Taiwan and the UK - Liverpool site

Websites	Taiwan	UK	Chi-Square	Sig
Typical Liverpool based version website	40%	53%	0.536	0.464
Modified Liverpool based version website	60%	47%		

There is no significant differences of desirability on typical and modified Liverpool based website between Taiwan and the UK.

Table 6.17 Participants' desirability between Taiwan and UK - Taichung site

Websites	Taiwan	UK	Chi-Square	Sig
Typical Taichung based version website	93%	27%	13.889	0.000
Modified Taichung based website	7%	73%		

Comparing the desirability of the two versions of the Taichung website between Taiwan and UK, p<0.05, there is a significant level between them.

● 93% of Taiwanese users prefer the typical Taichung version. 60% of Taiwanese users prefer the typical Taichung version because it is visually pleasing. 20% of Taiwanese users prefer the typical Taichung version because of overall ease of use. 13% of Taiwanese users prefer the typical Taichung version because it is graphically familiar.

● 7% of Taiwanese users prefer the modified Taichung version because of overall ease of use.

● 73% of British users prefer the modified Taichung version.

27% of British users prefer the modified Taichung version because of ease of finding information. 20% of British users prefer the modified Taichung version because of overall ease of use. 13% of British users prefer the modified Taichung version because it is visual pleasing. 13% of British users prefer the modified Taichung version because of ease of reading information.

● 27% of British users prefer the typical Taichung version.

20% of British users prefer the typical Taichung version because it is visual pleasing.

7% of British users prefer the typical Taichung version because of ease of finding

information.

6.5 Evaluation of effective communication & Discussion

Based on the results from Section 6.4, involving the performance of the participants (objective data) and the response of the questionnaire (subjective opinions) from participants across cultures (between UK and Taiwan), the effectiveness of the web communication is evaluated. The notion of usability from Nielsen (1993). Preece (1993), and Nielsen & Del Galdo (1996) is applied in defining the evaluation criteria of effective web communication. More and more researchers (Nielsen & Del Galdo, 1996; Barber & Badre,1998; Sun,2001; Simon, 2001; Smith, 2004) have emphasised that usability must be re-defined based on cultural context. The criteria of desirability from Nielsen & Galdos' study (1996) are incorporated into the evaluation criteria of effective communication. Finally, the evaluation criteria of effective communication in this research are defined as learnability, efficiency, errors, comprehension, satisfaction and desirability.

The evaluation process is presented in the following sections. The paired sample t-test is used to compare if there is any difference between two versions of a city website with one culture. The independent t-test is used to compare the difference between the two cultures. The general linear model analysis is applied to check if there is a significant interaction effect by city and by website across cultures. Furthermore, the results of evaluation of effective communication is checked to see if they are aligned with the second related hypotheses. These hypotheses are listed as below.

Hypothesis 1:

The typical Liverpool based version website, embedded with British culturally preferred design elements (reflecting UK culture), can be more effective in communication for

British users.

Hypothesis 2:

The typical Taichung based version website, embedded with Taiwanese culturally preferred design elements (reflecting Taiwanese culture), can be more effective in communication for Taiwanese users.

Hypothesis 3:

The modified Liverpool based version website, embedded with Taiwanese culturally preferred design elements (reflecting Taiwanese culture), can be more effective in communication for Taiwanese users.

Hypothesis 4:

The modified Taichung based version website, embedded with British culturally preferred design elements (reflecting British culture), can be more effective in communication for British users.

6.5.1 Learnability

In this research, learnability is defined as easy to learn and easy to look for specific information using the available links for browsing. Generally, the fewer steps a procedure takes to carry out a specific performance, the easier it is to learn. Thus, the average clicks to carry out the tasks on each site can be used to judge which version of the website is easier for the participants to learn. The results of performance from clicks are shown in Section 6.4.1.2 performance of clicks between Taiwan and the UK (Figure 6.7).

● From the linear general model analysis, the result is shown as below.

F $(1.28)=17.287$, $p<0.05$. The result indicates that there are significant differences for the clicks performance within four different versions of the website between the UK and Taiwan. A post hoc test shows a significant effect for the clicks by cultures. by city, and by website interaction (refer to Figure 6.8).

● From the paired sample t-test analysis, it is found that the average clicks to perform each task by Taiwanese participant between typical and modified Liverpool versions has significant difference. From Figure 6.7 and 6.8, it is found that Taiwanese users take the least clicks on the modified Liverpool version and take the most clicks on the typical Liverpool version.

● From the independent samples t- test analysis, comparing the average clicks to perform each task within each website between the UK and Taiwan, there are significant difference on the typical Liverpool version, and the modified Taichung version (refer to Section 6.4.1.2).

● For the performance of clicks, from Figures 6.7 and 6.8, it is found that British users have the best performance in the modified Taichung version, and the worst performance in the typical Taichung version. Taiwanese users perform best on the modified Liverpool version and the typical Taichung version, and perform worst in the typical Liverpool version, whilst the most interesting point is they use the least clicks in the modified Liverpool version. Comparing the clicks performance of Taiwanese users between the modified and typical Liverpool versions, $p<0.05$. which means there is a significant difference in performance for Taiwanese between the two versions of the Liverpool website. The Liverpool modified version site is advantageous to Taiwanese users and the typical Liverpool version can not benefit them.

● Based on the result from clicks performance, it is found that the websites which are embedded with Taiwanese preferred elements, such as the modified Liverpool version, can benefit Taiwanese users, whilst the typical Liverpool version cannot benefit them. In summary, the websites which reflect British culture (i.e., the modified Taichung version and the typical Liverpool version) can benefit British users, whilst the typical Taichung version cannot benefit them. Therefore, it is more effective for British users to use websites which are incorporated with British culturally preferred design elements, whilst it is it is more effective for Taiwanese users to use websites which are incorporated with Taiwanese preferred design elements. Hence, the results are aligned with hypotheses 1, 3, and 4.

6.5.2 Efficiency

Efficiency is defined as, "the less time required to execute a task, the more efficient". Therefore the time to carry out tasks is used to assess the efficiency. The average time of each participant to carry out the assigned tasks on each websites is listed (refer to Figure 6.5) and compared (refer to Figure 6.6). The average timing data can be referred to in Section 6.4.1.1 perfomance of timing between Taiwan and the UK.

●From the general linear model analysis, the result shows $F(1.28)=10.157$, $p<0.05$ (Sig=0.04). A post hoc test shows a significant difference, for the time performance by two cities and by two websites, in interaction effect between the two cultures.

Comparing the time performance of British participants within two versions of the websites, the linear general model analysis shows the result as $F(1.14)=17.121$, $p<0.05$ (Sig=0.001). This indicates that British users have significant different performances

between the typical and modified Liverpool versions, as well as the typical and modified Taichung versions. The modified Taichung version and the typical Liverpool version really benefits British users because they take very short time to execute tasks. Looking at Figure 6.6, there are some significant differences. Firstly, all the British users take less time than the Taiwanese users. Secondly, British users perform very prominently in the modified Taichung version and typical Liverpool version compared to websites which are incorporated with Taiwanese culturally preferred elements. It means that British users work efficiently when using websites which reflect British style, work inefficiently in the modified Liverpool version, whilst Taiwanese users do not work efficiently in the British style websites, because it takes them longer to execute tasks.

- From the paired sample t-test analysis, it is found that the average time to perform each task by British participants between typical and modified versions of each website has significant difference. Between the modified and typical Liverpool versions, p <0.05. For these two sites, it takes British participants 41.10 and 23.73 seconds, respectively. The result shows it is more effective for British users on the typical Liverpool version and they improve a lot on the website which reflects British culture. Between the modified and typical Taichung versions, p<0.05. It takes British participants 21.59 seconds on the modified Taichung version and 36.00 seconds on the typical Taichung version. The result shows it is more effective for British users to use the modified Taichung version and they improve a lot on the website, which reflects British culture.

- From the independent samples t-test analysis, the result indicates that the time performance has significant differences on the typical Liverpool version and the

modified Taichung version across British and Taiwanese cultures. (Refer to Section 6.4.1.1)

According to the performance data for time, it is found that it is more effective when British users are using British style websites. Overall the results are consistent with the hypothesis 1 and 4.

6.5.3 Errors

According to Nielsen (1993), the evaluation criteria of errors is defined as. "users should make as few errors as possible when using the website (computer system)." Nielsen's notion is adopted in this research. At first, the minimum clicks are defined and shown in Figure 6.9. Furthermore, the error ratio is calculated – the observed clicks are divided by the expected minimum click, and then four bar charts are illustrated to present the error ratio (total clicks) within each website between the UK and Taiwan. The results of error can be referred to in Section 6.4.1.3 error rate. The Bar charts can be referred to in Figures 6.10 - 6.13.

Looking at Figure 6.9, it is found that Taiwanese participants make the least errors in the modified Liverpool version site and make the most errors in the typical Liverpool version site. British participants make the least errors in the modified Taichung version site and make the most errors in the typical Taichung version site.

These figures reveal that there is uneven effect for British and Taiwanese participants. The modified Liverpool version makes Taiwanese users perform better, to the point that they are comparable with British users, whilst the modified Taichung version makes

British users perform better so that they outperform Taiwanese users. Taiwanese users perform better in the modified Liverpool version which reflects Taiwanese style, and British users perform best in the modified Taichung version, which reflects British culture.

6.5.4 Satisfaction

This refers to how pleasant it is to use the web site. A user's perception of satisfaction can be affected by visual representations, layout, navigation and other visual interface elements, and user satisfaction is probably a combination of all of the above.

Since the satisfaction is impacted by all of the perception of web interface design characteristics, the participants' opinions about web interface characteristics, such as culture attributes, visual representation, multimedia, layout, content and structure, are acquired from questionnaire. Therefore, average mean of subjective opinion from questionnaire is used to compare the satisfaction of four website between two cultures (refer to Figure 6.14). The results of satisfaction can be referred to in Section 6.4.2.1 average mean of subjective opinion.

● From the general linear model analysis, $f(3.84)=7.335$, $p<0.05$. The result shows a significant effect for the satisfaction by two cities and by two websites across British and Taiwanese cultures. Looking at Figure 6.15, British users are most satisfied with the typical Liverpool version, and least satisfied with the typical Taichung version. Taiwanese users are more satisfied with the modified Liverpool version, and are least satisfied with the modified Taichung version.

- From the paired sample t-test, comparing the satisfaction between the typical and modified Taichung versions, there is a distinct contrast. Taiwanese users are more satisfied with the typical Taichung version and lowly satisfied with the modified Taichung version, whilst the British participants are very satisfied with the modified Taichung version and least satisfied with the typical Taichung version.

- From the independent sample t-test, there is a significant level in the modified Taichung version between the UK and Taiwan. Comparing the satisfaction across cultures, there is a significant contrast. British participants are very satisfied with the modified Taichung version, whilst Taiwanese users are least satisfied with the modified Taichung version.

Based on the results from the paired sample t-test and the independent t-test, it is found that the modified Taichung version satisfies British users and the typical Taichung version satisfies Taiwanese users more. To sum up, British participants are very satisfied with a website which reflects British style, which Taiwanese are dissatisfied with. Taiwanese users are satisfied with a site which reflects Taiwanese style. Thus the results are aligned with the hypothesis.

6.5.5 Comprehension

Comprehension is defined as "It is easy to understand and readable."

The questions "Is it easy to understand the information?" and "I do not have doubts about finding the right information?" are used to evaluate the comprehension, and the data analysis results are presented in Figure 6.16. The results of comprehension can be referred to in Section 6.4.2.2 average mean of comprehension questions.

Figure 6.16 indicates that Taiwanese users have a higher mean in the typical Taichung version and the modified Liverpool version, and the lowest mean in the typical Liverpool version, whilst British users have the highest mean in the modified Taichung version, and the lowest mean in the typical Taichung version.

The results indicate that Taiwanese users have a higher comprehension in websites that reflect Taiwanese styles, whilst British users have the highest comprehension in websites that reflect British styles. Thus the result is aligned with the assumption.

6.5.6 Desirability

Desirability is defined as, "the expectation and preferences of users". The proportion of users who state their preference of web site version of each city is used to evaluate the desirability. Based on the results of Section 6.4.2.5 overall preferences, comparing the typical and modified Taichung versions, 93% of Taiwanese users prefer the typical Taichung version and 73% of British users prefer the modified Taichung version.

Comparing the correlation in the desirability of the two versions of the Taichung website between Taiwan and the UK, $p<0.05$ – hence, there is a significant level between them. Therefore, it is found that the typical Taichung version and the modified Liverpool version meet the expectations of Taiwanese users, whilst the modified Taichung and typical Liverpool versions meet the expectations of British users.

Overall, the results are consistent with the hypotheses. A high proportion of Taiwanese users like the typical Taichung website, and 64% of Taiwanese users prefer the typical Taichung website because it is visually pleasing. Nearly 50% of British users like the modified Taichung website because of ease of use and ease of finding specific

information. For Taiwanese users, the emphasis is on aesthetics. For British users, the emphasis is on ease of obtaining the information.

6.6 New nuance from the results

6.6.1 Cultural background impacts the desirability

● **Ease of use is strongly correlated to desirability for British users**

In the evaluation of effective communication, British users use the least clicks, take the shortest time, are most satisfied, get higher comprehension, and have a high desirability on the modified Taichung website. 73% of British users prefer the modified Taichung version, and the reason why most of them prefer the modified Taichung version is because of ease of use and ease of finding information. For British users, the result of users' desirability is consistent with the results of efficiency, learnability, satisfaction and comprehension. This indicates that British users' desirability is strongly correlated to ease of using the website and ease of finding information. The British users say what they desire is a website that they find easy to use. This suggests that the emphasis is on the ease of using a website to get what they want more than one that is visually pleasing.

● **Visual pleasing is strongly correlated to desirability for Taiwanese users**

The performance data shows clearly that Taiwanese users work very efficiently in the modified Taichung version, but when they express their subject opinion about their desirability, 93% of Taiwanese participants choose the typical Taichung version, and 64% of them prefer it because it is visual pleasing. Even though Taiwanese users work very efficiently in the modified Taichung version, based on the objective data collection, they expect the typical Taichung version to navigate based on their subjective opinion.

This suggests that, for Taiwanese users, the emphasis is on the aesthetics of a web interface design more than the function the website provides. The results imply that designing a site that Taiwanese users expect and designing a site that they can use may be conflicting for Taiwanese culture and aesthetics is the most important priority.

6.6.2 Cultural differences impact the performance of users

•British users have the best time performance in the modified Taichung version.

British users have the best time performance on the modified Taichung website and take shorter time to execute tasks in the modified Taichung version than the typical Liverpool version, according to the result of the time performance, even though both websites are embedded with British culturally preferred design elements. However, compared with the performances between the two versions of the Liverpool site, British users perform better in the modified Taichung version website, therefore the differences between the modified Taichung version and the typical Liverpool version are required to be further examined. The modified Taichung version has less pictures, most of links are text links, and has the highly logical layout compared to the typical Liverpool version, as well as more white space. Thus, this implies that the website which is incorporated with British culturally preferred elements and has attributes such as less pictures, more text links, highly logical layout (attention grabbing and eye catching), and more white space, can improve performances of British users.

• Taiwanese users have the best clicks performance on the modified Liverpool version.

Taiwanese users use the least clicks on the modified Liverpool version. Although the typical Taichung version is also incorporated with Taiwanese preferred design elements, Taiwanese users perform best on the modified Liverpool version, so the differences between the modified Liverpool version and the typical Taichung version are required to be examined. The modified Liverpool version has a more logical layout structure, more cartoon style icons, less commercial advertisement banner, and no dropdown menu, compared with the typical Taichung version. Taiwanese users prefer a website that is applied with flash animation and allow them navigate thoroughly through the website. Thus, this implies that a website which incorporates Taiwanese culturally preferred elements, is modified in the layout structure, is deduced in the quantity of commercial banner advertisement, makes the layout more logical and applies more cartoon icons to provide clues for navigation, can improve the performance for Taiwanese users.

- **Taiwanese take longer time and more clicks than British users in the performance overall**

The results show that Taiwanese users take more clicks and time than British users on each website overall, implying that the language is a barrier, because the Taiwanese native language is Chinese. These users are highly skilled, experienced in internet surfing and interact daily with the web as much as the British users. They take longer to perform actions because they can not catch the meaning of the text information as quick as the British users. When Taiwanese users use a second language to understand and search for the information, they can not catch the meaning and comprehend the information as quickly as when they are using their native language. This implies that

language is one of the important cultural factors that impact the effective communication.

- According to the above findings, it indicates that when the web designers and developers want to develop a website for a target culture, the culturally preferred design elements of web interface need to be adapted based on the testing of web prototype. For example, layout structure, icons, commercial advertisement banner, and dropdown menu, multimedia, colours, links, contents are required to be adjusted.

It also demonstrates that there are clear communication patterns of difference among participant preferences and performance of website for people from different culture (Taiwan and the UK). Theses preferences are identified by local websites audit and the previous cultural research, then the user testing should be constructed to test if these preferences can improve the performance and effective communication. The response from the user can give insights, confirm the hypotheses and if the culturally preferred elements are applied properly or not. The above process is related to Phase1 Incorporate cultural dimension and investigate cultural preferences and Phase 2 Define cultural model for target culture, Phase 3 Website design production and Phase 4 Evaluate the effectiveness of web communication in the theoretical cross-cultural Web design model.

●Generalised observation

Based on the observation from the web experiment, there are some important web interface design characteristics that can engage the users into the effective communication. These web design attributes are visual representation, colour, multimedia, navigation, content and structure, layout, links, language.

There is a clear need to understand the role that visual representation, colour, multimedia, navigation, content and structure, layout, links, language play when designing websites from a cross-cultural perspective. The findings from this web experiment manifest that there are clear patterns of difference among user preferences and how the preferences impact the performance and experiences of Websites for people from different culture. Some performance benefits for users of the target culture when websites were designed to incorporate cultural preferences from their culture. The following paragraphs present the web design characteristics to be considered when the design team wants to address the diverse global market.

Visual representation

The images, icons, symbols must be considered very carefully to succeed in the global market. Differences among cultures to recognize images, icons, symbols that are culturally specific must be understood by the web designers. It is required to investigate the visual representation (images, icons, symbols) in a local culture, their context of use, and the meaning that the local culture attributes to them, to gain a deeper understanding of how to develop websites that are matched to the target culture.

Colour

When the designers select the colour for a web product, consideration should be afforded to allow for the appropriate translation of the colours.

Multimedia

Multimedia not only can be an efficient way to convey meaning, but it also can lead to distraction. Therefore, the web designers need to consider the cultural context of the target customer. This is dependant on where the audience is from and the culture backgrounds of the users. High context cultures will apply for assimilating human

presence on their websites, it is expected that high context cultures draw on the many potentials of the Internet by integrating animation and other communicative effects in their websites. Flash animation, text in motion would have the potentials for providing a sense of human representation. On the contrary, low context cultures prefer direct, explicit communication pattern, logical layout structure and quickly getting result and reaching goals. Flash animation or text in motion would lead to distraction for low context cultures.

Navigation

Taiwanese users prefer the appearance of the site without any concern for movements specially, whilst British users contemplate text links, and logical layout can ease navigation on the site to improve movement while making it simpler to use. Marcus (1997) defined navigation as the movement through the mental model. Mental models are concepts the users have in mind. Based on McDaniel (2003), mental models allow the users to predict the result of their actions. Mental models are the concept it represent and include enough information to allow precise prediction. According to Norman (1986), the user's mental model originates from their earlier experience; the design model is the model for which the designer assumes that the system can work properly. People can get predictions and explanations of interaction based on these mental models shaping in their mind when interactions are executed or rehearsed. The users have a mental model in mind when they click an icon, use text links, use menu or prefer specific layout structure. The design team need to consider the mental model of users when they develop the design model. Therefore, the design team has to facilitate the movement by applying properly icons, links, menu, layout based on which different

cultural dimension the users belong to. Applying appropriate icons, links, menu, layout which fits the mental of users can facilitate the movement.

Layout

If the display layout is design appropriately based on the cultural background of users, it can make the audience easier to access information and understand the information within a contextual and structural model, and facilitate the communication. Users from different culture prefer different layout structure. Low context cultures (i.e., the UK culture) prefer a logical layout structure, whilst the users from a high context culture prefer a paralleled structure and visual representation for information.

Links

Based on the observation of web experiment, it is found that the less number of text links, the more efficiency in performance for British users (comparing the timing performance of British users between modified Taichung and typical Liverpool sites), whilst more icon links can lead to be effective for Taiwanese users (Taiwanese user have the best clicks performance in modified Liverpool site). British users prefer links in the navigation bar, which can be set up in alphabetical order, but this is not expected by Taiwanese users. Therefore, different types of links have to be applied based on the cultural background of the target users.

Language

Based on the observation of user testing, Taiwanese take longer time and more clicks than British users in the performance overall. When Taiwanese users use a second language to understand and search for the information, they can not catch the meaning and comprehend the information as quickly as when they are using their native language. This implies that language is one of the important cultural factors that impact

the effective communication. Thus, website design will need to have more than one language if a company wants to internationalise themselves.

6.7 Conclusion

6.7.1 Culturally preferred elements integrating with the cultural dimension have a great influence on web communication effectiveness

●The results of performance differs across British and Taiwanese cultures

British users improve their performances over time (efficiency) when they use the modified Taichung version website, which reflects British culture. Taiwanese users improve the performance in clicks (learnability) when they use the modified Liverpool version website, which reflect Taiwanese culture.

●The results of satisfaction differs across British and Taiwanese cultures

British participants are highly satisfied with the modified Taichung website , which reflects British culture, whilst Taiwanese users are not satisfied with it. Taiwanese users are satisfied with the modified Liverpool version , which reflects Taiwanese culture.

●The results of comprehension differs across British and Taiwanese cultures

Taiwan has higher mean in websites that reflect Taiwanese culture (e.g., the modified Liverpool version), whilst the UK has the highest mean in the website, which reflects British styles (i.e., the modified Taichung version).

●**The results of desirability differs across British and Taiwanese cultures**

93% of Taiwanese users like the typical Taichung website, and 64% of Taiwanese users prefer the typical Taichung website because it is visually pleasing. 73% of British users prefer the modified Taichung version. Nearly 50% of British users like the Taichung modified version website because of ease of use and ease of finding specific information. For Taiwanese users, the emphasis is on aesthetics. For British users, the emphasis is on ease of obtaining information.

6.7.2 Cultural variables

● **Taiwan is a high context culture, UK is a low context culture**

According to the results of the questionnaire on cultural variables (the results can be referred to Table 6.15), there is significant difference ($p<0.05$) between the UK and Taiwan in the variable of high context & low context. The UK is a low context culture and Taiwan is a high context culture. British users prefer to read detailed instructions in text on the display, instead of symbolic information in pictures. The results relate to the anthropological literature from Hall and Hall (1990).

● **Taiwan culture has a long-term time orientation, UK culture has a short-term time orientation**

According to the results of the questionnaire on cultural variables, there is another significant difference ($p<0.05$) between the UK and Taiwan in the variable of long-term time orientation & short-term time orientation. The UK has a short-term time orientation and Taiwan has a long-term time orientation. Taiwanese users would like to

navigate in a paralleled structure and read information shown in a pop up window (polychronic structure). British users would like to navigate in a monochromic structure. For cultures with a short-term time orientation, the Web interface design tends to quickly get results and reach goals. The result relates to the anthropological literature, the literature from Hofstede (2005) and Hall and Hall (1990).

6.7.3 Design criteria for localisation (cross-cultural design)

Overall, the results of this experiment indicate that the culturally preferred design elements, integrating with the cultural dimension, indeed impact the effective communication (especially performance, satisfaction, desirability, learnability, efficiency). Therefore, incorporating the preferred design characteristics, based on the cultural dimension of the target culture appropriately to the website, can help in the localisation process, and it can improve the web usability and facilitate communication. Since the culturally preferred design elements integrating cultural dimension can be applied as a practical and robust method in the cross-cultural Web design process, the criteria of web interface design based on respective cultural background are defined in the following sections.

6.7.3.1 Criteria for British culture

According to the results of the evaluation of effective communication, the modified Taichung version meets the needs of British users, therefore, the attributes embedded in the modified Taichung version. the result of the evaluation including objective data and the subjective opinions for the Web characteristics questions of this website, can

suggest suitable criteria for localised design. Reviewing which cultural dimension the UK belongs to and the culturally preferred elements embedded in the modified Taichung version, the localisation criteria is constructed.

● **Prominence of individuals and actions are emphasised through the web attributes such as images of young individuals and action, which can benefit users from UK**

British culture has individualism, where everyone is expected to look after themselves and are usually inclined to be independent of other people, value personal time, freedom, challenge, and prominence given youth and action. Hofstede (2005) states that people from individualistic cultures value honest, truth, expressing things out, and maintaining self-respect. Consequently, individualistic cultures would place the emphasis on prominence of individuals. The result of the evaluation from the modified Taichung version relates to Hofstede's cultural model and shows the evidence that the prominence of individuals, and their actions, are emphasised through the web attributes, such as, images of young individuals and action. British users also state the visual representations in the modified Taichung version are easy to understand and visually pleasing

●**Logical layout and more white space can benefit British users to achieve their goals efficiently**

The UK has short-term time orientation, preferring the equal relationships, stressing on individualism, and fulfilment is attained through real action. Information concentrates on the truth and certainty of notions, regulation as a reference of information and credibility, quickly getting results and reaching goals. The British users use the shortest time to carry out the tasks and have the lowest error rate of clicks performance on

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modified Taichung website. The findings from the modified Taichung version are aligned with the hypotheses and relates to Hofstede's cultural model and show the evidence that attributes, such as more white space, logical layout structure. menu on right, and menu on top, can help them to get the information (the goal) very quickly and efficiently, easing their navigation. British users regard these attributes of layout, making them clear to go next, fit their navigation and also think the typography and graphics elements are grouped properly in the modified Taichung version, based on the response of the questionnaire from British users.

● **Asymmetrical layout structure can benefit British users**

British culture has a lower power distance, where the society has a flatter structure, more equal relationship between leader and subordinates, and a consultative management style. According to Marcus and Gould (2000), in cultures with a lower power distance, the layout tends to be asymmetrical. The result of the experiment shows that British users prefer this kind of asymmetrical layout structure in the modified Taichung version and this relates to the anthropological literature.

●**Fewer links, navigate in the same browser can benefit British users**

British culture, with its higher masculinity, tends to present assertive and competitive qualities. Cultures with higher masculinity are inclined to navigation oriented towards discovering and control (limited choice) more. The modified Taichung version shows evidence that British users like to navigation oriented towards discovering and control (limited choice) more through attributes such as fewer external links, navigate in the same browser, and consistent logical layout. The best timing performance on the modified Taichung site from the web experiment show the evidence that the fewer links, consistent logical layout benefits British users.

● **More white space, time saving oriented and mono-structure layout can benefit British users**

British culture with a low context dimension tends to use verbal language to express their thinking, emotion and use explicit, direct ways to present their thinking. The British users tend to prefer logical and linear thinking patterns. Consequently, they prefer linear navigation throughout the site, with a consistent layout throughout the pages of the site, which can promote a structured and timesaving quality, i.e., few sidebars and menus, constant opening in same browser window. The UK, with LC cultures, is monochromic, where people view time as an important, almost tangible phenomenon; they are generally oriented towards planning and scheduling, so as to promote efficiency. The results of the experiment from the modified Taichung version show the evidence that British users perform well in this kind of logical and more white space layout. Actually when we are looking at the web elements in the modified Taichung version, there is an extremely logical layout structure, with no pop-up windows and a consistent layout throughout the whole site. There is no sidebar and no flash animation on it. Based on the performance of time and the lowest error rate in the modified Taichung website shows the evidence that all these above attributes can lead to time saving, goal–oriented, efficiency for British users and they are very satisfied, with high comprehension and desire of this site.

● **Bright, saturated colours, but not multiple colours are preferred by British users**

With regard to colour, there are only three main colours, white, blue, and red, in the modified Taichung version and the British users regard these colours as representative of their culture. These three colours are the colours of the British national flag. Maybe

the colours of the national flag make British users feel familiar. British users think the colours in the typical Taichung version are too much and too bright.

6.7.3.2 Criteria for Taiwan culture

Based on the results of the evaluation of effective communication, Taiwanese users have least clicks performance, highest satisfaction and comprehension in the modified Liverpool version, but the most desirability is with the typical Taichung version. Consequently, the attributes embedded in the modified Liverpool version site can benefit Taiwanese users and the typical Taichung version website meets their desirability because it is visually pleasing. Overall, the website which reflects Taiwanese culture can benefit them. Thus the attributes embedded in the modified Liverpool version and the typical Taichung site, and the subjective opinions for both of the websites, suggest suitable criteria for localised design. Reviewing which cultural dimension Taiwan belongs to and the culturally preferred elements in the modified Taichung version can lead to construction of the localisation criteria.

- **Prominence of group are emphasised through web attributes, such as leader image and images of group, which can reflect Taiwanese culture**

Taiwanese culture, with collectivism, tends to prioritise group welfare over the individual's target, where the achievement of an individual is not regarded as important as the accomplishment of the group, and believes in group relationship where loyalty is

dominant. Consequently, collectivist culture would emphasise prominence of groups, pictures with groups, pictures of aged experienced, and leaders in web interface. The results of the experiment from the typical Taichung version show the evidence that prominence of group are emphasised through the web attributes, such as leader image and images of groups, and Taiwanese users regard the typical Taichung version site as visually pleasing and the graphics reflect their culture attributes.

● **More graphics, more crowded layout, drop-down menu and paralleled structure layout can benefit Taiwanese users**

Taiwan culture has a long-term time orientation influenced deeply by Confucianism. The culture believes strongly that an unequal state of connection is required to keep a society stable, a clear hierarchical relationship is needed to keep family and society in harmony, and virtuous behaviour is identified as hard-working and perseverant. Information is emphasised on practice and practical value, relationships as a reference of information and believability, and patience required to attain results and reach goals. The typical Taichung version shows evidence that the layout has less white space, more text and graphisc, more crowded layout, less logical layout structure, pop-up windows, drop-down menus and a paralleled structure, thus it is more complicated and may take longer time to obtain the information; however, Taiwanese users are willing to take longer to obtain the information they are looking for. 93% of Taiwanese users still desire using the typical Taichung version and Taiwanese users also regard the typical Taichung version as having elements are grouped properly. Taiwanese users use the least clicks and have the lowest error rate in the modified Liverpool website. The modified Liverpool site has more graphics and paralleled layout, which also reflects Taiwanese culture.

● **Symmetrical layout structure can benefit Taiwanese users**

Taiwan culture has a higher power distance, where the society has hierarchical levels, a leader with a certain level of dictatorship, and teachers and parents are highly respected. Based on the cultural dimension, Marcus and Gould (2000) suggest that, in cultures with higher power distance, the layout tends to be symmetrical. The results from the experiment show evidence that a culture with higher power distance indeed prefer this kind of symmetrical layout structure, which is incorporated in the modified Liverpool version, and Taiwanese users have the best clicks performance on this site, thus this attribute can benefit Taiwanese users. The websites Taiwanese desire (e.g., typical Taichung version) is also embedded with this attribute. This not only strongly suggests that a symmetrical layout structure can benefit Taiwanese users and echo Hofstede's cultural dimension model and Marcus & Gould's cultural web design model.

● **More external links and aesthetics can benefit Taiwanese users**

Taiwanese culture, with lower masculinity, tends to collapse gender distinction and overlap gender roles, presenting family oriented and tenderness roles.

Based on Hofstede's definition, a culture with this dimension focuses on balance between roles and relationship. Marcus and Gould (2000) suggest that a culture with lower masculinity inclines reciprocal group action, exchange, and support, where attention is attracted by aesthetics. The attributes of more external links in the typical Taichung version shows evidence that the Taiwanese culture is inclined to be supported, and Taiwanese users prefer this kind of feature, preferring the typical Taichung site because it is visually pleasing.

● **Paralleled structure, pop-up window, and flash animation can benefit Taiwanese users**

Taiwanese culture, with a high context dimension, tends to draw on the many potentials of the Internet by integrating animation and other communicative effects in their websites to apply for assimilating human presence. For example, multimedia and flash animations have the potential for providing a sense of human representation. Consequently, Taiwanese users prefer multimedia and flash animations to appear in the Web design interface. High context cultures are polychromic, believing that everything will happen "when it's time" Taiwan's culture has parallel thinking patterns, which would imply a complex, less discernible navigation, offering subtler clues as to where the links will guide the visitor. Priority should be given to the aesthetic experience of the website, rather than the informative function. Consequently, Taiwanese users would deal well with many sidebars, menus, and opening of new browser windows for each new page. The results of the experiment from the typical Taichung version website show evidence that Taiwan users perform well with attributes such as, less logical layout, less white space layout, flash animation, and opening of a new browser window for each new page. Actually, considering the web elements in the typical Taichung version website, there is a less logical layout structure, and it is incorporated with attributes such as, text in motion, pop-up window, drop-down menu and flash animation. Based on the response of the questionnaire, Taiwanese participants prefer and enjoy a paralleled structure, pop-up window, and flash animation

● **Taiwanese users prefer dynamic and strong colours compared to British culture**

Taiwanese users regard multi-colour in the typical Taichung version site more interesting and dynamic. The colours used in the typical Taichung site are very vivid, highly saturated and strong.

6.7.4 Summary of the findings

● **Cultural differences impact the performance of users**

● **Incorporating cultural dimension and studying local cultural preferences is a powerful method**

Incorporating cultural dimension and study local cultural preferences should be considered for Web developers and designers in order to develop an effective website. It is a powerful method in the localisation process, but cultures keep on interacting and developing, so designers need to keep on observing the current context.

● **Based on the result of the evaluation, criteria for British culture are formulated**

British culture has individualism, short-term time orientation, low context dimension, lower power distance, and higher masculinity. Overall the UK culturally preferred elements indeed improve the effectiveness for British users, but there are some specific web interface characteristics that have a significant impact for British users, such as, less pictures, less colour, highly logical layout, asymmetrical, more white space, more text links and no use of flash.

● **Based on the result of the evaluation, criteria for Taiwanese culture are formulated**

Taiwanese culture has collectivism, long-term time orientation, high context dimension, higher power distance, and lower masculinity. Overall, the Taiwanese culturally preferred elements indeed improve the effectiveness for Taiwanese users, and there are some specific web interface characteristics that have a significant impact for Taiwanese users, such as, cartoon style icon, multiple colour, flash animation, paralleled structure, symmetrical layout, external links, availability of translation, and reduction in the quantity of commercial banner advertisement. According to the findings, Taiwanese

users perform best in the modified Liverpool site, implying that the website. which is

incorporated with Taiwanese culturally preferred elements, can improve the

performance for Taiwanese users.

6.8 Implication

• **Ease of using and obtaining information affects the desirability of British users**

• **Aesthetics affect the desirability of Taiwanese users**

• **The findings relate to the anthropological literature, particularly, some cultural**

dimensions are strongly correlated with each country

High context dimension, long-term time orientation dimensions, and collectivism

appear to be strongly correlated with Taiwanese culture. Low context dimension, short-

term time orientation dimension, and individualism appear to be strongly correlated

with British culture.

• **The findings can give consideration for Web developers in localisation design**

The results of evaluation is based on the real performance of users, not the self

data report, and can give considerations for Web developers and designers about

how to accommodate culture factors into designing Website for specific culture.

• **Content and message is still the core of Web design**

Incorporating cultural dimension and integrating cultural preferences (i.e.. visual

representations. colour. multimedia, navigation. layout. structure & content. links.

and language) convey the meaning to the users of the target culture through an

appropriate communication pattern which fits local users.

• Cultural model can be good reference if apply them with caution

Overall, the culturally preferred elements indeed impact the performance of respective culture users. Some specific attributes such as mayor column, city slogan, foliage, landscape, and water are defined as Taiwanese preferred elements, based on Hofstede's cultural dimension, Marcus and Goulds' cultural web design model, and Barber and Badre's cultural markers, but, regarding the questions designed to ask the users about their preference for these attributes, there is no significant difference across Taiwan and the UK. Therefore, this implies that the designers can apply the current cultural model, but with caution.

• Design team is required to be organised to observe the current context to apply the proper cultural preferences

The cartoon style icon is defined as a Taiwanese culturally preferred element, and is based on the real phenomenon of Taiwan government websites, not on the cultural web design model. In particular, the feature is embedded in the modified Liverpool version and Taiwanese users use the least clicks on this site, thus Taiwanese users perform well on the modified Liverpool version, and this kind of icon design can bring the navigation clue for the Taiwanese and ease their navigation.

This is a special and unique situation in Taiwan, but one cannot just rely on the cultural model or cultural web design guideline. Therefore, it is necessary for the designers and developers to have a real and direct observation for the target culture because culture is dynamic, and keeps on interacting and developing, especially as the Internet has a high spread density in Taiwan, and Taiwanese people obtain new information very quickly

and have an open mind to accept new fashions and trends, particular amongst the younger generation.

Based on the above observation, Hofstede's model should be used with caution by web developers and designers who want to develop culturally appropriate websites. Alternatively, the design team is required to be organised to observe the current context because culture is constantly interacting and developing.

- **Important issues for future research**

Based on the process of the experiment and evaluating effective communication, it is found that some important issues are required to be discussed when culture factors are accommodated to Web design. They are technology context, age and gender factors. The details of this part will be presented in Chapter 8, documenting limitations and future research.

Chapter 7 Validating theoretical cross-cultural Web design model

7.1 Introduction

The aim of this research is to establish a cross-cultural Web design model. A multistage study, comprising a literature survey, local website audit and web experiment, is used to investigate the validity of each phase of the theoretical cross- cultural Web design model. The theoretical model is formulated based on the gap within the literature review, and is a critique of the existing cultural model (the details of this are presented in Chapter 3). Four phases of the theoretical model are reviewed and listed as follows. Phase 1: Understand the context of use, incorporate the cultural dimension model and investigate cultural preferences. Phase 2: Define the cultural model for target culture. Phase 3: Website design production. Phase 4: Evaluate the effectiveness of web communication. This chapter explains how each phase is validated, what the result of each phase indicates and how each phase is related to each chapter. In the local websites audit, documented in Chapter 5, not only Phase 1 was carried out, but also Phase 2 as well. The results of the local website audit indicate that there are different Web design preferences across Taiwanese and British cultures, and it answers the first related question, "Are there any significant web design preferences across Taiwanese and British cultures?"

In Chapter 6. Phase 3 and Phase 4 were carried out. The results of web experiment indicate that the cultural design preferences, incorporating cultural dimension. can improve the communication effectiveness and answer the second related question, "Can

cultural differences be applied to improve the performance of users and facilitate effective communication?"

Chapter 4 elaborates why different methods are applied in each phase.

Based on the two related hypotheses, the proper and robust methods, data collection instruments and different data analysis method are applied to investigate the validation of the theoretical model. Figure 7.1 is a review of the theoretical cross-cultural Web design model and Figure7.2 addresses the process of validating the theoretical cross-cultural web design model.

Figure 7.1 Theoretical cross-cultural Web design model

Phase1.Understand the context of use

Investigate cultural preferences

Local website audit
Foraging websites
Cultural markers identification
(Design preferred characteristics)
Cultural pattern identification

Cultural dimension factors

High context vs. low context
Power distance
Collectivism vs. individualism
Masculinity vs. femininity
Uncertainty avoidance
Long - term vs. short - term orientation

Phase 1 & Phase 2 were carried out in Chapter 5 Local website audit

Phase 4.Evaluate the effectiveness of web communication

Usability
learnability
efficiency
errors
satisfaction
Comprehension
Desirability

Facilitate Effective Communication

Phase 2.Define cultural model for target culture

Culture data patterns
Differences
Similarities

Phase 3 & Phase 4 were carried out in Chapter 6 Web experiment

Phase 3.Website design production

Components impacting web communication

Visual representation
Colour
Multimedia
Navigation
Layout
Links
Content and structure
Language

Figure 7.2 Process of validating theoretical cross-cultural Web design model

Theoretical model is formulated in Chapter 3

Phase1: Understand the context of use
        Incorporate cultural model and investigate cultural preferences
Phase2: Define cultural model for target culture-formulate the customer profiles
Phase3: Website design production
Phase4: Evaluate the effectiveness of web communication

Phase 1 & Phase 2 were validated in Chapter 5 Local websites audit

- To test the first related hypotheses
- Method: Literature survey &Cultural markers approach

Phase 3 & Phase 4 were validated in Chapter 6 Website experiment

- To test the second related hypotheses
- Method: User testing approach

Overview of how theoretical cross-cultural web design model is validated

7.2 Understand the context of use: Incorporate cultural dimension model and investigate cultural preferences

To understand the context of use, the author incorporated cultural dimension and investigated cultural preferences. They are carried out in the local websites audit in Chapter 5. The method applied in this phase is a literature survey and cultural markers approach.

● **Investigate cultural preferences and incorporate cultural dimension model**

The concept of cultural markers (Barber and Badre, 1998) is adopted to define the web interface characteristics that reflect the signs and their meanings to match the expectations of the local culture audience. According to Smith et al. (2004), to better understand how to create a website that is appropriately pitched to the target culture users, it is essential to examine the different signs or symbols (or visual representation) in a target culture, the usage of signs based on the context, and how the target culture audience interprets these signs. This can be achieved by conducting an audit of local indigenous sites. Thus, a local website is established and comprises three steps shown below.

Firstly, previous research involving cultural preferences is consulted, such as those of Barber & Badre (1998), Sun (2001) and Cyr & Trevor-Smith (2004).

Secondly, observing the real features in websites that have been selected.

Thirdly, Hofstede's (2005) cultural dimension. Hall and Halls' (1990) high and low context dimension, Marcus and Gould (2000), and Würtz (2005) are incorporated, and web design characteristics (cultural markers) are identified by integration with the

elements from previous research involving cultural preferences, as well as detailed inspection of the scope websites. Finally, the culturally preferred design elements are defined and comprise of eight categories: visual representations, multimedia, colour, layout, navigation, links, content & structure, and language. These elements are united to match the cultural expectations of the users from specific culture.

● **The findings from Phase 1 - understanding the context of use**

The findings from the local websites audit show that significant model differences of the culturally preferred design elements were found in each category (see Table 6.1 of Chapter 6). This indicates that Taiwanese culture, with collectivism, long-term time orientation, high context, higher power distance, and lower masculinity, have their culturally preferred web design characteristics, whilst British culture, with individualism, long-term time orientation, high context, lower power distance, and higher masculinity, have their culturally preferred web design characteristics. This implies that different cultures prefer a specific mode of web design elements. Culturally preferred design elements between Taiwan and the UK are reviewed in Table 6.1.

7.3 Define cultural model for target culture

Phase 2, "Define cultural model for target culture" was validated in the local websites audit (Chapter5). The aim of this phase is to define the differences and similarities for the target culture. The details of defining these differences and similarities are presented in Chapter 5, in Section 5.5 and Table 5.6-5.15. If there is a significant level in the web design characteristics variable, the variable is defined as the culturally preferred elements between Taiwanese and British cultures. If there is no significant level in the variable, the variable is defined as the similarities between Taiwanese and British cultures.

This phase aims to identify and state a picture of differences and similarities in the observed features of the target-culture users' specific practice. The objective of this stage identifies the international variables needed to define a cultural model, as well as compare and identify the similarities and significant differences, in the response of the samples in order to create a pattern of the target-culture customers.

7.4 Website design production

● **Website design production was validated in Chapter 6**

Phase 3 was carried out in Section 6.3.3, in Chapter 6. Based on the results from Phase 1 and 2, the website prototype is constructed, and the webpages are incorporated with the identified culturally preferred characteristics integrating with the cultural dimension. The preferred design characteristics are categorised into eight categories such as visual representation, navigation, multimedia, colour, layout, language, interaction, and content. This phase focuses on the production of the website's prototype.

The culturally preferred features are embedded into four websites to test if the website can reflect the users' culture and be more effective in communication.

The Liverpool city council website is selected as the representative website which reflects British culture and the Taichung county government website is selected as the representative website which reflects Taiwanese culture. The city logos, some pictures, news, events, and information are adopted from both of the original websites, however, the web interface features are modified. The British culturally preferred design characteristics are incorporated into two of the websites (the typical Liverpool and the modified Taichung website versions), whilst the Taiwanese culturally preferred design characteristics are incorporated into the other two websites (the typical Taichung and the modified Liverpool website versions). The creation details and processes are introduced in Section 6.3.3.

● **Construction of experimental websites**

Firstly, the typical version websites are incorporated with the culturally preferred features based on the result of the local website audit between the UK and Taiwan.

Secondly, the modified version websites of Liverpool city council and Taichung county government are created. Both of the websites have the same content as the typical version website, but the British culturally preferred web elements are incorporated into the modified Taichung version website, whilst the Taiwanese culturally preferred web design characteristics are embedded into the modified Liverpool version website. The web design features are listed in Table 6.1.

Thirdly, there are two contrasting styles for the two versions of each city's website. They are the typical Liverpool website which reflects British culture, the modified Liverpool website which reflects Taiwanese culture, the typical Taichung website which reflects Taiwanese culture, and the modified Taichung website which reflects British culture. Eventually, the four experimental websites are constructed. The Web interfaces are shown in Figures 6.1- 6.4 of Chapter 6.

The web addresses of these sites are listed below.

- A Typical Liverpool based version website
  http://culturalweb.myweb.hinet.net/livenglish/liverpoolenglish.html

- A Modified Liverpool based version website
  http://culturalweb.myweb.hinet.net/livmodified/liverpoolmodified.html

- A Typical Taichung based version website
  http://culturalweb.myweb.hinet.net/taienglish/taichungenglish.html

- A Modified Taichung based version website
  http://culturalweb.myweb.hinet.net/taimodified/Taichungmodified.html

7.5 Evaluating the effectiveness of web communication

Phase 4 was carried out in Sections 6.3.4 to 6.3.6 of Chapter 6. Reviewing the previous research from Nielson (1993), Brink et al. (2002), Preece (1993), Zahedi et al. (2001), the evaluation criteria of web communication effectiveness is identified as learnability, efficiency, minimal errors, satisfaction, comprehension and desirability.

● **Learnability**

In the Linear General Model analysis, $F(1.28)=17.287$, $p<0.05$. This indicates that Taiwanese and British culture are interacting with 4 different versions of a website in the click performance. The Post hoc test shows a significant effect for the clicks by cultures, by towns and by websites interaction. The performance of the clicks (Figure 6.8) shows that a different style of website can make users from different cultures have significantly different performances. The websites which reflect British culture (i.e., the modified Taichung and the typical Liverpool websites) can make British users perform better, however, the typical Taichung site cannot benefit them. Thus, this indicates that it is more effective for British users to navigate a website which is incorporated with British culturally preferred design attributes, whilst it is more effective for Taiwanese users when they use a website which is incorporated with Taiwanese preferred design elements.

● **Efficiency**

The time performance of British participants within the two versions of the websites was compared. In the Linear General Model analysis, $F(1.14)=17.121$, $p<0.05$ (Sig=0.001). This indicates that British users have a significantly different performance between the typical and modified versions of the Liverpool sites, as well as the typical and modified versions of the Taichung sites. Figure 6.6 shows that British users perform outstandingly in the modified Taichung site and the typical Liverpool site, compared to

the Taiwan style websites. This indicates that British users work efficiently when they interact on the websites which reflect British style, and the Taiwanese style sites can not benefit them, whilst Taiwanese users do not work efficiently in the British style websites (typical Liverpool website) because it takes them the longest to perform the tasks. Based on the data for time performance, it is found that it is more effective when British users use UK style websites.

● **Minimal errors**

Based on the results of the user testing and from reviewing Figure 6.9. it is found that Taiwanese participants make the least errors in the modified Liverpool website and the most errors in the typical Liverpool website. British participants make the least errors in the modified Taichung website and make the most errors in the typical Taichung website. Taiwanese participants perform best performance in the modified Liverpool website, which reflects the Taiwanese style, and British users perform best in the modified Taichung website, which reflects UK culture.

● **Satisfaction**

Based on the results of the user testing and from reviewing Figure 6.14 and 6.15. British participants are most satisfied with the website which reflects the British style (Taichung modified version website), whilst Taiwanese are least satisfied with this. Taiwanese users are highly satisfied with the modified Liverpool website, which reflects the Taiwanese style.

● **Comprehension**

The results of user testing indicate that Taiwan has a higher comprehension in the website which reflect the Taiwanese style (modified Liverpool version site), whilst the UK has the highest comprehension in the website which reflects the British style (modified Taichung version site).

● **Desirability**

93% of Taiwanese users like the typical Taichung website. and 64% of Taiwanese users prefer the typical Taichung website because it is visually pleasing. 73% of UK users prefer the modified Taichung version website and nearly 50% of British users like the modified Taichung website because of ease of use and ease of finding specific information. This indicates that Taiwanese users prefer a website visually pleasing, whilst British users prefer easily accessible information.

Overall, the results are consistent with the hypotheses. Data are analysed to modify the websites based on the results of the usability test. A replicable process should take place subsequently by modifying the prototype website based on the results of the evaluation. Further assessment should be developed on the working site. Based on the results of this evaluation, criteria are suggested for the cross-cultural Web design (Section 6.7.3 of Chapter 6).

7.6 Summary

A team should be organised for the localisation within the target culture to meet the need of the communication pattern from the target culture. Based on Gribbons's (1997) study, there are usually two sub-levels required to be carried out in the localisation process, the surface level and the cultural level (modifying the visual representation, such as symbols, images, icons, colours, structure, layout, functionality and communication patterns, to accommodate the target users). This research focuses on the cultural level and suggests that localisation needs to make adaptations on the web interface characteristics, including visual representation, colour, multimedia, navigation, layout, links, content and structure.

This model can contribute to the need of localisation and help the web developers and designers develop the web product as culturally appropriate. Although the cross-cultural research was undertaken using Taiwanese and British users to test the model.

This cross-cultural web design model can be applied to other cultures. Finally, the process of this cross-cultural Web design model is reviewed as follows:

Firstly, incorporate the cultural model and study cultural preferences from a target culture

It is recommended that the design team needs to construct a local website audit to define culturally preferred attributes and incorporate them with cultural studies (i.e., Hofsted's cultural dimension; Hall & Halls' culture context; Marcus & Goulds' cultural web model; Würtz's cultural web design consideration) that measure and target local culture. The cultural dimension might provide helpful information for cultural preferences from the local culture. Also, specify what cultural dimensions relate to the web product.

Secondly, define a cultural model for the target culture and formulate the customer profiles

This phase aims to identify and state a picture of differences and similarities in the observed features of the target-culture users' specific practice. The objective of this phase is to identify the similarities and significant differences in the response of the samples in order to create a pattern of the target-culture customers.

Thirdly, website design production - prototype implementation

Test the findings of the local website audit on users from the target culture to assess if these design preferences are applied properly, and increase usability and facilitate communication whilst also assessing subconscious patterns of behaviour.

The preferred design characteristics are categorised into eight categories: visual representation, navigation, multimedia, colour, layout, language, interaction, and content. This phase focuses on the production of the website's prototype.

These culturally preferred features are embedded into prototype websites to evaluate the response and experiences of the target culture users.

Fourthly, evaluation of effective communication

Construct user testing from the target culture in the developing process to study the relationship between culture and user-interface design more thoroughly. Prototype websites are used to evaluate if websites that reflect the users' culture can benefit the target culture users.

User testing is the most direct and efficient way to obtain a response from the real users, and Nielsen (2000) reports that the best way to evaluate a localised product is to observe local users using the product, and this is the most cost effective way. An iterative process should take place subsequently by modifying the prototype website based on the results of the user testing.

Chapter 8 Conclusion and contribution

8.1 Conclusion

Figure 8.1 presents a brief overview of how the various studies fit together. The

multi-approach studies (literature survey, local website audit and web experiment) are

eventually drawn together to validate the theoretical model. The process of determining

the validity involves presenting evidence to support the following issues for

cross-cultural web developing.

Figure 8.1 Overview of validating theoretical cross-cultural Web design model

Theoretical model is formulated in Chapter 3

The theoretical model is formulated based on the gap of literature review, and criticizing the existing cultural model. There are four phases in the theoretical model, which are listed as below.
Phase1: Understand the context of use
        Incorporate cultural model and investigate cultural preferences
Phase2: Define cultural model for target culture-formulate the customer profiles
Phase3: Website design production
Phase4: Evaluate the effectiveness of web communication

↓

Phase 1 & Phase 2 were validated in Chapter 5 Local websites audit

- **Executing Phase1 Understand the context of use**
  Incorporate cultural model and investigate cultural preferences

- **Executing Phase2 Define cultural model for target culture**

- **To test the first related hypotheses**
  There are different Web design preferences across Taiwanese and British cultures

- **Finding**
  Significant cultural preferences are found across Taiwan and UK

Method:
Literature survey &
Cultural markers
approach

↓

Phase 3 & Phase 4 were validated in Chapter 6 Website experiment

- **Executing Phase 3 Website design production**

- **Executing Phase 4 Evaluate the effectiveness of web communication**
  Evaluation criteria:
  Learnibility, efficiency, minimal errors, satisfaction, desirability

- **To test the second related hypotheses**
  If the web interface design can reflect the user's culture, it can be more effective in communication. Based on the results of the local website audit, the culturally preferences of Taiwan and UK are embedded in websites integrating with their cultural dimension in web experiment. Four experimental websites are set up and users are recruited to participate the user testing.

- **Finding**
  Culturally preferred design elements incorporating with cultural dimension improve the performance and increase effective communication for users from respective culture

Method:
User testing

↓

A new cross-cultural Web design model is validated

8.1.1 Cultural model can contribute to effective communication

The current cultural model can contribute to effective communication. but these cultural models have to be applied with caution.

Overall, the culturally preferred elements incorporating cultural dimension. found in the local websites audit, do impact the performance of respective culture users. Some specific attributes (i.e., mayor column, city slogan, foliage. landscape and water are defined as Taiwanese preferred elements, based on cultural dimension and the cultural web design model) and some specific questions are designed to ask the users about their preference for these attributes, since there is no significant difference across Taiwan and the UK. Thus, this indicates that the designers can apply the existing cultural model. but with caution, and it is still necessary to recruit a group of users to participate in the usability test to completely understand what they prefer and need.

8.1.2 Cultural preferences impact effective web communication

• Cultural preferences can improve the performance of the target culture users if they are applied properly.

• Cultural preferences impact the performance of users across British and Taiwanese cultures

Based on the results of effective communication evaluation. it is found that UK users

improve the performance in time (efficiency) when they use a website that reflects the British culture (e.g., the modified Taichung site). Taiwanese users improve the performance in clicks (learnability) when they use the modified Liverpool website, which reflects the Taiwanese culture.

● **Cultural preferences impact satisfaction of users across UK and Taiwan culture**

Based on the results of the effective communication evaluation, it is found that British participants are highly satisfied with the modified Taichung website, which reflect British culture, whilst Taiwanese users are not satisfied with it. Taiwanese users are satisfied with the modified Liverpool site, which reflects Taiwanese culture.

● **Cultural preferences impact comprehension across British and Taiwanese cultures**

Taiwan has a higher mean in the websites (i.e., modified Liverpool version) which reflects Taiwanese culture, whilst the UK has the highest mean in the websites that reflect the British style (i.e., modified Taichung version).

● **Cultural preferences impact desirability across UK and Taiwan culture**

Based on the results of the effective communication evaluation, it is found that most of the Taiwanese participants prefer and expect to use the typical Taichung website, and 64% of them prefer the Taichung typical website due to it being visually pleasing. 73% of UK users prefer the modified Taichung website and nearly 50% of them prefer the

modified Taichung site because of ease of use and ease of finding specific information.

For Taiwanese users, the emphasis is on aesthetics, whilst, for British users, the

emphasis is on ease of use.

- **For British users, ease in using the website is strongly correlated to desirability**

- **For Taiwanese users, aesthetics is strongly correlated to desirability, but efficient**

performance is not correlated to desirability.

8.1.3 This model suggests a robust method

- **Incorporating cultural dimension and study local cultural preferences is a**

  powerful method

Based on the results of the local website audit and the web experiment, it is found that

the cultural markers approach can map directly into culturally appropriately design

elements for a website. This model not only integrates the strength of the cultural

markers approach (construct local website audit), but also incorporates the strength of

the cultural dimension, which suggest a robust and practical method for the localisation

design. This is supported by the results of the user testing because it improves the

performance of users from the target culture.

Incorporating cultural dimension and studying local cultural preferences should be

considered for Web developers and designers in order to develop an effective website.

It is a powerful method in the localisation process, but cultures keep on interacting and developing, so designers need to keep on observing the current context.

Setting up the local website audit and user testing would enable the investigation of each culture to find the culturally preferred elements.

8.1.4 Criteria for cross-cultural Web design

● **Based on the results of the user testing, the criteria for British culture are formulated**

British culture comprises of individualism, short-term time orientation, low context dimension, lower power distance, and higher masculinity. Overall, the British culturally preferred design elements do improve the effective communication for British users.

Furthermore, it is found that there are some specific web interface characteristics that have significant impacts for British users, e.g., less pictures, less colours, highly logical layout, asymmetrical, layout, more white space, more text links and no use of flash. All these above features can benefit British users and improve their performances.

● **Based on the results of the user testing, the criteria for Taiwanese culture are formulated**

Taiwanese culture comprises of collectivism, long-term time orientation, high context

dimension, higher power distance, and lower masculinity. Overall, the Taiwanese

culturally preferred design elements do improve the effective communication for

Taiwanese users, and there are some specific web interface characteristics that have

significant influence on Taiwanese users, e.g., cartoon style icon, multiple colour, flash

animation, paralleled structure, symmetrical layout, external links, and availability of

translation. Furthermore, Taiwanese users have the best performances in the modified

Liverpool site, which indicates that the interface attributes of this website can benefit

Taiwanese users by making the layout more logical, reducing the quantity of

commercial banner advertisement, and applying more cartoon icons for navigation. The

above findings can provide valuable design criteria for web developers, and enable

designers to become aware of the possibilities of effective communication with a

specific culture.

8.1.5 A design team

● **The model suggests web developers should have their own teams to engage the**

target culture directly

Cultures are not static, thus this needs to observe the audience directly and immediately.

The current cultural models can be applied with caution, and the best solution is

incorporating the cultural model and investigating the local preferences to avoid

stereotyping.

The findings suggest that the web developer has a design team to engage the target culture directly, to observe the target culture preferences, integrate the existing model, and then set up the cultural model on their own to meet their target culture, in order to yield an innovative and creative solution.

- **Some issues that a design team member needs to consider in cross-cultural Web design**

1. What are the cultural differences (cultural context and cultural preferences)?

2. How to adapt web features to meet the need of a target culture?

3. Identifying the differences, understanding the design implications and design for them, and evaluation of a web prototype before the web product is released.

8.2 Contribution and Implications

● **An empirical study is constructed to give evidence to support the model**

The distinct difference between this model and the existing model is that an empirical

study (web experiment) is constructed to give evidence to support the proposed model

in this research. According to the literature review, no empirical studies support the

claims of the previous cross-cultural Web design models (Zahedi et al., 2001; Sun, 2002;

Jagne and Smith-Atakan, 2006). Even some empirical studies have been constructed,

but ignored the performance issues in the usability. This model has improved the

limitations and comprises of a web experiment being constructed to test the proposed

model. This web experiment, experimental websites design and implementation, as well

as evaluation of web communication, (user testing approach is adopted in this stage)

and the evaluation of users' performances are carried in this research. Eventually, it is

found that the performances of the users are improved when the cultural preferences,

incorporating cultural dimensions, are embedded into the websites. The experiences,

responses, and performance data collected, from the real user through the interaction

within the experimental website, give a strong support to the validity of this model.

●**The model comprises of four phases, the process is replicable to obtain an**

improved web product

This model comprises of four phases, and the process is replicable. In cross-cultural

web design developing, this needs to be a strong relationship between cultural theory

and practical design approach, so that an improved web product can be obtained by a

replicable process of design, evaluation and reflection on theory.

● **The model not only culturally adapts Websites, but also enhances Web site**

usability and increase the global web communication

The theoretical model based on Hofstede's and Hall and Halls'cultural dimension model.

investigates cultural preferences, sets up web prototype, and constructs user testing,

which can be useful for web developers and Web site designers to develop

culture-specific Web sites. If it is applied, this model can not only culturally adapt

Websites, but also facilitate Web usability and increase the global web communication.

● **The model can provide consideration and information for cross-cultural web**

design

The model can provide consideration for web design and information about what

communication pattern is needed by the target culture. The key, to effective

communication across different cultures, is knowing what type of information users

from target cultures require and presenting them in the communication pattern they

expect. This research focuses on the communication pattern that fits the target culture

audience.

This model also can provide information about the method used in each phase to

web design developing, this needs to be a strong relationship between cultural theory and practical design approach, so that an improved web product can be obtained by a replicable process of design, evaluation and reflection on theory.

● **The model not only culturally adapts Websites, but also enhances Web site usability and increase the global web communication**

The theoretical model based on Hofstede's and Hall and Halls'cultural dimension model, investigates cultural preferences, sets up web prototype, and constructs user testing, which can be useful for web developers and Web site designers to develop culture-specific Web sites. If it is applied, this model can not only culturally adapt Websites, but also facilitate Web usability and increase the global web communication.

● **The model can provide consideration and information for cross-cultural web design**

The model can provide consideration for web design and information about what communication pattern is needed by the target culture. The key, to effective communication across different cultures, is knowing what type of information users from target cultures require and presenting them in the communication pattern they expect. This research focuses on the communication pattern that fits the target culture audience.

This model also can provide information about the method used in each phase to

contribute to cross-cultural web design research. Furthermore. the process of validating

this theoretical model can give insights into how to develop web sites that can maximise

communication effectiveness.

- **The model, validated by multi-approach, can bring consideration for cross-cultural Web design**

This model is validated by the objective data and subjective opinions gained from the

user testing, leading to crucial insights, and support the propositions and the previous

notions, bringing new nuances and considerations for cross-cultural Web design.

- **The model may inspire others to undertake cross-cultural design research**

The local websites studies across Taiwanese and British culture apply methods that

incorporate the cultural dimension model and investigate the culturally preferences.

This method develops a set of comprehensive culturally preferred elements from a local

website audit for specific cultures. This approach provides considerable potential for

localisation design. The experiences gained from Taiwanese and British user tests led to

important insights, confirmed previous notions, and helped bring about changes in the

practical approach to Web design. This model may inspire others to undertake similar

analyses and design efforts.

● **The applicability of cultural models, cross-cultural design approaches, usability**

method are explored

In the process of validating the proposed cross-cultural model, cultural studies,

cross-cultural web models, cultural preferences approaches, and usability methods are

reviewed and applied. This model can provide insight into cross-cultural research and

human-computer interaction.

Taiwanese users take, on average, more clicks and time than British users for each website, which implies that the language influences their performance. Whilst the participants are qualified in English to undertake a British university course, the Taiwanese's native language is Chinese. Therefore, in future experiments, a Chinese language website is required to be constructed to ensure that the Taiwanese users can absorb and understand the information as the same speed as the British users.

Thirdly, reviewing the results of the effective communication evaluation, the culturally preferred elements incorporated with cultural dimension models indeed improve the performance of users from respective cultures, and, overall, these elements facilitate the effective communication for users from respective cultures. The evaluation results of desirability reveal that the websites reflecting Taiwanese culture (e.g., Taichung typical site) are strongly preferred by Taiwanese users and the websites reflecting British culture (e.g., Taichung modified site) are highly preferred by British users. The subjective data from users shows that they do not have strong inclinations towards specific cultural preferences (i.e., leader image, mayor column, foliage, water, landscape, images of individuals, images of action), but the experimental websites that are incorporated with cultural preferences do influence the performance and effective communication. Further research can be conducted with an expanded sample of participants in more countries and with more different cultural categories.

Fourthly, this research concentrates on particular government genre website, with local government websites selected to reduce the influence of any company branding. It was expected that the local websites are less affected by the external design attributes, but the selection of local government websites could confine the data in other contexts

(i.e., a company website) to be generalised. For further research, a different genre of website could be selected to investigate cultural differences.

9.3 Future research

The results of the research and the limitations indicate that further investigation needs to be considered. Consequently, more rigorous further research will be developed. Further analysis of culture factors and other dimensions, and a more detailed assessment may bring further insight and more specific design considerations. Validating the theoretical model and building up a cross-cultural web design model is just one step. The complicated and dynamic cultural context around the localised websites still needs to be investigated further. Some research directions need to be considered for the future, and these are listed below.

• Other factors are required to be considered

Forty seven percent of British users prefer the modified Liverpool based website and one third of them preferred this site because it is visually pleasing. The modified Liverpool based site is embedded with Taiwanese cultural preferences, such as flash animation and cartoon style icons.Th ese British users are younger users (between 22-25 years old), which implies that the age would be a factor on usability. Girls' preferences, perceptions, and expectations are quite different to boys' preferences, based on the response of the subjective data collection, so gender would be an important issue for consideration the future research. Based on the above observation of users from Taiwan and the UK, there are other important factors required to be considered. Some of the researcher such as Zahedi et al. (2001) and Sun (2002) also suggested that these issues need to be considered in a cross-cultural Web design development. Zahedi et al. define

these factors as individual factors and Sun defines them as general cultural factors. Also, there are some philosophies which can inspire web communication researchers. For example, Spinuzzi (1999) regards technology as ecology and he developed his thinking based on Nardi and O'Day's (1999) information ecology. To sum up, the factors that should be considered in future are listed as follows: age and gender, professional knowledge, information technology knowledge, information processing orientation, and organisational culture.

● New direction to explore why Taiwanese favour symbolic information in pictures

Taiwanese users prefer symbolic information in pictures and perform well in the modified Liverpool based website, which is embedded with Taiwanese cultural preferences, and most of them expect and prefer Taiwanese style websites. This relates to the literature, which explains that Taiwan tends to be a high context culture, thus Taiwanese users prefer this. However, there is one important point that is ignored in the previous research. The traditional Chinese characters, which are used by Taiwanese, are originally formulated by imitating the image from daily life objects, the living environment, and nature. Taiwanese are brought up to read icon characters, and the characters have lots of similarity to the appearance of objects and the image of nature. It has a deep connection which is why Taiwanese would prefer and enjoy websites incorporated with lots of images, icons, and symbolic information in pictures.

● Research methodology

In future research, a direct approach, instead of adopting the cultural dimension theories from anthropologists (i.e. Hofstede, 2005; Hall and Hall, 1990), would be applied to

investigate and assess culture. It is very important to apply appropriate research methodologies to study cultural usability and to collect cultural data. Alternatively, ethnography may be a usable method to investigate cultural differences in web interface design in the future studies.

• Evaluation method might need to be adjusted

This research adopted a western usability method/technique to collect data from users. The usability testing approach is adopted from Nielsen (1993). Evers (2002: p.336) suggested that, "...It may be that for international research, different data collection methods need to be developed for the different cultures involved while investigating the same topic." Therefore, new usability methods and techniques are required to be developed to fit users from different cultural contexts.

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Appendix A:

Instruction form, Demographics, Consent form

Appendix A.1 Instruction form

Information

- This test aims to find out if the culturally preferred elements are incorporated into the website can facilitate the effective communication on web design or not.

- The purpose of this test is to evaluate the experimental web sites, not you. Just take it easy to carry out the tasks and answer the questions.

Procedure

- Later you will navigate and interact in four of website. They are listed as below.

The modified Liverpool based website: http://culturalweb.myweb.hinet.net/livmodified/liverpoolmodified.html

The typical Liverpool based website: http://culturalweb.myweb.hinet.net/livenglish/liverpoolenglish.html

The modified Taichung based websites: http://culturalweb.myweb.hinet.net/taimodified/Taichungmodified.html

The typical Taichung based website: http://culturalweb.myweb.hinet.net/taienglish/taichungenglish.html

- You need to perform four tasks of each website shown on the tasks list, the time and clicks of carrying out each task are captured and recorded. After you carry out four tasks, you will be required to answer questionnaire which are used to get the response, subjective opinions, satisfaction from you based on your real interaction experience within each websites. You will navigate the websites one by one. The whole duration is 50 minutes.

Directions

- Please tell me "Start" when you get ready to begin to find the answer and say "Stop" when you get the answer. It helps me to calculate the time you take.

- If there is any design key word you don't understand, you are welcome to ask questions

- The answer to these questions range on a 5 scale, scale 1 means strongly disagree, scale 2 means disagree, scale 3 means neutral, scale 4 means agree, scale 5 means strongly agree. Just cross one box which shows your answer best for each question.

Definition of web interface attributes

icon : Small pictures used in web interface to represent some function or object.

flash animation : moving images, moving pictures

symmetrical : balanced layout, even distributed images

asymmetrical : not balanced layout, not even distributed images

foliage: florals, grass, tree

images on actions: images with people who are moving or in actions

Confidentiality

The information you provide is strictly confidential. The completed questionnaires will only be read by Hsiu Ching Hsieh.

Many thanks for your help!

Appendix A.2 Demographics

1.Name: _____

2.Gender: □Male   □Female

3.Age: ——————

4.Nationality: □Taiwan □UK □Other   ——————

5.Educational level/qualification: ——————————————

6.Occupation: ———————————————————

7.How often do you use the internet?

Please choose only one box below.

□Every day and in the weekends,

□Every weekday,

□3 to 4 times per week,

□1 to 2 times per week

□1 to 3 times per month,

□Other

8.What do you use the internet for most? Please choose as many boxes as you needed.

□E-mail

□On-line chatting

□To find information on personal interests

□To find information for study or work

□Game related

□Other

Appendix A.3 Consent form

The aim of this experiment is to evaluate how culture factors effect the effective communication in Web design.

You will need to carry out the assigned tasks and answer the questionnaires after you use the web site to work through specific tasks. As you interact on the web site, your performance will be captured and recorded by an experimenter who may takes notes on your performance and activities. The duration of the test is 50 minutes. If for any reason you are not comfortable with the experiment, you may stop at any time.

I, _____ , have read and fully understood the extent of this test and any rrisks involved. I sign here acknowledging the above information.

Participant Signature _____

Date _____

Experimenter _____

Appendix B:

Task assigned and Questionnaire

Appendix B.1: Task assigned and Questionnaire

Liverpool City Council Website (modified version)

I. Please carry out the tasks below.

1. If you got council tax problem in Liverpool city, which specific number you can call? _____

2. Can you find out the address of Central Library in Liverpool ? _____

3. Can you find out the e-mail of Liverpool City Council? _____

4. Which building, Municipal Building or Millenum House is nearest St. George's Hall? _____

II. Please cross one box which shows your answer best for each question.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.Does the city slogan convince you it is a nice city?	☐	☐	☐	☐	☐
2.Are you interested in reading the introduction about mayor?	☐	☐	☐	☐	☐
3.Does the graphics reflect your culture attributes?	☐	☐	☐	☐	☐
4.Can icons be easily be associated with their functions?	☐	☐	☐	☐	☐
5.Are there too many colours used?	☐	☐	☐	☐	☐
6.Are visual representations easy to understand?	☐	☐	☐	☐	☐
7.Overall, visually pleasing?	☐	☐	☐	☐	☐
8.Do you like to see the image of city mayor in the interface?	☐	☐	☐	☐	☐
9.Do those foliage, landscape, water images make you familiar with the interface and stimulate you keep on exploring?	☐	☐	☐	☐	☐
10.Does the flash animation attract you to navigate in the web?	☐	☐	☐	☐	☐
11.Do the text in motion attract you to read the information?	☐	☐	☐	☐	☐
12.Does the website use pop-up windows properly to help manage screen real estate?	☐	☐	☐	☐	☐
13.Do you think elements are grouped properly?	☐	☐	☐	☐	☐
14.Is it clear where to go next?	☐	☐	☐	☐	☐
15.Do the layout fit appropriately to your navigation?	☐	☐	☐	☐	☐
16.Do you pay attention on the commercial banner ad and know what it is on the banner?	☐	☐	☐	☐	☐
17.Overall, easy to use this web?	☐	☐	☐	☐	☐
18.Ease of finding specific information you seek?	☐	☐	☐	☐	☐
19.Ease of reading information?	☐	☐	☐	☐	☐
20. I had doubts about finding the right information?	☐	☐	☐	☐	☐
21.Overall, were you satisfied in using this website?	☐	☐	☐	☐	☐
22.Do you feel comfortable with the task?	☐	☐	☐	☐	☐

Appendix B.2 : Task assigned and Questionnaire

Taichung County Website (Modified version)

I. Please carry out the tasks below:

1.Can you find out the address of Taichung county government ?_____

2.Can you tell me which road is near Taichung county government, Bo-ai Street or Sanfen Rd?_____

3. Can you find out the contact number of New plaza Hotel?_____

4.Can you find out the e-mail of Taichung county police Bureau?_____

II. Please cross one box which shows your answer best for each question.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.Should an index feature be added in this website?	☐	☐	☐	☐	☐
2.Do the graphics reflect your culture attributes?	☐	☐	☐	☐	☐
3.Do the colours appropriately represent your culture?	☐	☐	☐	☐	☐
4.Are there too many colours used?	☐	☐	☐	☐	☐
5.Are visual representations easy to understand?	☐	☐	☐	☐	☐
6.Overall, visually pleasing?	☐	☐	☐	☐	☐
7.Do you think elements are grouped properly?	☐	☐	☐	☐	☐
8.Is it clear where to go next?	☐	☐	☐	☐	☐
9.Does the layout suit your navigation?	☐	☐	☐	☐	☐
10.Overall, easy use this web?	☐	☐	☐	☐	☐
11.Ease of finding specific information you seek?	☐	☐	☐	☐	☐
12.Ease of reading information?	☐	☐	☐	☐	☐
13.I had doubts about finding the right information?	☐	☐	☐	☐	☐
14.Will you be willing to view this website again?	☐	☐	☐	☐	☐
15.Overall, were you satisfied in using this website?	☐	☐	☐	☐	☐
16.Do you feel comfortable with the task?	☐	☐	☐	☐	☐

Appendix B.3 : Task assigned and Questionnaire

Liverpool City Council Website (Typical version)

I. Please carry out the tasks below.

1. Can you find out the address of Edge Hill Library in Liverpool ?_____

2. Which station, Lime St station or Central station is near central library?_____

3. If you got housing problem in Liverpool city, which number you can call?_____

4. If you need environmental health service, which e-mail you can contact ? _____

II. Please cross one box which shows your answer best for each question.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.Should an index feature be added in this website?	☐	☐	☐	☐	☐
2.Do the graphics reflect your culture attributes?	☐	☐	☐	☐	☐
3.Do the colours appropriately represent your culture?	☐	☐	☐	☐	☐
4.Are there too many colours used?	☐	☐	☐	☐	☐
5.Are visual representations easy to understand?	☐	☐	☐	☐	☐
6.Overall, visually pleasing?	☐	☐	☐	☐	☐
7.Do you think elements are grouped properly?	☐	☐	☐	☐	☐
8.Is it clear where to go next?	☐	☐	☐	☐	☐
9.Does the layout suit your navigation?	☐	☐	☐	☐	☐
10.Overall, easy use this web?	☐	☐	☐	☐	☐
11.Ease of finding specific information you seek?	☐	☐	☐	☐	☐
12.Ease of reading information?	☐	☐	☐	☐	☐
13.I had doubts about finding the right information?	☐	☐	☐	☐	☐
14.Will you be willing to view this website again?	☐	☐	☐	☐	☐
15.Overall, were you satisfied in using this website?	☐	☐	☐	☐	☐
16.Do you feel comfortable with the task?	☐	☐	☐	☐	☐

Appendix B.4 : Task assigned and Questionnaire

Taichung County Website (typical version)

I. Please carry out the tasks below.

1.Can you find out the contact number of Royal Resort Hotel?_____

2.Can you find out which road is near Taichung county government, Jhongjheng Rd or National highway?_____

3.Can you find out the e-mail of Environmental Protection Bureau?_____

4.Can you find out the address of Taichung county cultural center? _____

II. Please cross one box which shows your answer best for each question.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.Does the city slogan convince you it is a nice city?	☐	☐	☐	☐	☐
2.Are you interested in reading the introduction about mayor?	☐	☐	☐	☐	☐
3.Does the graphics reflect your culture attributes?	☐	☐	☐	☐	☐
4.Can icons be easily be associated with their functions?	☐	☐	☐	☐	☐
5.Are there too many colours used?	☐	☐	☐	☐	☐
6.Are visual representations easy to understand?	☐	☐	☐	☐	☐
7.Overall, visually pleasing?	☐	☐	☐	☐	☐
8.Do you like to see the image of city mayor in the interface?	☐	☐	☐	☐	☐
9.Do those foliage, landscape, water images make you familiar with the interface and stimulate you keep on exploring?	☐	☐	☐	☐	☐
10.Does the flash animation attract you to navigate in the web?	☐	☐	☐	☐	☐
11.Do the text in motion attract you to read the information?	☐	☐	☐	☐	☐
12.Does the website use pop-up windows properly to help manage screen real estate?	☐	☐	☐	☐	☐
13.Do you think elements are grouped properly?	☐	☐	☐	☐	☐
14.Is it clear where to go next?	☐	☐	☐	☐	☐
15.Do the layout fit appropriately to your navigation?	☐	☐	☐	☐	☐
16.Do you pay attention on the commercial banner ad and know what it is on the banner?	☐	☐	☐	☐	☐
17.Overall, easy to use this web?	☐	☐	☐	☐	☐
18.Ease of finding specific information you seek?	☐	☐	☐	☐	☐
19.Ease of reading information?	☐	☐	☐	☐	☐
20. I had doubts about finding the right information?	☐	☐	☐	☐	☐
21.Overall, were you satisfied in using this website?	☐	☐	☐	☐	☐
22.Do you feel comfortable with the task?	☐	☐	☐	☐	☐

Appendix C:

Questionnaire for cultural variables and Desirability

Appendix C.1 Questionnaire for cultural variables

1. I get very anxious when the web does something strange and I am uncertain of what to do next.

   □Strongly agree   □Agree   □Neutral   □Disagree   □Strongly disagree

2. I would like to view the personal information about the mayor and the accomplishments of a group.

   □Strongly agree   □Agree   □Neutral   □Disagree   □Strongly disagree

3. I prefer to read detailed instructions in text on the display, instead of symbolic information in pictures

   □Strongly agree   □Agree   □Neutral   □Disagree   □Strongly disagree

4. I would like to open different applications and carry out different tasks at the same time

   □Strongly agree   □Agree   □Neutral   □Disagree   □Strongly disagree

5. I would like to navigate in parallel structure, read information shown in the pop up window

   □Strongly agree   □Agree   □Neutral   □Disagree   □Strongly disagree

Appendix C.2 Questionnaire for desirability

1. Compare typical and modified versions of Liverpool city council website, which one do you prefer?

   □ typical version   □ modified version

2. Please state the reason for your choice in question 1 above?

   □Visually pleasing   □Graphics are familiar to me   □Ease of finding specific information

   □ Ease of reading information   □Overall easy of use

3. Compare typical and modified versions of Taichung county government website, which one do you prefer?

   □ typical version   □ modified version

4. Please state the reason for your choice in question 3 above?

   □Visually pleasing   □Graphics are familiar to me   □Ease of finding specific information

   □ Ease of reading information   □Overall easy of use

Appendix D:

Analysis of performance

General Linear Model analysis

Paired sample T-test

Independent samples T-test

Appendix D.1.1

General Linear Model analysis – Performance for time

Descriptive Statistics

nationality		Mean	Std. Deviation	N
Taiwan	LMtime	45.5444	24.37943	15
	LTtime	59.2439	22.73597	15
	TMTtime	44.5039	27.75175	15
	TTTtime	45.4706	30.56003	15
UK	LMtime	41.1039	19.33749	15
	LTtime	23.7317	15.02889	15
	TMTtime	21.5906	14.49065	15
	TTTtime	36.0017	25.31367	15

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
town	Sphericity Assumed	912.227	1	912.227	1.850	.185
	Greenhouse-Geisser	912.227	1.000	912.227	1.850	.185
	Huynh-Feldt	912.227	1.000	912.227	1.850	.185
	Lower-bound	912.227	1.000	912.227	1.850	.185
town * nationality	Sphericity Assumed	107.462	1	107.462	.218	.644
	Greenhouse-Geisser	107.462	1.000	107.462	.218	.644
	Huynh-Feldt	107.462	1.000	107.462	.218	.644
	Lower-bound	107.462	1.000	107.462	.218	.644
Error(town)	Sphericity Assumed	13809.097	28	493.182		
	Greenhouse-Geisser	13809.097	28.000	493.182		
	Huynh-Feldt	13809.097	28.000	493.182		
	Lower-bound	13809.097	28.000	493.182		
design	Sphericity Assumed	256.888	1	256.888	.966	.334
	Greenhouse-Geisser	256.888	1.000	256.888	.966	.334
	Huynh-Feldt	256.888	1.000	256.888	.966	.334
	Lower-bound	256.888	1.000	256.888	.966	.334
design * nationality	Sphericity Assumed	582.598	1	582.598	2.190	.150
	Greenhouse-Geisser	582.598	1.000	582.598	2.190	.150
	Huynh-Feldt	582.598	1.000	582.598	2.190	.150
	Lower-bound	582.598	1.000	582.598	2.190	.150
Error(design)	Sphericity Assumed	7448.142	28	266.005		
	Greenhouse-Geisser	7448.142	28.000	266.005		
	Huynh-Feldt	7448.142	28.000	266.005		
	Lower-bound	7448.142	28.000	266.005		
town * design	Sphericity Assumed	680.482	1	680.482	1.860	.183
	Greenhouse-Geisser	680.482	1.000	680.482	1.860	.183
	Huynh-Feldt	680.482	1.000	680.482	1.860	.183
	Lower-bound	680.482	1.000	680.482	1.860	.183
town * design * nationality	Sphericity Assumed	3715.658	1	3715.658	10.157	.004
	Greenhouse-Geisser	3715.658	1.000	3715.658	10.157	.004
	Huynh-Feldt	3715.658	1.000	3715.658	10.157	.004
	Lower-bound	3715.658	1.000	3715.658	10.157	.004
Error(town*design)	Sphericity Assumed	10243.364	28	365.834		
	Greenhouse-Geisser	10243.364	28.000	365.834		
	Huynh-Feldt	10243.364	28.000	365.834		
	Lower-bound	10243.364	28.000	365.834		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	188643.466	1	188643.466	187.157	.000
nationality	9810.660	1	9810.660	9.733	.004
Error	28222.319	28	1007.940		

Tests of Within-Subjects Effects

Measure: MEASURE_1

nationality	Source		Type III Sum of Squares	df	Mean Square	F	Sig
Taiwan	town	Sphericity Assume	822.942	1	822.942	1.054	.322
		Greenhouse-Geiss	822.942	1.000	822.942	1.054	.322
		Huynh-Feldt	822.942	1.000	822.942	1.054	.322
		Lower-bound	822.942	1.000	822.942	1.054	.322
	Error(town)	Sphericity Assume	10926.168	14	780.441		
		Greenhouse-Geiss	10926.168	14.000	780.441		
		Huynh-Feldt	10926.168	14.000	780.441		
		Lower-bound	10926.168	14.000	780.441		
	design	Sphericity Assume	806.606	1	806.606	2.194	.161
		Greenhouse-Geiss	806.606	1.000	806.606	2.194	.161
		Huynh-Feldt	806.606	1.000	806.606	2.194	.161
		Lower-bound	806.606	1.000	806.606	2.194	.161
	Error(design)	Sphericity Assume	5146.855	14	367.633		
		Greenhouse-Geiss	5146.855	14.000	367.633		
		Huynh-Feldt	5146.855	14.000	367.633		
		Lower-bound	5146.855	14.000	367.633		
	town * design	Sphericity Assume	607.964	1	607.964	1.191	.294
		Greenhouse-Geiss	607.964	1.000	607.964	1.191	.294
		Huynh-Feldt	607.964	1.000	607.964	1.191	.294
		Lower-bound	607.964	1.000	607.964	1.191	.294
	Error(town*desig	Sphericity Assume	7145.738	14	510.410		
		Greenhouse-Geiss	7145.738	14.000	510.410		
		Huynh-Feldt	7145.738	14.000	510.410		
		Lower-bound	7145.738	14.000	510.410		
UK	town	Sphericity Assume	196.747	1	196.747	.955	.345
		Greenhouse-Geiss	196.747	1.000	196.747	.955	.345
		Huynh-Feldt	196.747	1.000	196.747	.955	.345
		Lower-bound	196.747	1.000	196.747	.955	.345
	Error(town)	Sphericity Assume	2882.930	14	205.924		
		Greenhouse-Geiss	2882.930	14.000	205.924		
		Huynh-Feldt	2882.930	14.000	205.924		
		Lower-bound	2882.930	14.000	205.924		
	design	Sphericity Assume	32.881	1	32.881	.200	.662
		Greenhouse-Geiss	32.881	1.000	32.881	.200	.662
		Huynh-Feldt	32.881	1.000	32.881	.200	.662
		Lower-bound	32.881	1.000	32.881	.200	.662
	Error(design)	Sphericity Assume	2301.287	14	164.378		
		Greenhouse-Geiss	2301.287	14.000	164.378		
		Huynh-Feldt	2301.287	14.000	164.378		
		Lower-bound	2301.287	14.000	164.378		
	town * design	Sphericity Assume	3788.176	1	3788.176	17.121	.001
		Greenhouse-Geiss	3788.176	1.000	3788.176	17.121	.001
		Huynh-Feldt	3788.176	1.000	3788.176	17.121	.001
		Lower-bound	3788.176	1.000	3788.176	17.121	.001
	Error(town*desig	Sphericity Assume	3097.626	14	221.259		
		Greenhouse-Geiss	3097.626	14.000	221.259		
		Huynh-Feldt	3097.626	14.000	221.259		
		Lower-bound	3097.626	14.000	221.259		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

nationality	Source	Type III Sum of Squares	df	Mean Square	F	Sig
Taiwan	Intercept	142247.024	1	142247.024	122.958	.000
	Error	16196.227	14	1156.873		
UK	Intercept	56207.103	1	56207.103	65.433	.000
	Error	12026.092	14	859.007		

Appendix D.1.2

Paired sample T-test - Performance for time

Paired Samples Statistics

nationality			Mean	N	Std. Deviation	Std. Error Mean
Taiwan	Pair 1	LMtime	45.5444	15	24.37943	6.29474
		LTtime	59.2439	15	22.73597	5.87040
	Pair 2	TMTtime	44.5039	15	27.75175	7.16547
		TTTtime	45.4706	15	30.56003	7.89057
	Pair 3	LMtime	45.5444	15	24.37943	6.29474
		TMTtime	44.5039	15	27.75175	7.16547
	Pair 4	LTtime	59.2439	15	22.73597	5.87040
		TTTtime	45.4706	15	30.56003	7.89057
	Pair 5	LMtime	45.5444	15	24.37943	6.29474
		TTTtime	45.4706	15	30.56003	7.89057
	Pair 6	LTtime	59.2439	15	22.73597	5.87040
		TMTtime	44.5039	15	27.75175	7.16547
UK	Pair 1	LMtime	41.1039	15	19.33749	4.99292
		LTtime	23.7317	15	15.02889	3.88044
	Pair 2	TMTtime	21.5906	15	14.49065	3.74147
		TTTtime	36.0017	15	25.31367	6.53596
	Pair 3	LMtime	41.1039	15	19.33749	4.99292
		TMTtime	21.5906	15	14.49065	3.74147
	Pair 4	LTtime	23.7317	15	15.02889	3.88044
		TTTtime	36.0017	15	25.31367	6.53596
	Pair 5	LMtime	41.1039	15	19.33749	4.99292
		TTTtime	36.0017	15	25.31367	6.53596
	Pair 6	LTtime	23.7317	15	15.02889	3.88044
		TMTtime	21.5906	15	14.49065	3.74147

Paired Samples Test

nationality			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Taiwan	Pair 1	LMtime - LTtime	-13.69944	35.89246	9.26739	-33.57602	6.17714	-1.478	14	.161
	Pair 2	TMTtime - TTTtime	-.96667	21.62906	5.58460	-12.94444	11.01111	-.173	14	.865
	Pair 3	LMtime - TMTtime	1.04056	37.16144	9.59504	-19.53876	21.61987	.108	14	.915
	Pair 4	LTtime - TTTtime	13.77333	34.65153	8.94699	-5.41604	32.96271	1.539	14	.146
	Pair 5	LMtime - TTTtime	.07389	34.57377	8.92691	-19.07242	19.22020	.008	14	.994
	Pair 6	LTtime - TMTtime	14.74000	33.17832	8.56661	-3.63354	33.11354	1.721	14	.107
UK	Pair 1	LMtime - LTtime	17.37222	23.73766	6.12904	4.22675	30.51770	2.834	14	.013
	Pair 2	TMTtime - TTTtime	-14.41111	14.41516	3.72198	-22.39396	-6.42826	-3.872	14	.002
	Pair 3	LMtime - TMTtime	19.51333	17.50032	4.51856	9.82198	29.20469	4.318	14	.001
	Pair 4	LTtime - TTTtime	-12.27000	23.41162	6.04485	-25.23492	.69492	-2.030	14	.062
	Pair 5	LMtime - TTTtime	5.10222	22.92321	5.91875	-7.59223	17.79667	.862	14	.403
	Pair 6	LTtime - TMTtime	2.14111	14.66727	3.78707	-5.98135	10.26357	.565	14	.581

Appendix D.1.3

Independent sampleT-test - Performance for time

Group Statistics

	nationality	N	Mean	Std. Deviation	Std. Error Mean
LMtime	Taiwan	15	45.5444	24.37943	6.29474
	UK	15	41.1039	19.33749	4.99292
LTtime	Taiwan	15	59.2439	22.73597	5.87040
	UK	15	23.7317	15.02889	3.88044
TMTtime	Taiwan	15	44.5039	27.75175	7.16547
	UK	15	21.5906	14.49065	3.74147
TTTtime	Taiwan	15	45.4706	30.56003	7.89057
	UK	15	36.0017	25.31367	6.53596

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
LMtime	Equal variances assumed	1.045	.316	.553	28	.585	4.44056	8.03449	-12.01735	20.89846
	Equal variances not assumed			.553	26.621	.585	4.44056	8.03449	-12.05586	20.9369
LTtime	Equal variances assumed	5.434	.027	5.046	28	.000	35.51222	7.03701	21.09757	49.92688
	Equal variances not assumed			5.046	24.273	.000	35.51222	7.03701	20.99720	50.02725
TMTtime	Equal variances assumed	5.106	.032	2.835	28	.008	22.91333	8.08348	6.35509	39.47158
	Equal variances not assumed			2.835	21.106	.010	22.91333	8.08348	6.10796	39.71871
TTTtime	Equal variances assumed	.587	.450	.924	28	.363	9.46889	10.24597	-11.51902	30.45680
	Equal variances not assumed			.924	27.062	.364	9.46889	10.24597	-11.55184	30.48961

Appendix D.2.1

General Linear Model analysis – Performance for clicks

Descriptive Statistics

	nationality	Mean	Std. Deviation	N
LMclick	Taiwan	2.1167	.84504	15
	UK	2.3333	.97131	15
	Total	2.2250	.90129	30
LTclick	Taiwan	4.9056	1.93338	15
	UK	2.5667	.43780	15
	Total	3.7361	1.81984	30
TMclick	Taiwan	3.4167	1.67379	15
	UK	2.2833	.37639	15
	Total	2.8500	1.32403	30
TTclick	Taiwan	3.1056	1.22534	15
	UK	2.6333	1.16445	15
	Total	2.8694	1.19879	30

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig
town	Sphericity Assumed	.438	1	.438	.258	.615
	Greenhouse-Geisser	.438	1.000	.438	.258	.615
	Huynh-Feldt	.438	1.000	.438	.258	.615
	Lower-bound	.438	1.000	.438	.258	.615
town * nationality	Sphericity Assumed	.501	1	.501	.295	.591
	Greenhouse-Geisser	.501	1.000	.501	.295	.591
	Huynh-Feldt	.501	1.000	.501	.295	.591
	Lower-bound	.501	1.000	.501	.295	.591
Error(town)	Sphericity Assumed	47.449	28	1.695		
	Greenhouse-Geisser	47.449	28.000	1.695		
	Huynh-Feldt	47.449	28.000	1.695		
	Lower-bound	47.449	28.000	1.695		
design	Sphericity Assumed	17.570	1	17.570	20.517	.000
	Greenhouse-Geisser	17.570	1.000	17.570	20.517	.000
	Huynh-Feldt	17.570	1.000	17.570	20.517	.000
	Lower-bound	17.570	1.000	17.570	20.517	.000
design * nationality	Sphericity Assumed	6.729	1	6.729	7.858	.009
	Greenhouse-Geisser	6.729	1.000	6.729	7.858	.009
	Huynh-Feldt	6.729	1.000	6.729	7.858	.009
	Lower-bound	6.729	1.000	6.729	7.858	.009
Error(design)	Sphericity Assumed	23.977	28	.856		
	Greenhouse-Geisser	23.977	28.000	.856		
	Huynh-Feldt	23.977	28.000	.856		
	Lower-bound	23.977	28.000	.856		
town * design	Sphericity Assumed	16.688	1	16.688	14.870	.001
	Greenhouse-Geisser	16.688	1.000	16.688	14.870	.001
	Huynh-Feldt	16.688	1.000	16.688	14.870	.001
	Lower-bound	16.688	1.000	16.688	14.870	.001
town * design * nationality	Sphericity Assumed	19.401	1	19.401	17.287	.000
	Greenhouse-Geisser	19.401	1.000	19.401	17.287	.000
	Huynh-Feldt	19.401	1.000	19.401	17.287	.000
	Lower-bound	19.401	1.000	19.401	17.287	.000
Error(town*design)	Sphericity Assumed	31.424	28	1.122		
	Greenhouse-Geisser	31.424	28.000	1.122		
	Huynh-Feldt	31.424	28.000	1.122		
	Lower-bound	31.424	28.000	1.122		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Intercept	1023.265	1	1023.265	506.387	.000
nationality	26.056	1	26.056	12.894	.001
Error	56.580	28	2.021		

Tests of Within-Subjects Effects

Measure: MEASURE_1

nationality	Source		Type III Sum of Squares	df	Mean Square	F	Sig
Taiwan	town	Sphericity Assumed	.938	1	938	338	570
		Greenhouse-Geisser	.938	1.000	938	338	570
		Huynh-Feldt	938	1 000	938	338	570
		Lower-bound	938	1 000	938	338	5⁻0
	Error(town)	Sphericity Assumed	38.778	14	2 770		
		Greenhouse-Geisser	38.778	14 000	2 770		
		Huynh-Feldt	38.778	14 000	2.770		
		Lower-bound	38.778	14.000	2 770		
	design	Sphericity Assumed	23.023	1	23 023	20 279	000
		Greenhouse-Geisser	23.023	1.000	23 023	20 279	000
		Huynh-Feldt	23.023	1.000	23 023	20 2⁻9	000
		Lower-bound	23.023	1.000	23 023	20 279	000
	Error(design)	Sphericity Assumed	15.894	14	1 135		
		Greenhouse-Geisser	15.894	14.000	1 135		
		Huynh-Feldt	15.894	14.000	1 135		
		Lower-bound	15.894	14.000	1 135		
	town * design	Sphericity Assumed	36.038	1	36 038	22 371	000
		Greenhouse-Geisser	36.038	1.000	36.038	22 371	000
		Huynh-Feldt	36.038	1 000	36.038	22 371	000
		Lower-bound	36.038	1 000	36 038	22.371	000
	Error(town*design)	Sphericity Assumed	22.553	14	1 611		
		Greenhouse-Geisser	22.553	14.000	1 611		
		Huynh-Feldt	22.553	14.000	1 611		
		Lower-bound	22.553	14.000	1 611		
UK	town	Sphericity Assumed	.001	1	001	002	968
		Greenhouse-Geisser	001	1.000	001	002	968
		Huynh-Feldt	001	1.000	.001	002	968
		Lower-bound	001	1.000	001	002	968
	Error(town)	Sphericity Assumed	8.671	14	619		
		Greenhouse-Geisser	8.671	14.000	619		
		Huynh-Feldt	8.671	14.000	619		
		Lower-bound	8.671	14.000	619		
	design	Sphericity Assumed	1.276	1	1 276	2.210	159
		Greenhouse-Geisser	1.276	1.000	1.276	2.210	159
		Huynh-Feldt	1.276	1.000	1 276	2 210	159
		Lower-bound	1.276	1.000	1 276	2 210	159
	Error(design)	Sphericity Assumed	8.083	14	577		
		Greenhouse-Geisser	8.083	14.000	577		
		Huynh-Feldt	8.083	14.000	577		
		Lower-bound	8.083	14 000	.577		
	town * design	Sphericity Assumed	.051	1	051	081	781
		Greenhouse-Geisser	051	1.000	051	081	781
		Huynh-Feldt	051	1 000	051	081	781
		Lower-bound	051	1.000	051	081	781
	Error(town*design)	Sphericity Assumed	8.871	14	634		
		Greenhouse-Geisser	8.871	14 000	634		
		Huynh-Feldt	8.871	14 000	634		
		Lower-bound	8.871	14.000	634		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

nationality	Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Taiwan	Intercept	687.945	1	687.945	212.391	000
	Error	45.347	14	3.239		
UK	Intercept	361.376	1	361.376	450.380	000
	Error	11.233	14	.802		

Appendix D.2.2

Paired sample T-test - Performance for click

Paired Samples Statistics

nationality			Mean	N	Std. Deviation	Std. Error Mean
Taiwan	Pair 1	LMclick	2.1167	15	.84504	.21819
		LTclick	4.9056	15	1.93338	.49920
	Pair 2	TMclick	3.4167	15	1.67379	.43217
		TTclick	3.1056	15	1.22534	.31638
	Pair 3	LMclick	2.1167	15	.84504	.21819
		TMclick	3.4167	15	1.67379	.43217
	Pair 4	LTclick	4.9056	15	1.93338	.49920
		TTclick	3.1056	15	1.22534	.31638
	Pair 5	LMclick	2.1167	15	.84504	.21819
		TTclick	3.1056	15	1.22534	.31638
	Pair 6	LTclick	4.9056	15	1.93338	.49920
		TMclick	3.4167	15	1.67379	.43217
UK	Pair 1	LMclick	2.3333	15	.97131	.25079
		LTclick	2.5667	15	.43780	.11304
	Pair 2	TMclick	2.2833	15	.37639	.09718
		TTclick	2.6333	15	1.16445	.30066
	Pair 3	LMclick	2.3333	15	.97131	.25079
		TMclick	2.2833	15	.37639	.09718
	Pair 4	LTclick	2.5667	15	.43780	.11304
		TTclick	2.6333	15	1.16445	.30066
	Pair 5	LMclick	2.3333	15	.97131	.25079
		TTclick	2.6333	15	1.16445	.30066
	Pair 6	LTclick	2.5667	15	.43780	.11304
		TMclick	2.2833	15	.37639	.09718

Paired Samples Test

nationality			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Taiwan	Pair 1	LMclick - LTclick	-2.78889	1.91093	.49340	-3.84713	-1.73065	-5.652	14	.000
	Pair 2	TMclick - TTclick	.31111	1.35674	.35031	-.44023	1.06245	.888	14	.389
	Pair 3	LMclick - TMclick	-1.30000	2.04532	.52810	-2.43266	-.16734	-2.462	14	.027
	Pair 4	LTclick - TTclick	1.80000	2.13967	.55246	.61509	2.98491	3.258	14	.006
	Pair 5	LMclick - TTclick	-.98889	1.21043	.31253	-1.65920	-.31857	-3.164	14	.007
	Pair 6	LTclick - TMclick	1.48889	2.51895	.65039	.09394	2.88384	2.289	14	.038
UK	Pair 1	LMclick - LTclick	-.23333	1.14746	.29627	-.86878	.40211	-.788	14	.444
	Pair 2	TMclick - TTclick	-.35000	1.05136	.27146	-.93222	.23222	-1.289	14	.218
	Pair 3	LMclick - TMclick	.05000	.85670	.22120	-.42442	.52442	.226	14	.824
	Pair 4	LTclick - TTclick	-.06667	1.33117	.34371	-.80385	.67051	-.194	14	.849
	Pair 5	LMclick - TTclick	-.30000	1.38293	.35707	-1.06584	.46584	-.840	14	.415
	Pair 6	LTclick - TMclick	.28333	.69351	.17906	-.10072	.66738	1.582	14	.136

Appendix D.2.3

Independent sample T-test - Performance for click

Group Statistics

	nationality	N	Mean	Std. Deviation	Std. Error Mean
LMclick	Taiwan	15	2.1167	.84504	.21819
	UK	15	2.3333	.97131	.25079
LTclick	Taiwan	15	4.9056	1.93338	.49920
	UK	15	2.5667	.43780	.11304
TMclick	Taiwan	15	3.4167	1.67379	.43217
	UK	15	2.2833	.37639	.09718
TTclick	Taiwan	15	3.1056	1.22534	.31638
	UK	15	2.6333	1.16445	.30066

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
LMclick	Equal variances assumed	.010	921	-.652	28	.520	-.21667	33242	-.89760	46426
	Equal variances not assumed			-.652	27.474	520	-.21667	33242	-.89818	46485
LTclick	Equal variances assumed	33.853	.000	4.570	28	.000	2.33889	51184	1.29044	3.38734
	Equal variances not assumed			4.570	15.432	000	2.33889	51184	1.25059	3.42.19
TMclick	Equal variances assumed	4.828	.036	2.559	28	016	1.13333	44296	22596	2.04070
	Equal variances not assumed			2.559	15.412	021	1.13333	44296	19137	2.07529
TTclick	Equal variances assumed	.361	.553	1.082	28	.289	47222	43646	-.42182	1.36626
	Equal variances not assumed			1.082	27.928	289	47222	43646	42.92	36637

Appendix E:

Participants' subjective opinion about Web interface

characteristics

Appendix E.1

The response of Taiwanese users between typical and modified Taichung websites

		Questions	Mean	N	Std. Deviation	Std. Error Mean
Pair 1	taichunMQ2	Do the graphics reflect your culture attributes?	2.9333	15	.96115	.24817
	taichunT3		3.7333	15	.70373	.18170
Pair 2	taichunMQ4	Are there too many colours used?	2.4000	15	.91026	.23503
	taichunT5		2.7333	15	.88372	.22817
Pair 3	taichunMQ5	Are visual representations easy to understand?	2.9333	15	1.09978	.28396
	taichunT6		3.6000	15	.91026	.23503
Pair 4	taichunMQ6	Overall, visually pleasing?	2.6667	15	.61721	.15936
	taichunT7		3.6000	15	.82808	.21381
Pair 5	taichunMQ7	Do you think elements are grouped properly?	2.8000	15	.77460	.20000
	taichunT13		3.6000	15	.73679	.19024
Pair 6	taichunMQ8	Is it clear where to go next?	2.8667	15	.91548	.23637
	taichunT14		3.5333	15	.91548	.23637
Pair 7	taichunMQ9	Does the layout fit appropriately to your navigation?	3.0000	15	.84515	.21822
	taichunT15		3.5333	15	.63994	.16523
Pair 8	taichunMQ10	Overall, easy use this web?	3.2667	15	.88372	.22817
	taichunT17		3.5333	15	.91548	.23637
Pair 9	taichunMQ11	Ease of finding specific information you seek?	3.3333	15	.72375	.18687
	taichunT18		3.8000	15	.94112	.24300
Pair 10	taichunMQ12	Ease of reading information?	3.5333	15	.83381	.21529
	taichunT19		3.6000	15	.82808	.21381
Pair 11	taichunMQ13	I had doubts about finding the right information?	2.6000	15	.82808	.21381
	taichunT20		2.6667	15	1.04654	.27021
Pair 12	taichunMQ15	Overall, were you satisfied in using this website?	2.7333	15	.70373	.18170
	taichunT21		3.6000	15	.98561	.25448
Pair 13	taichunMQ16	Do you feel comfortable with the task?	3.6667	15	.72375	.18687
	taichunT22		3.8667	15	.91548	.23637

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
Pair 1	taichunMQ2 - taichunT3	-.80000	1.08233	.27946	-1.39937	-.20063	-2.863	14	.013
Pair 2	taichunMQ4 - taichunT5	-.33333	.97590	.25198	-.87377	.20710	-1.323	14	.207
Pair 3	taichunMQ5 - taichunT6	-.66667	1.63299	.42164	-1.57099	.23765	-1.581	14	.136
Pair 4	taichunMQ6 - taichunT7	-.93333	1.16292	.30026	-1.57734	-.28933	-3.108	14	.008
Pair 5	taichunMQ7 - taichunT13	-.80000	1.01419	.26186	-1.36164	-.23836	-3.055	14	.009
Pair 6	taichunMQ8 - taichunT14	-.66667	1.29099	.33333	-1.38160	.04826	-2.000	14	.065
Pair 7	taichunMQ9 - taichunT15	-.53333	1.18723	.30654	-1.19080	.12413	-1.740	14	.104
Pair 8	taichunMQ10 - taichunT17	-.26667	1.33452	.34457	-1.00570	.47237	-.774	14	.452
Pair 9	taichunMQ11 - taichunT18	-.46667	1.30201	.33618	-1.18770	.25436	-1.388	14	.187
Pair 10	taichunMQ12 - taichunT19	-.06667	1.33452	.34457	-.80570	.67237	-.193	14	.849
Pair 11	taichunMQ13 - taichunT20	-.06667	1.16292	.30026	-.71067	.57734	-.222	14	.827
Pair 12	taichunMQ15 - taichunT21	-.86667	1.24595	.32170	-1.55665	-.17668	-2.694	14	.017
Pair 13	taichunMQ16 - taichunT22	-.20000	.86189	.22254	-.67730	.27730	-.899	14	.384

Appendix E.2

The response of British users between typical and modified Taichung websites

	Questions	Mean	N	Std Deviation	Std Error Mean
Pair 1 taichunMQ2	Do the graphics reflect your culture attributes?	3.0667	15	1.03280	.26667
taichunT3		2.5333	15	1.06010	.27372
Pair 2 taichunMQ4	Are there too many colours used?	1.9333	15	.45774	.11819
taichunT5		3.4667	15	1.12546	.29059
Pair 3 taichunMQ5	Are visual representations easy to understand?	4.0000	15	.92582	.23905
taichunT6		3.0667	15	1.33452	.34457
Pair 4 taichunMQ6	Overall, visually pleasing?	3.5333	15	1.35576	.35006
taichunT7		3.3333	15	1.34519	.34733
Pair 5 taichunMQ7	Do you think elements are grouped properly?	3.7333	15	1.03280	.26667
taichunT13		3.2667	15	1.03280	.26667
Pair 6 taichunMQ8	Is it clear where to go next?	4.1333	15	.63994	.16523
taichunT14		3.2000	15	1.01419	.26186
Pair 7 taichunMQ9	Does the layout fit appropriately to your navigation?	3.9333	15	.88372	.22817
taichunT15		3.2000	15	.94112	.24300
Pair 8 taichunMQ10	Overall, easy use this web?	4.0667	15	.96115	.24817
taichunT17		3.6000	15	.98561	.25448
Pair 9 taichunMQ11	Ease of finding specific information you seek?	4.0667	15	.96115	.24817
taichunT18		3.5333	15	.99043	.25573
Pair 10 taichunMQ12	Ease of reading information?	4.2667	15	.70373	.18170
taichunT19		3.6667	15	1.04654	.27021
Pair 11 taichunMQ13	I had doubts about finding the right information?	2.2667	15	1.03280	.26667
taichunT20		2.5333	15	1.12546	.29059
Pair 12 taichunMQ15	Overall, were you satisfied in using this website?	4.0667	15	.70373	.18170
taichunT21		3.6667	15	.97590	.25198
Pair 13 taichunMQ16	Do you feel comfortable with the task?	4.2667	15	.59362	.15327
taichunT22		4.0000	15	.75593	.19518

Paired Samples Test

		Paired Differences			95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	taichunMQ2 - taichunT3	.53333	1.68466	.43498	-.39960	1.46627	1.226	14	.240
Pair 2	taichunMQ4 - taichunT5	-1.53333	.99043	.25573	-2.08182	-.98485	-5.996	14	.000
Pair 3	taichunMQ5 - taichunT6	.93333	1.57963	.40786	.05856	1.80810	2.288	14	.038
Pair 4	taichunMQ6 - taichunT7	.20000	1.74028	.44934	-.76373	1.16373	.445	14	.663
Pair 5	taichunMQ7 - taichunT13	.46667	1.12546	.29059	-.15659	1.08993	1.606	14	.131
Pair 6	taichunMQ8 - taichunT14	.93333	.79881	.20625	.49097	1.37570	4.525	14	.000
Pair 7	taichunMQ9 - taichunT15	.73333	1.22280	.31573	.05617	1.41050	2.323	14	.036
Pair 8	taichunMQ10 - taichunT17	.46667	1.06010	.27372	-.12040	1.05373	1.705	14	.110
Pair 9	taichunMQ11 - taichunT18	.53333	1.12546	.29059	-.08993	1.15659	1.835	14	.088
Pair 10	taichunMQ12 - taichunT19	.60000	.98561	.25448	.05419	1.14581	2.358	14	.033
Pair 11	taichunMQ13 - taichunT20	-.26667	1.16292	.30026	-.91067	.37734	-.888	14	.389
Pair 12	taichunMQ15 - taichunT21	.40000	.82808	.21381	-.05857	.85857	1.871	14	.082
Pair 13	taichunMQ16 - taichunT22	.26667	.45774	.11819	.01318	.52015	2.256	14	.041

Appendix E.3

Users' subjective opinions on modified Taichung website between British &
Taiwanese - Independent sample test

	Nationality	N	Mean	Std. Deviation	Std.Error mean	Sig
taichunMQ1	Taiwan	15	3.4000	1.12122	.28950	
	UK	15	2.8000	1.08233	.27946	
taichunMQ2	Taiwan	15	2.9333	.96115	.24817	
	UK	15	3.0667	1.03280	.26667	
taichunMQ3	Taiwan	15	2.3333	.81650	.21082	0.009
	UK	15	3.1333	.74322	.19190	
taichunMQ4	Taiwan	15	2.4000	.91026	.23503	
	UK	15	1.9333	.45774	.11819	
taichunMQ5	Taiwan	15	2.9333	1.09978	.28396	0.008
visual	UK	15	4.0000	.92582	.23905	
taichunMQ6	Taiwan	15	2.6667	.61721	.15936	0.032
visual	UK	15	3.5333	1.35576	.35006	
taichunMQ7	Taiwan	15	2.8000	.77460	.20000	0.009
layout	UK	15	3.7333	1.03280	.26667	
taichunMQ8	Taiwan	15	2.8667	.91548	.23637	0.000
layout	UK	15	4.1333	.63994	.16523	
taichunMQ9	Taiwan	15	3.0000	.84515	.21822	0.006
navigation	UK	15	3.9333	.88372	.22817	
taichunMQ10	Taiwan	15	3.2667	.88372	.22817	0.025
	UK	15	4.0667	.96115	.24817	
taichunMQ11	Taiwan	15	3.3333	.72375	.18687	0.025
	UK	15	4.0667	.96115	.24817	
taichunMQ12	Taiwan	15	3.5333	.83381	.21529	0.015
	UK	15	4.2667	.70373	.18170	
taichunMQ13	Taiwan	15	2.6000	.82808	.21381	
	UK	15	2.2667	1.03280	.26667	
taichunMQ14	Taiwan	15	2.8000	.67612	.17457	0.001
	UK	15	3.8000	.77460	.20000	
taichunMQ15	Taiwan	15	2.7333	.70373	.18170	0.000
	UK	15	4.0667	.70373	.18170	
taichunMQ16	Taiwan	15	3.6667	.72375	.18687	0.019
	UK	15	4.2667	.59362	.15327	

Appendix E.4

Users' subjective opinions on typical Taichung based version website between British & Taiwanese - Independent Sample test

	Nationality	N	Mean	Std. Deviation	Std.Error mean	Sig
taichunT1	Taiwan	15	2.7333	1.03280	.26667	
	UK	15	3.2667	1.16292	.30026	
taichunT2	Taiwan	15	2.3333	.81650	.21082	
	UK	15	2.6000	1.18322	.30551	
taichunT3	Taiwan	15	3.7333	.70373	.18170	0.001
reflect ur culture	UK	15	2.5333	1.06010	.27372	
taichunT4	Taiwan	15	3.6000	1.05560	.27255	
	UK	15	3.1333	1.45733	.37628	
taichunT5	Taiwan	15	2.7333	.88372	.22817	
	UK	15	3.4667	1.12546	.29059	
taichunT6	Taiwan	15	3.6000	.91026	.23503	
	UK	15	3.0667	1.33452	.34457	
taichunT7	Taiwan	15	3.6000	.82808	.21381	
	UK	15	3.3333	1.34519	.34733	
taichunT8	Taiwan	15	3.1333	.63994	.16523	
	UK	15	3.1333	1.18723	.30654	
taichunT9	Taiwan	15	3.6000	.91026	.23503	
	UK	15	3.3333	1.04654	.27021	
taichunT10	Taiwan	15	3.6000	1.05560	.27255	0.044
multimedia	UK	15	2.6000	1.50238	.38791	
taichunT11	Taiwan	15	3.0667	1.03280	.26667	
	UK	15	2.6000	1.50238	.38791	
taichunT12	Taiwan	15	3.7333	.96115	.24817	0.042
navigation	UK	15	3.0000	.92582	.23905	
taichunT13	Taiwan	15	3.6000	.73679	.19024	
	UK	15	3.2667	1.03280	.26667	
taichunT14	Taiwan	15	3.5333	.91548	.23637	
	UK	15	3.2000	1.01419	.26186	
taichunT15	Taiwan	15	3.5333	.63994	.16523	
	UK	15	3.2000	.94112	.24300	
taichunT16	Taiwan	15	2.4667	.99043	.25573	
	UK	14	2.4286	.93761	.25059	
taichunT17	Taiwan	15	3.5333	.91548	.23637	
	UK	15	3.6000	.98561	.25448	
taichunT18	Taiwan	15	3.8000	.94112	.24300	
	UK	15	3.5333	.99043	.25573	
taichunT19	Taiwan	15	3.6000	.82808	.21381	
	UK	15	3.6667	1.04654	.27021	
taichunT20	Taiwan	15	2.6667	1.04654	.27021	
	UK	15	2.5333	1.12546	.29059	
taichunT21	Taiwan	15	3.6000	.98561	.25448	
	UK	15	3.6667	.97590	.25198	
taichunT22	Taiwan	15	3.8667	.91548	.23637	
	UK	15	4.0000	.75593	.19518	

Appendix E.5

Participants' desirability between Taiwan and the UK - Liverpool site

Crosstab

			nationality		Total
			Taiwan	UK	
cultureQ6	typical version	Count	6	8	14
		Expected Count	7.0	7.0	14.0
		% within cultureQ6	42.9%	57.1%	100.0%
		% within nationality	40.0%	53.3%	46.7%
		% of Total	20.0%	26.7%	46.7%
	modified version	Count	9	7	16
		Expected Count	8.0	8.0	16.0
		% within cultureQ6	56.3%	43.8%	100.0%
		% within nationality	60.0%	46.7%	53.3%
		% of Total	30.0%	23.3%	53.3%
Total		Count	15	15	30
		Expected Count	15.0	15.0	30.0
		% within cultureQ6	50.0%	50.0%	100.0%
		% within nationality	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.536[b]	1	.464		
Continuity Correction[a]	.134	1	.714		
Likelihood Ratio	.537	1	.464		
Fisher's Exact Test				.715	.358
Linear-by-Linear Association	.518	1	.472		
N of Valid Cases	30				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.00.

The reasoning you prefer the version of Liverpool website you selected

Crosstab

			nationality		Total
			Taiwan	UK	
cultureQ7	1.00	Count	7	8	15
		Expected Count	7.5	7.5	15.0
		% within cultureQ7	46.7%	53.3%	100.0%
		% within nationality	46.7%	53.3%	50.0%
		% of Total	23.3%	26.7%	50.0%
	2.00	Count	1	0	1
		Expected Count	.5	.5	1.0
		% within cultureQ7	100.0%	.0%	100.0%
		% within nationality	6.7%	.0%	3.3%
		% of Total	3.3%	.0%	3.3%
	3.00	Count	1	2	3
		Expected Count	1.5	1.5	3.0
		% within cultureQ7	33.3%	66.7%	100.0%
		% within nationality	6.7%	13.3%	10.0%
		% of Total	3.3%	6.7%	10.0%
	5.00	Count	6	5	11
		Expected Count	5.5	5.5	11.0
		% within cultureQ7	54.5%	45.5%	100.0%
		% within nationality	40.0%	33.3%	36.7%
		% of Total	20.0%	16.7%	36.7%
Total		Count	15	15	30
		Expected Count	15.0	15.0	30.0
		% within cultureQ7	50.0%	50.0%	100.0%
		% within nationality	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

1 means visual pleasing

2 means graphics are familiar to me

3 means ease of finding specific information

4 means ease of reading information

5 means overall easy of use

Participants' desirability between Taiwan and UK - Taichung site

Crosstab

			nationality		Total
			Taiwan	UK	
cultureQ8	typical version	Count	14	4	18
		Expected Count	9.0	9.0	18.0
		% within cultureQ8	77.8%	22.2%	100.0%
		% within nationality	93.3%	26.7%	60.0%
		% of Total	46.7%	13.3%	60.0%
	modified version	Count	1	11	12
		Expected Count	6.0	6.0	12.0
		% within cultureQ8	8.3%	91.7%	100.0%
		% within nationality	6.7%	73.3%	40.0%
		% of Total	3.3%	36.7%	40.0%
Total		Count	15	15	30
		Expected Count	15.0	15.0	30.0
		% within cultureQ8	50.0%	50.0%	100.0%
		% within nationality	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.889[b]	1	.000		
Continuity Correction[a]	11.250	1	.001		
Likelihood Ratio	15.635	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	13.426	1	.000		
N of Valid Cases	30				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.00.

The reasoning you prefer the version of Taichung website you selected

Crosstab

			nationality		Total
			Taiwan	UK	
cultureQ9	1.00	Count	9	5	14
		Expected Count	7.0	7.0	14.0
		% within cultureQ9	64.3%	35.7%	100.0%
		% within nationality	60.0%	33.3%	46.7%
		% of Total	30.0%	16.7%	46.7%
	2.00	Count	2	0	2
		Expected Count	1.0	1.0	2.0
		% within cultureQ9	100.0%	.0%	100.0%
		% within nationality	13.3%	.0%	6.7%
		% of Total	6.7%	.0%	6.7%
	3.00	Count	0	5	5
		Expected Count	2.5	2.5	5.0
		% within cultureQ9	.0%	100.0%	100.0%
		% within nationality	.0%	33.3%	16.7%
		% of Total	.0%	16.7%	16.7%
	4.00	Count	0	2	2
		Expected Count	1.0	1.0	2.0
		% within cultureQ9	.0%	100.0%	100.0%
		% within nationality	.0%	13.3%	6.7%
		% of Total	.0%	6.7%	6.7%
	5.00	Count	4	3	7
		Expected Count	3.5	3.5	7.0
		% within cultureQ9	57.1%	42.9%	100.0%
		% within nationality	26.7%	20.0%	23.3%
		% of Total	13.3%	10.0%	23.3%
Total		Count	15	15	30
		Expected Count	15.0	15.0	30.0
		% within cultureQ9	50.0%	50.0%	100.0%
		% within nationality	100.0%	100.0%	100.0%
		% of Total	50.0%	50.0%	100.0%

1 means visual pleasing

2 means graphics are familiar to me

3 means ease of finding specific information

4 means ease of reading information

5 means overall easy of use

Appendix F:

Average mean of subjective opinion

Appendix F.1 General Linear Model analysis

Average mean of subjective opinion on each website between UK and Taiwan

	nationality	N	Mean	Std. Deviation	Std. Error Mean
LTMEAN	Taiwan	15	3.59	.68056	.17572
	UK	15	3.70	.56853	.14679
TMMEAN	Taiwan	15	2.79	.54497	.14071
	UK	15	3.65	.68270	.17627
LMMEAN	Taiwan	15	3.54	.46810	.12086
	UK	15	3.38	.63449	.16382
TTMEAN	Taiwan	15	3.53	.55605	.14357
	UK	15	3.03	.85843	.22165

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
websites	Sphericity Assumed	3.292	3	1.097	3.252	.026
	Greenhouse-Geisser	3.292	2.283	1.442	3.252	.039
	Huynh-Feldt	3.292	2.586	1.273	3.252	.033
	Lower-bound	3.292	1.000	3.292	3.252	.082
websites * nationality	Sphericity Assumed	7.425	3	2.475	7.335	.000
	Greenhouse-Geisser	7.425	2.283	3.252	7.335	.001
	Huynh-Feldt	7.425	2.586	2.872	7.335	.000
	Lower-bound	7.425	1.000	7.425	7.335	.011
Error(websites)	Sphericity Assumed	28.344	84	.337		
	Greenhouse-Geisser	28.344	63.929	.443		
	Huynh-Feldt	28.344	72.399	.392		
	Lower-bound	28.344	28.000	1.012		

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1387.929	1	1387.929	2327.445	.000
nationality	.182	1	.182	.306	.585
Error	16.697	28	.596		

Appendix F.2

Users' subjective opinions on each website between UK and Taiwan

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
LTMEAN	Equal variances assumed	.467	.500	-.458	28	.651	-.10476	.22897	-.57378	.36426
	Equal variances not assumed			-.458	27.141	.651	-.10476	.22897	-.57445	.36493
TMMEAN	Equal variances assumed	1.916	.177	-3.800	28	.001	-.85714	.22555	-1.31915	-.39513
	Equal variances not assumed			-3.800	26.689	.001	-.85714	.22555	-1.32018	-.39411
LMMEAN	Equal variances assumed	2.493	.126	.764	28	.451	.15556	.20358	-.26147	.57258
	Equal variances not assumed			.764	25.757	.452	.15556	.20358	-.26311	.57422
TTMEAN	Equal variances assumed	1.127	.297	1.872	28	.072	.49444	.26408	-.04651	1.03539
	Equal variances not assumed			1.872	23.990	.073	.49444	.26408	-.05061	1.03950

Appendix F. 3

Taiwanese users' subjective opinions on each website

Taiwan Paired Samples Statistics

Taiwan		Mean	N	Std. Deviation
Pair 1	LTMEAN	3.5905	15	.68056
	LMMEAN	3.5389	15	.46810
Pair 2	TMMEAN	2.7905	15	.54497
	TTMEAN	3.5278	15	.55605

Paired Samples Test

	Paired Differences							
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1 LTMEAN - LMME	.05159	.70725	.18261	-.34007	.44325	.283	14	.782
Pair 2 TMMEAN - TTME	-.73730	.92131	.23788	-1.24751	-.22710	-3.099	14	.008

a. nationality = Taiwan

Appendix F. 4

British users' subjective opinions on each website

UK Paired Samples Statistics

UK		Mean	N	Std. Deviation
Pair 1	LTMEAN	3.6952	15	.56853
	LMMEAN	3.3833	15	.63449
Pair 2	TMMEAN	3.6476	15	.68270
	TTMEAN	3.0333	15	.85843

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	LTMEAN - LMMEA	.31190	.84170	.21733	-.15421	.77802	1.435	14	.173
Pair 2	TMMEAN - TTMEA	.61429	.95258	.24596	.08676	1.14181	2.498	14	.026

a. nationality = UK