

DESIGNING WAY-FINDING IN THE THAI CONTEXT

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-ATTESTATION OF AUTHORSHIP-

I hereby declare that this submission is my work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which, to a substantial extent, has been accepted for the qualification of any other degree or diploma of a university or other institution of high learning, except where due acknowledgement is made in the acknowledgements.



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-ETHICS APPROVAL-

This thesis had obtained formal ethics approval from the university (Ethics Application Number 11/280) in November 2011

-ABSTRACT-

This applied PhD study focuses on navigation systems for the new Urban Transport System (UTS) in Khon Kaen city, Thailand. In 2017 Khon Kaen city will reform their UTS by introducing 'Bus Rapid Transits' (BRT), replacing the old local transport (Song Thel). The radical change to a whole new operating system will create a culture shock phenomenon in the transit usage behaviour of citizens in this community of about 250,000 people.

A public transport map is a useful instrument that many experts in Western countries have studied and applied to bridge the gap between passengers and the UTS. The design standard of most graphical variables in these studies is based on Western cultures. These perspectives are very different from Thai and Khon Kaen (Isan) cultures. In particular, there are differences in individual cognitive learning, affecting long-term memory in the process of interpretations. The application of Western navigation system design standards to create readability for Khon Kaen passengers is not the best solution for understanding the new system.

My development as a designer influenced the design development for creating a new public transport map in areas of the Khon Kaen municipality. I thought systematically through philosophies (co-design, epistemology and axiology) to cover the design framework, and participatory design, systems psychology and design theory, using what key ideas the Western paradigms could offer to my Isan cultural and Thai design contexts. Stakeholder analysis, human-centred design and information design assisted my inquiry into the knowledge base of the stakeholders in the community reflecting the local way of life, culture and perspectives of the Isan people. These human factors (variables) formed the original map design concepts in order to make identity sets of graphical materials reflecting the local people's cognitive experience and meeting usability design concepts.

After the evaluation of the final design, results indicated that 92.5% of the stakeholders recognised the usability of the original maps based on auditing concepts of efficiency,

effectiveness and satisfaction. My research approach not only linked and enhanced the cognitive map (readability) skills of the target users, but also demonstrated how democratic responsiveness, community design ownership and cultural values in public space, could be applied in the Thai context in the experimental design of the new map model.

-Preface- My Designer Voice

My Design Perspectives

‘Experimental design in communication’ is a design perspective that I have been using to develop pieces of my design artworks. This is because I believe that human beings live with an experimental concept capacity, but using this depends on the context of their applications. Without this concept, we would not have electricity, computers, motors, medicine, houses, aircraft, or even clothes. All of these products were designed to solve, save, protect and progress human life. However, the quality of goods is often decided by intrinsic values, based on the appropriate functional use. For example, a woollen coat fits with cold regions, whereas a cotton jacket is better suited for winter in warmer climates. Although both are jackets, the materials were individually designed to fit with the weather and way of life. I cannot say which one is better than the other.

This same concept applies to communication systems. A great communication system in a large country may be useless in some smaller countries because of the different contexts of social behavior¹, which influences the cognitive learning and background experience individual/group. These distinct factors are embedded into individuals’ subconscious, which directly and/or indirectly impact on their interpretative processes with any matter. This problem in the communication world is an essential issue that designers or communicators need to address. The experimental concept is always there, if we choose to use it.

Autobiography

Who am I: “*I was born in Khon Kaen city, I live here and I’m a part of this culture*”

These words strongly represent my real inspiration for this applied PhD case study. I was born in Khon Kaen (city) municipality, northeast Thailand, in 1983. I am a

¹For example; language, belief, trust, religion, ethnicity and geography.

northeast (Isan) native. My ancestors are Chinese and moved to Thailand in the period of World War II. Our whole lives we have followed the traditional culture of Thai, Isan and Chinese. This background has made me a multi-cultural person. Some beliefs in Thai and Chinese cultures are totally different, such as traditional ways of living and eating; thus, as I grew up, I found myself needing to understand both perspectives and negotiate the different cultural practices.

From 2000 to 2005 I studied for my undergraduate degree in Bangkok University, School of Fine and Applied Arts. My major was visual communication design. The university taught me to design and think in the way of the experimental design concept. They believed that this concept made a design student apply and integrate design knowledge with other multi-disciplines. In my last year, I created the interactive design that was my final degree project; comparing ‘communication efficiency between speech versus writing within the same situation’. This design project was selected to be exhibited in a student degree show at the Bangkok Art and Culture Centre. Hence, I have always had an interest in studying the design of communication. However, in my academic experience in this first degree, I was only introduced to quantitative research approaches. This approach was required at every stage of our study of design methods, whether or not we agreed or disagreed with it. I thought to myself “Are we learning design or is this a science degree?”. We were not introduced to alternative methods by our teachers. I can remember being conscious that I learned I had a ‘designer voice’, but that made me uncomfortable, as I could not use ‘I’ or ‘me’ to represent my own voice in a Thai thesis. These are not academic phrases to use in the Thai academic design context, in a cultural context where the focus is not on an individual. The western ideas of transparency and reflexivity are not part of the Thai academic culture. Moreover, if I used these phrases too much in a thesis, I would attract comments that my research was not valid because my designer voice meant my work was biased.

I applied for a job in the advertising industry because I wanted to create a visual image along with a communication message. The creative juice G1 (Thailand) gave me an opportunity in the role of creative art director. I worked there for six months and I wanted to improve my skills in English and marketing communication. In that period, I made creative ideas link to my design accounts but I did not understand the real world of business. I needed to grow more. I decided to study for my Master’s degree in Australia and changed my study field to business. In 2007, I finished my Master’s degree in marketing management at Central Queensland University. At this stage, I

could integrate business views to my creative thinking, along with communication and graphic design worldviews. In my academic worldview, this degree gave me a chance to learn a new research paradigm. The qualitative approach was introduced to my research project. Using stakeholder analysis by using mixed methods made me understand deeply the details of people's experiences, and how these would impact on and inform my design decisions. Moreover, I was encouraged to use the phrases 'I' and 'me' representing my research and designer voice, inside my research projects.

I came back to Thailand confused. I asked myself, 'do I need to get back into the advertising industry?' My answer was 'yes'; but I no longer wished to work in Bangkok. I changed my life from advertising to academia and applied for a position as lecturer at Maharakham University, located in the province next to my hometown. Being close to my parents was a motivating factor. The role of a lecturer in this city introduced me to a lot of people who do not comprehend what 'graphic design' is. Local government is not active in using graphical information to improve the quality of life in the community. For example, there is no guidance information for public transportation, although this system is the backbone on which community activity runs, e.g. tourism, households, education, business and markets.

I was interested in how people travelled in this system without information, and why local government did nothing about it? This phenomenon was not particular to Maharakham; it also appeared in my hometown and other provinces in Thailand. From my experience, if you are not a local person who often uses the public transport in the city, you may not be sure how to use it correctly and would not be able to find any guiding information without asking. I compared my travelling experience between Thailand and overseas. I could travel using public transportation overseas, even though I had never been there before. However, I could not use public transportation in my country. This experience motivated me to consider how I could apply my graphic design skills to improve the quality of life in Thai communities. At this stage I realised that I needed to include not only business, communication and graphic designs, but that I should integrate a community worldview into my design knowledge.

Project Inspirations

Why do this research: *“The introducing of a brand new urban transport system in my hometown is the biggest challenge of my graphic designer career: to apply my design skill to respond to the needs of my community”*

Since 2006, my hometown (Khon Kaen city municipality) has planned to introduce a new urban transport system project under the name of BRT Khon Kaen. This plan will organise new service tracks and reform the old public transportation. Local government would install new major transit facilities, which would need a public transport map (a map, fares and timetables) and street furniture (a bus shelter and bus stations). However, modern public transport systems and reading of transit maps are a brand new experience for Thai and Isan people (Thienmongkol & Thomassen, 2013). People will be introduced to way-finding systems. However, these instruments are developed from Western design perspectives and cultures. The strong perspective of Isan culture in people's minds results in a different way of individual interpretation when they perceive Western transit-map systems. Therefore, the application of cross-cultural design standards to connect the inhabitants and the new urban transport system is not the best solution. This situation inspired me² to experiment with my design ideas and skills in order to create an appropriate set of graphical materials in the new transit map, which reflected the knowledge base of people within the community.

Design/Contribution/Challenges

What is my contribution: "I believe design which comes from the knowledge base of stakeholders in the community is the key variable to create communication fit (readability) and identity of design"

I feel honoured to be the first graphic designer in Thailand who will apply graphical innovation to improve the life quality of people in my home town and Isan region. The strong original design contribution in my PhD is integrating the knowledge base of stakeholders³ in my community to be the central part of the design and development process. I believe that the identity perspective of Isan folk wisdom can create new graphical material for the public transport map field. Further, the materials can reflect the cognitive experience of Isan people, and meet with the usability design concept. I am proud to be able to celebrate Isan culture in public places, not simply duplicating design concepts based on the western perspective or the ISO standard, where design concepts do not reflect the culture or communicate with Isan people.

These were other challenges for this contribution I wished to make. In many case studies of qualitative work in Western scholarship, a participatory model may engage with

²In the roles of a graphic designer, researcher, inhabitant and user.

³ Knowledge such as the beliefs, ways of life, arts, cultures, folk wisdoms and customs; these elements influence the process of individual and group interpretations.

many different people in a system or community, and they would expect to be asked to actively contribute. On the other hand, in Thai and Isan political contexts, when people are invited to ‘participate’ in any public hearing, the expectation is that they just listen and then go away. There is no public policy process where cultures their voices can make changes or be actively engaged in political the administrative system. In Thailand people call this participatory. I do not think this is ‘participation’ of a community. I need to hear these voices of experience and capture many ideas for my project from this process, informing my designer voice in order to contribute the original design in a transit map. In this thesis I want to find a way in my hometown to create the possibility for genuine and real participation from a range of stakeholders in this community. This challenge also came from the influence of my academic colleagues who had studied in the West in other disciplines⁴⁵. In their doctoral theses, they used mixed method qualitative approaches to engage with Isan people who came to join in and share their voices in their research. In this thesis I wanted to take the opportunity to introduce a new way of thinking and a new way of using different methodologies and fieldwork practices to create a graphic design in Thai and Isan contexts, and in a way that did not replicate western expectations, but was congruent with and comfortable for Isan people to participate. This was new ground for my designer positioning in the Thai Isan context.

Finally, although any innovations change behaviour, the root of culture is changeless. It transfers from one generation to the next generation. The roots of culture develop the different ways of traditional practices, for example: thinking processes, beliefs, way of life, art, custom and folk wisdom. These diversifications create a colourful design world. On the other hand, elements of traditional practice also provide for different processes of individual interpretation.

“I’m very proud to respect my traditional culture, by applying my graphic design skill to represent values and spirits of Isan culture through this PhD”.

⁴Suttisa, C. (2005). *Civil society in the Chi River, Northeast Thailand*. (Doctor of Philosophy), Massey University, Auckland.

⁵WechOsotsakda, C. (2008). *ICT in community-based lifelong learning centre: model for northeast Thailand*. (Doctor of Philosophy), Auckland University of Technology, Auckland.

-Chapter 1-
Introduction

Rationale of the Study

The UTS is the cornerstone of urban communities, and is a resounding success in terms of services to urban resident commuters (Altshuler, Womack, & Pucher, 1979). UTSs can be classified into two groups: (1) Public Transportation and (2) Mass Transportation, for example BRT, trams, ferries, and trains (Hess, 2007). These transport modes are the key factors supporting the ‘Sustainable Development’ concept of the United Nations, and involve a model for urban ecology systems. The components of this model consist of social, environmental and economic factors (Adams, 2006; United Nations, 2005a) which are related to resource use that meets people’s needs, and which also conserve the environment, not only for the present but also for future generations (P. Rogers, Jalal, & Boyd, 2008; C. Smith & Rees, 1998). Furthermore the UTSs are the main systems co-ordinating land use planning and transit-oriented developments. This approach must be used to define the growth of cities, for example, increasing land and business values by bringing the UTS close to residential, shopping, business and entertainment areas (Dunphy et al., 2004).

The value of UTSs’ attributes has made them an urgent concern for many cities in developed and developing countries (Gwilliam, 2003; Morichi, 2005; Qureshi & Huapu, 2007). Thailand is one of many countries awake to these concerns. Many UTS projects, for example, the Bangkok Sky Train, Subway, and BRT⁶ have seen investments reforming a whole network of UTSs in the capital city and some major provinces. These projects are planned to be completed in 2029 (Dailynews, 2009). Khon Kaen is one of three major provinces under the BRT project. The Thai government promoted Khon Kaen city as the first priority to reform the old UTS in the central business district (CBD). This is because in 2015 the Southeast Asian Nations (ASEAN) will become the

⁶Bus Rapid Transits (BRT) are transit systems that use buses to provide a faster service for commuting passengers in special (bus) lanes (R. Cervero, 1996).

Asean Economic Community (AEC⁷) (Vo, 2005). Khon Kaen city is located at the centre of the Isan region and Indo China (Cambodia, Laos, Thailand and Vietnam) that is also called the East-West Economic Corridor (EWEC)⁸(NESD, 2010b). This location means Khon Kaen has to make adaptations in the logistical and transport hubs in the Isan region, in order to support the aims of EWEC and AEC. Goods and cargo need to be stored before distribution. Travellers and visitors stay in the city before moving on. For these reasons the Khon Kaen municipality was prompted to introduce a new public transport plan.

This project will create radical change by replacing whole operating systems of public transport. The plan of the new project involves: (1) reformation of the old local transport system (Song-Thel) and installation of the new one (BRT); (2) creating a new network route service; (3) the adaptation of city land use planning; (4) defining new interchange stations, stops, fare systems and timetables. These changes will impact on the transit usage behaviour of people who have been familiar with the Song Thel (old) system for more than 40 years. The old system has created a negative view in transit use behaviours because of the non-standard services of the system. For example, there are no-route maps and timetables. Stopping and pick-up points, and rates of payments are uncertain; people who are not familiar with the system must ask for information from others or Song Thel drivers. These inconveniences are not confined to Khon Kaen city, but have also spread in every urban centre in Thailand. Most Thai people do not have much knowledge about BRT systems and have no information about travelling by the Song Thel system.

A BRT system requires passengers to help themselves by reading the guidance information that is provided in stations. This includes system information about service operations, for example, timetables, stops and pick-up points. The first line of the BRT is planned to begin operating around 2017 (Jaensirisak, Klungboonkrong, & Udomsri, 2013), but from 2009 to 2010, meetings between the Khon Kaen city municipality and the operations team did not mention how to handle changing transit usage behaviours. They focussed on the effects of engineering structures, commercial investments and traffic monitoring. Operations management between the BRT and Song Thel will have to address this issue. However, a public transport map is guidance information that

⁷The AEC consists of 10 member countries: Indonesia, Malaysia, Philippines, Singapore, Thailand, Brunei, Burma, Cambodia, Laos and Vietnam (Hew, 2005).

⁸EWEC will consist of double lines of trains and motorways from Burma to Thailand, through Laos and stopping in Vietnam (Banomyong, Sopadang, & Ramingwong, 2010).

combines a variety of graphic materials to bridge the gap between passengers and UTSs, for example public transport maps (network maps, bus routes), You Are Here (YAH) maps (for interchange points), map symbols (symbols, icons), map legends, signage systems, and timetables (Avelar & Allard, 2009; Vertesi, 2008). Many standard designs of these graphics were developed by experts to improve users' comprehension of navigation systems, for example the New York City subway system (Bronzaft, Dobrow, & O'Halon, 1976); the online map of San Francisco (Law & Sung, 2003); the map of London's underground (Roberts, 2005) and the public transport network map in Zurich (Avelar, 2008). The design standard of most graphical variables in these studies is based on Western culture. These perspectives are very different from Thai and Khon Kaen (Isan) cultures, for example physiology, philosophy, cultures, lifestyles and beliefs, background knowledge, languages and public transport experiences. Dissimilar perspectives may lead to deviations in individual cognitive learning, and issues of long-term memory, in the process of interpretation. Moreover, this thinking process may create a different subconscious interpretation from past individual experiences (Cowan, 2001; F.D. Saussure, 1983). The application of Western navigation system design standards to create readability for Khon Kaen passengers is not the best solution for this case study.

Significance of the Study

My study involved creating a new design of the public transport map for Khon Kaen city, Thailand. The graphic materials on the map include the seven areas which are as follows: (1) logo of the project, (2) graphic routes, (3) graphics for fare rates and timetable systems, (4) route symbol information, (5) key legends, (6) service information tables and (7) index symbols. I studied the multi-perspectives and different ideas from all the people who participated in my design project in the community. These stakeholders⁹ shared information so I could investigate the key human factors which needed to be synthesised with the design processes.

Human centred design (HCD) influenced me to investigate the key human factors. These factors guided me to understand the background of the individuals and group, in respect to the physiological (e.g. natural wealth, geography and season), psychological (faith, belief and sense of place) and social/cultural variables (e.g. Isan culture, community role, ways of life, folk wisdom, transport behaviour and urban policy). These

⁹They include a group of local administrators, experts and people who played a central role in my design process.

variables were synthesised and formed the key map design concepts. These key concepts were integrated with the UTS information. Both sources were organised and transformed into graphic images by applying the information design principles in order to create a set of graphic materials that articulate with the learning experience of target users based on the usability design concepts.

Studying graphic innovations in a public place as part of developing a strategy in public policy environments, is research that has not been done in Thailand before. Seeing stakeholders in communities as the centre of design development in the UTS field is a new process in Thai public policy design. No scholars in this country have been concerned with this in the past, in order to create original graphic material for the Khon Kaen UTS, based on the knowledge base of stakeholders in the community. The graphics style represents the Isan cultural identity, which corresponds with the background, culture, beliefs and experiences of the Khon Kaen people. This design also represents the reflection of democratic responsiveness, community design ownership/participation and respect of cultural values in public space. I believe that this original graphic material on the Khon Kaen public transport map is familiar to the people in this community. It may also improve the map's readability and the learning experiences of the readers because of the map's new innovative designs, directly involving the daily lives of people using public transport.

Research Questions

To investigate this case study, I defined the research questions to ensure that I could identify the key variables and theories to support my graphic design materials in Khon Kaen city's public transport map. This design contribution established the original map design which was inclusive and responsive to the knowledge base of stakeholders in the community. The map design reflects local cognitive experience and meets usability design concepts. This research used mixed methodologies to investigate, collect and analyse data. Thus, the study sought to answer these research questions:

- 1) How can we apply and integrate transdisciplinary, information design, human-centred design and the knowledge of Khon Kaen stakeholders, to provide new public transport map systems for the Khon Kaen UTS which reflect Thai cognitive experience (psychology, physiology and society/culture) and meet usability design concepts.

2) What is the best design solution to communicate the UTS into Khon Kaen's cultural context, in order to respond to:

2.1 Community communications

2.2 Suitability for the local urban transport system (BRT)

2.3 Issues of representation of local (Isan) identity designs

Outline of Chapters

This thesis contains ten chapters. Chapter one briefly describes the background of the thesis, including the rationale and significance of the study. It provides the scope of the research aim and inquiry.

Chapter Two (Literature Review): describes the key terminology, principles, applications and case study backgrounds of those who were engaged in my PhD. It is structured in three sections: (1) UTS, (2) the way-finding system in the UTS and (3) case study background. The material in each section was explained, analysed and synthesised from scholars and my critical thinking in order to integrate the key critical ideas which were applied in my research and processes.

Chapter Three (Regional Setting) is divided into three main sections. The first explains the historical background of the Isan culture including what Isan is, the ways of life, amusements, folk art and wisdom. The second section is an overview of the Khon Kaen context where my case study area was located. The detail covers demography, trends of urban development policy, new roles of the city, city and transit structures. The last section mentions transport contexts. It includes the current UTS, transit facilities, transit behaviour and culture and the new UTS.

Chapter Four (Theoretical Framework) is divided into two sections. The first describes my systematic thinking and the integration of ideas from western literature. The second section presents the component of key concepts that were used in this case study.

Chapter Five (Research Design) presents the outlines of my research design, including my choice of participants, methodologies, methods and research instruments. The research process consisted of two stages. In the first stage, the results from the data collection and analysis created a design outcome as the Khon Kaen transit map prototype. The second stage evaluated and adapted the prototype to create the final version. Mixed methods were used to match the investigation themes and sampling units.

Chapter Six (Key Finding 1) discusses the significance of my research findings from my field work and their influences on this study. The chapter is divided into three sections for reporting and summarising the key results from my data collection in stage one. Section one presents the key findings obtained from in-depth interviews, questionnaires and observations. Section two presents key results from the snowball techniques after I had analysed the research data in section one. The summary section outlines the significance of the key findings from sections one and two. These findings became the key (human) factors which were applied to define the key design concepts that contributed to the original transit map prototype of Khon Kaen municipality.

Chapter Seven (Key Finding 2) is an overview of the key results from the second stage of my data collection obtained from in-depth interviews and focus groups. The results came from the evaluative design processes of my transit map prototype. The key findings in this second stage resulted from significant feedback from the participants. The feedback led to the revision phase of my design materials. The process also reduced communication problems and allowed me to create and recognise the usability requirements of the stakeholders, before I could design the final version of the transit map prototype.

Chapter Eight (Discussion) discusses the significant findings from the case study fieldwork. The sources of discussions are brought from the key findings in chapters 6 and 7. There are four main sections: (1) cultural background toward key findings and design concepts, (2) from key findings toward my experimental perspectives, (3) symbolic and cognitive learning and (4) the conflict of opinions in the community.

Chapter Nine (Design process) outlines my design processes used in this study (Khon Kaen transit map). The practical process was conducted in two major stages. The first stage demonstrates the design process of my transit map prototype. The second stage describes the processes of adaptation after I received key feedback from the Khon Kaen stakeholders. The development details are presented in a step-by-step format. The important parts of my data collation relate to the design processes and outcomes which are presented in this chapter.

Chapter Ten (Conclusion) is a general conclusion of my thesis and recommendations for future research and design. The first section summarises the key points of my thesis and the second recommends further research and design.

-Chapter 2-
Literature Review

Introduction

This chapter reviews the definitions, conceptual framework, principles and background of key terminologies that are involved in my PhD. It is structured in three sections; (1) UTSs, (2) the way-finding system in UTSs, and (3) case study background. The material in each section was analysed and synthesised drawing on scholars and my critical thinking to integrate the key critical ideas that will be applied and evaluated in my design process and discussion.

Section 1: Urban Transport Systems

This section is divided in two parts. The first part explains the definition of the UTS framework in this thesis. The content is reviewed from scholars in order arrive at a clear definition of this terminology. The second part describes the overview model and pattern of UTSs in various cities, with their designs based on the population and geographic factors. These materials would advantage me to understand the structure of the UTS in my case study. I analysed and categorised the modes of transit information to assist my design process in the next stage.

1.1 The Definitions of anUrban Transport System

The term ‘UTS’ has no universally agreed definition or specified conceptual framework. Many scholars have taken various standpoints. Altshuler et al. (1979) described the UTS as the cornerstone of urban communities, representing a resounding success in offering services to the urban resident majority, e.g. London Underground , New York Subway and Tokyo Metro. Small (2007) argued that UTSs have the ability to handle a high population density while transferring people and products. Qureshi and Huapu (2007) explained that UTSs are an urgent concern for megacities around the world. These studies span a range of UTS characteristics.

The concept of a UTS has many categories; for example: public transportation, mass transit or mass transportation (Fischler, 1979; Fogelson, 1993; Wambalaba, Sisinnio, & Marlo, 2004). These terms can be classified by their traits into two groups: (1) ‘Public Transportation’ and (2) ‘Mass Transportation’. Achs (1991) defined public transportation as a shared service of vehicle systematic transportation which is available for people in public places. The public transportation modes include Bus Rapid Transit (BRT), trolleybuses, car-pooling and taxicabs (Hess, 2007). By comparison, mass transportation involves public transportation systems designed to shift a large number of passengers in several types of vehicles in suburbs, cities, and large metropolitan areas (Mass transit, 2010). Hess (2007) and Post (2006) wrote that mass transportation designed for commuting between urban and suburban centres also included operational transportation systems within cities. Ground mass transportation consists of rapid transit trains (subway, surface light rail system, trams) and rapid transit buses, while the water and sky mass transportation systems are ferries and airlines. The textured context of public transportation and mass transportation systems have different meanings to describe the characteristics of a UTS, but both terminologies are able to be represented, and their traits covered, by using the term UTS. Hence, in this thesis I will use UTS to represent both public transportation and mass transportation systems. Although the model underneath the UTS has several patterns, this terminology still covers a strong sense of both systems.

1.2 Urban Transportation Models and Patterns

The urban transportation model and patterns can be represented by features of urban characteristics and capacities in the contexts of systems infrastructure, numbers of people, and the economic situation. In the past, the success of UTSs could develop a horizontal business progression and increase rapid urbanisation¹⁰ (Altshuler et al., 1979). This provided opportunities to other businesses supporting a new community, for example: shops, restaurants, markets, shopping centres, and small business centres (R Cervero, 1994).

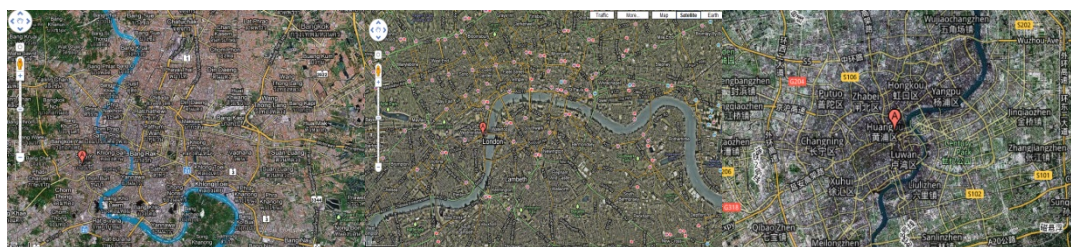
The size of the urban population is related to the size of the UTS infrastructure (for example: number of buses and train routes, number of bus shelters and train stations).

¹⁰ For example: Bay Area Rapid Transit (BART) the light rail transit systems project in San Francisco expanded horizontal benefit for the San Francisco economy based on housing development around the rail stations (BART Planning Office, 1993). The benefit also includes ongoing air pollution reduction and costs of living because people do not need to reside only in the city areas, using a private vehicle that has a high cost effect. In Portland Maine, the development of UTSs improved average household incomes from \$45,771 (USD) in 2002 to \$50,395 (USD) in 2007, also increasing the average capital income from \$29,455 (USD) in 2002 to \$34,482 (USD) in 2007 (Gragg, 2005; US Census Bureau, 2009).

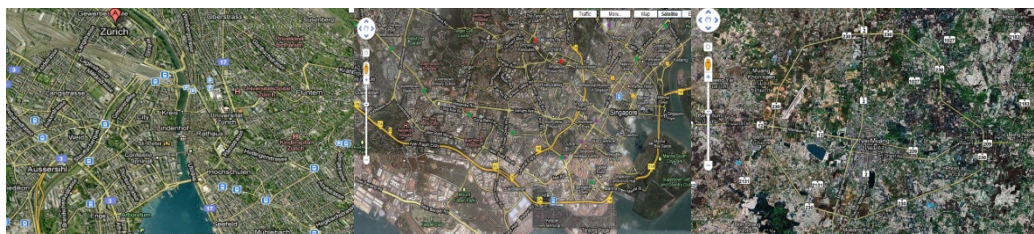
The numbers of inhabitants is the key dynamic to determine the demands for a UTS (Morichi, 2005). Nevertheless, if the balance in the system between demand and supply lacks equilibrium, it will impact on urban economic systems, for example increasing the 'cost of living'¹¹, 'capital investment', 'business regression' and so forth (Pucher & Krattyswaroopam, 2004). However, it can be seen that the development of a UTS can reshape the business performance, quality of life and social behaviour of a city.

After World War II, the urban transportation model in much of the western and southern metropolitan regions developed alternative transit systems, which offered minimal bus services, and developed new types of transit systems, e.g. light trains, rapid buses and trains, or a full range of transit modes (Dunphy et al., 2004). The transit modes can be analysed at four levels under the UTS 'Transit Pyramid' (Dunphy et al., 2004). This pyramid consists of: (1) Regional Rail, (2) Bus and Light-Rail Transit, (3) Bus Service Only and (4) All Modes. In selecting the appropriate transit modes, we have to concentrate on the overview elements, i.e. geographic contexts, population size, demands, supply and capital investments of each city (Dunphy et al., 2004). For example Bangkok, London, Zurich and Shanghai have a river, one of the major transit options that impacts on the centre of a city's geography, along with high populations, the demands and supplies for use of the UTSs (see Figure 1, p.42) (Avelar, 2008; R Cervero, 2000). These cities have to apply all transit modes to support the transit behaviours of their citizens (Avelar, 2008; Beek, 1995; Okamoto & Tadakoshi, 2000). On the other hand, some city such as Singapore or Khon Kaen do not provide all of these transit systems, because their geography does not have a river that is connected as the one of main transit systems, and they have a lower density of population than any of the cities above.

¹¹ Cervero (1994) and Hall (1998) explained that the 'cost of living' will increase if the supply of UTSs is not responsive. Workers need to rent accommodation in the limited housing areas in the city accessible by UTS facilities. Kenworth and Laube (1996, p. 632) studied the data from 46 international cities, and found that most sprawling cities have a poorer economic performance. The investment of gross regional product (GRP) per unit was increased in cities which had an inefficient UTS. Poor UTSs increased the number of private vehicles and wasted too much money to pay for energy. This is one of the main factors impacting the social cost effect on people who live in urban areas. In addition, this factor is a cause of building traffic congestion that creates air pollution, affecting the city environment, increasing health problems and a decreasing resident's quality of life (Faiz, 1993).



(1) Bangkok geography (2) London geography (3) Shanghai geography



(4) Zurich geography (5) Singapore geography (6) Khon Kaen geography

Figure 1 City geography

Under the transit pyramid model, UTSs can be classified according to ‘Trip Patterns’ (TP). Cities have differentiated physical environments, population, budgetary investment, and public transport policy to create the appropriate TP for the city setting (Wilson, 1997). The TP is related to the life of people who live in the city and move around from their places of residence to other locations in the city, for example: shopping areas, places of work, cultural and social facilities (Donald, Alan, & Robert, 2003). Generally, 50 per cent of urban journeys are generated from working and visiting each other’s residences¹². The model of TP in each city must depend on the relative location of inhabitants and meeting places within the urban setting.

Several types of TP can be distinguished. Frey(1999) divided the forms of TP in his research as including: (1) ‘Centralised’ (Monocentric-model)¹³, (2) ‘Decentralised-Concentration’ (Polycentric-model)¹⁴ and (3) ‘Decentralized’ (Low density sprawl-model)¹⁵. On the other hand, some scholars believe that there are more than three models of TP. Donald et al. (2003) argued that the major apparatus of TP can be separated into four models. Alonso (1964), Muth (1969), and Mills (1979) found that

¹² However, to avoid any confusion, in this chapter, the expression ‘Meeting Places’ will be used to represent the places that people go to from their home. The meeting places definition covers shopping places, schools, cinemas, work places, other people’s homes, and recreation spaces (Donald et al., 2003).

¹³ The monocentric form is a short journey to the CBD which is the high ‘value’ land (Frey, 1999).

¹⁴ The polycentric model uses the standpoint of the sub-centre, with some ‘urban villages’, heading a cluster to organise the UTS into sub-villages. This point of view is the basic concept any vast metropolis would use for developing their UTSs framework (Lynch, 1960).

¹⁵ The low density sprawl is the form which has not set up any systematic hub, and seems to scatter in many directions (Morichi, 2005). This form can be found in the cities which have a low density of population in CBD areas, with inhabitants’ residences distributed all over the urban space (Brown, 1999).

the results of density gradients in large cities were increasing numbers of ‘population growth’ and ‘trip activities’ from outside the traditional CBD in any metropolis. Donald et al. (2003) determined a fourth model by adding a ‘Mono-Polycentric’ model, because they believed that most of the polycentric cities were progressive and transformed from a monocentric city structure. The new model combined the characteristics of ‘monocentric’ and ‘polycentric’ models as simultaneous radial and random transport movements (Donald et al., 2003).

The above paragraphs give a clear illustration of the transit pyramid model and different TP under the pyramid, and showed how the UTS is able to represent and be influenced by the characteristics of urban features and capacities. These studies (pyramid and TP models) supported my understanding of the overview structure of UTSs. The principles were used to analyse the transit mode and TP in my case study, in order to clarify the transit-node level in my case study areas. The results enabled me to identify the key locations for my data collection in any field work (see details in Chapter 6, p.187). Information management further aided me in categorising the layer of transit information, e.g. interchange points, transit modes etc.; before the information was incorporated into the design process (see details, Chapter 9). Furthermore, the study of TP supported my analysis of transit behaviour of the inhabitants. These behaviours were triangulated with the results from the field work, before I defined the group of transit information needed in the map prototype. The next section describes the key systems and principles which create efficiency in usability bases connecting the UTS and people.

Section 2: Way-Finding Systems in an Urban Transport System (UTS)

This section describes the conceptual framework of the way-finding system that influences use of the UTS context. The review is divided into three major parts. Part one explains a main trait of the way-finding concept in the UTS guidance system. Part two explains the context of way-finding and environmental graphic design approaches in UTSs. Part three describes the principles of role, type and components in a way-finding map system. It also includes a critical review of the significance of symbolism in Public Transport Map communication.

2.1 The Significance and Integration of the Way-Finding Concept

One key criterion to measure the successful performance of a UTS is the ‘way-finding system’ (Darken & Peterson, 2001). The main purpose of a UTS involves people having to share public transport (Small, 2007). In the process of planning a journey, passengers have to comprehend a system of urban transport trip patterns in each area before travelling to their meeting places (Donald et al., 2003). However, if the passengers cannot use the system and plan because they do not understand the transit system, it means the numbers of riders will be decreased, even though the system of transit operation may stay at a high standard (Cluett, Bregman, & Richman, 2003).

Cherry et al. (2006) named the way-finding system as the keystone factor which determines the trends of transit ridership. In USA, 38-40% of non-transit passengers in a UTS indicated that the provision of an appropriate navigation system (transit guidelines-information) would have a significant impact on their decision making to use or not use the service (Abdel-Aty, 2001). Darken and Peterson (2001) explained that the navigation system is a primary task demanded and essential to guide people to meet their objectives in any complex environment of very large spaces. Their research found that people will have disoriented feelings at times when they have an uncomfortable and unsettling experience of being unfamiliar with their surroundings when making a transit related decision.

With respect to usability, the way-finding concept focuses on the cognitive element of navigation. Its sole focus is the strategic and tactical sections that guide movement (Darken & Peterson, 2001). The ‘cognitive map’ is the essential part of way-finding that focuses on use and develops a guideline conceptual framework, also referred to as a mental map (Tolman, 1948). Moreover, it includes the development of knowledge about the cognition and comprehension of users based on visual literacy of interpretative information that is presented in a pattern of symbolic and graphical representation (O’Grady & O’Grady, 2008). The next part will justify the key principles and variables to create a successful way-finding system, including a description of the role of environmental graphic design to organize graphical messages in the way-finding system.

2.2 Way-Finding and Environmental Graphic Design Approaches in UTSS

This part is divided into two sub-topics. The first describes the role and principles of way-finding in UTSS. It also includes examples, comparisons and critical ideas regarding the current situation of way-finding systems. The second topic justifies the principles and elemental concepts of environmental graphic design concerned with designing a model of a common way-finding system (map).

2.2.1 Principles of a Way-Finding System

The ability to locate points in an environment is one of most crucial abilities of agents like autonomous robots, animals and human beings (Freksa, 1999). A way-finding system describes how an individual understands a new environment and the cognitive processes used to travel from one location to another (Lynch, 1960; O'Grady & O'Grady, 2008, p. 72). A way-finding system links dissimilar people together although they do not share a target or common language. It can guide them toward the same space under a single system of communication (Gibson, 2009). This system includes: (a) the information gathering, and (b) decision making processes people use to orient themselves and move into space (Hunter, 2010). Three variables determine the success of the way-finding design, as follows: (1) the nature of the people in the environment; (2) the people who are the target users to communicate with, and (3) the type of setting in which the system will be installed (Gibson, 2009). For example, if we want to install a navigation system in Khon Kaen city (Thailand), these variables need to be identified. First we need to think about the nature of Thai people living there, because most Asian people have different attitudes, cultures, and beliefs from Westerners (Knutson, Komolsevin, Chatiket, & Smith, 2003; Lu, Chin, Yao, Xu, & Xiao, 2010). For example, in the West the symbol of knife, fork and plate in the middle means food or restaurant, but 'Isan-people'¹⁶ may think of kitchen utensils, because in their culture equipment for eating is bamboo woven baskets (Ka-Tip-Kau) (see Figure 2, p.46) (Grandstaff et al., 2008). The symbol of a fried egg on the plate in the West means breakfast, while some traditional Thai people may think of the sun, a lunar eclipse or single eye fish (see Figure 3, p.46). Even within in the same region, the red colour in Thailand means danger or nation, while in China it means lucky or good (Cowgill & Bolek, 2003).

¹⁶ Isan-People: The people who are original citizens in Northeast region of Thailand that have a strong and high identity in way of life e.g. foods, eating, customs, culture, amusements and belief (see details, Chapter 3, p.85) (Grandstaff, Grandstaff, Limpinuntana, & Suphanchaimat, 2008).

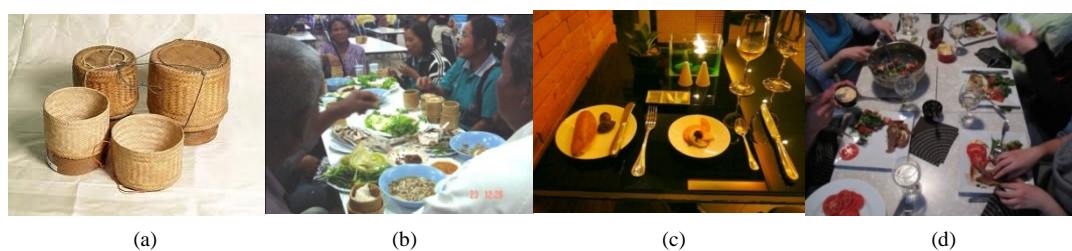


Figure 2 Comparisons of eating styles in different cultures

(a) Woven Baskets (Ka-Tip-Kau), (b) Isan (Thai) people with eating style, (c) Western table set and (d) Western people with eating style

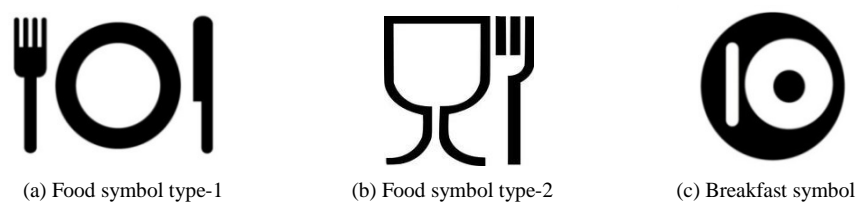


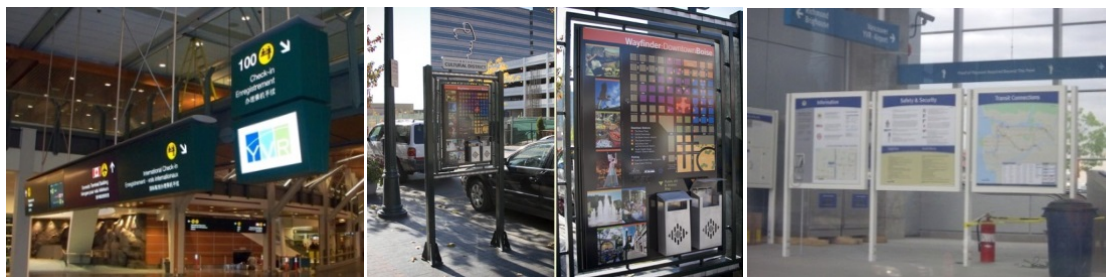
Figure 3 Symbol types of foods and beverages

These factors affect the thinking processes in interpretive and cognitive learning systems (information literacy)¹⁷ when people read graphical material (way-finding information) (R. Lipton, 2002; O'Grady & O'Grady, 2008). To identify the target group of Thai people, we need to specify which part of, or city in, Thailand where we want to conduct the project. In a developing country such as Thailand, the learning background of citizens in provincial areas, shows high differences in education levels, incomes, lifestyles and sometimes customs, from citizens in the capital city (Grandstaff et al., 2008). Lastly, we need to study the type of city structure, for example: urban forms (mono or poly centric), transit modes (transit pyramid) and public transportation policies in order to create a sustainable way-finding design system for the UTS within the city environments (see more details, Chapter 3, p.99). Moreover, in developing the way-finding strategy and designing a sign program, Gibson (2009) suggested that use of only design principles and secondary information in way-finding needs is inefficient. The designer must also gather primary data (human factors) and recognise target users for designing the protocols with appropriate graphical information and sign messages¹⁸.

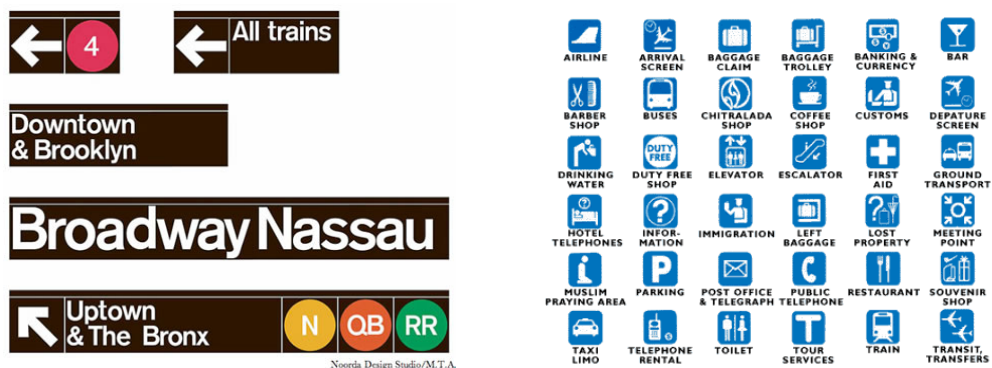
¹⁷ Information Literacy: Human ability to recognise information are needed by using the skills to find, analyse, evaluate use that information (O'Grady & O'Grady, 2008).

¹⁸ I noted that one of the key theories that needed to be applied for investigating primary data from my target stakeholders is a human-centred design (HCD). This theory inquires about human factors by putting a human (user/stakeholder) at the centre of the design process (see more details, Chapter 4, p.120).

representation of urban transport structure in solving problems for a passenger in determining one's transit position, route system, destination, distance and time of service (Donald et al., 2003). UTSs have to settle their services and operating systems in the complex spaces within the urban setting (for example: London, New York and Tokyo have to operate their subway stations serving a passenger system with more than 200 stations in the city areas) (see Figure 6, p.49) (Rose, 2005). Passengers who are unfamiliar with the physical journey of the transit systems in a different area, city and country need to have a way-finding system to help them get to their destinations (O'Grady & O'Grady, 2008).



(a)



(b)

Figure 5 Environmental graphic designs

(a) architectural graphic way-finding in buildings and on streets and (b) sign and signage-system design on way-finding boards

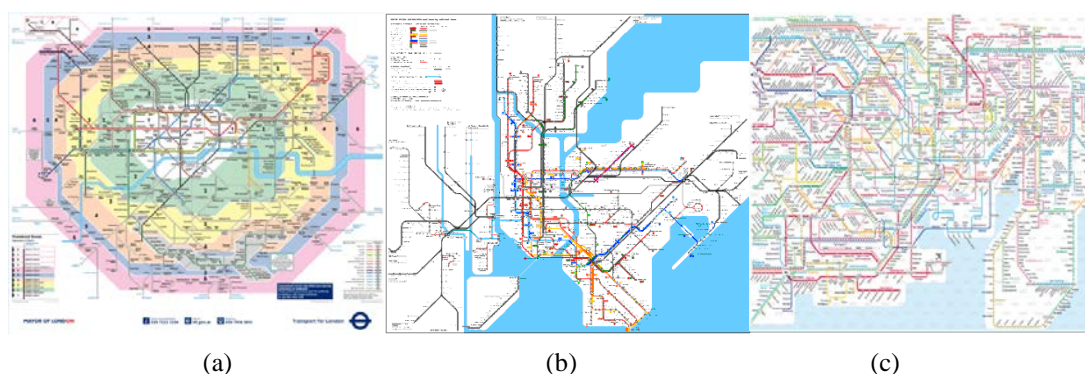


Figure 6 Subway track services and stations in a complex city area

(a) Tube map of London, (b) Subway (New York) and (c) Tokyo Metro (Subway)

Therefore, it can be said that way-finding systems were designed to aid and improve the quality of public navigation in early UTSs (Gibson, 2009; Stern et al., 2003). In summary, way-finding systems are designed for mapping a real-physical environment toward graphical representations; for example, signage systems and type designs. They involve the integrative paradigms between art and science conceptual frameworks, to examine human factors for designing information that is appropriate for a human cognitive process, in order to guide people to understand and determine their physical journey, and travel route, and also to create transit plans by themselves. Finally, the above materials helped me understand the key principles of way-finding analysis in a site. It guided me in defining the overview framework of my question themes in the field; e.g. demographic, transit behaviour/experience, information need and cognitive skills with cultural perception.

2.2.2 Environmental Graphic Design

The concept of EGD is related to an organisation of the ‘spatial’ space in urban areas, signage systems, and public design systems of way-finding applications, for creating an appropriate message to communicate with people (Gibson, 2009). EGD became the preferred umbrella term to explain any graphic communication of information in the built environment (Follis & Dave, 1979). Calori (2007) stated that the term EGD replaced the term ‘architectural graphic’ because the word ‘architectural’ was too limited, and the use of the words ‘graphic design’ did not convey a sense of architecture. Moreover, the words ‘architectural graphic’ could be confused with the drawing of architects who want to design buildings, or design graphics of buildings.

A systematic development of EGD activity purposes to organise a cohesive information and unifying visual element within a graphic communicating system in order to give location in a built environment (Hunt, 1994). For example: using a transport network connects with multiple places in a city, region and nation. All of those connections have complex communication needs. Calori (2007) described that environmental communication needs in the EGD of Hunt (1994) can be addressed by three components often in overlapping arenas. They can be identified by: (1) signage and way-finding pointing people to a location and aiding them to navigate it; (2) interpretative information showing the meaning of a concept from graphical material (e.g. texts, images, icons, signs and symbols that are represented in the form of a graphics and pictogram); and (3) place-making, creating a distinctive image for a site, such as meeting-points, portals, gateways, gathering points and landmarks.

This concept is different from the overlapping component idea of Lynch (1960) of building clarity for way-finding in the public image of a modern city. Lynch believed that humans would respond with emotions and cognition to aesthetic design, and also instinctively be able to classify five physical forms of urban environment in an graphical image: (1) paths (routes we travel on); (2) edges (barriers and boundaries); (3) districts (areas with distinctive character); (4) nodes (central intersections) and (5) landmarks (notable buildings or sights) (Turner, 2010). Lynch (1960) used these elements to build his schematic maps of cities in the United States based on social factors from the inhabitants in those cities. In his book *Image of the City*, Lynch applied social methods, such as interpretivism, to interview target research participants; being the group of inhabitants who were long term residents or employed in the areas, in order to investigate the interrelationship between these people and memory, experience and sensation, with their living or work places. This investigation studied the mental map in the inhabitants' minds²⁴.

Although Hunt and Lynch have a difference theoretical framework to integrate best way-finding components, both frameworks represent the objectives of EGD. The frameworks emphasise how to develop and create a well-informed graphics and signage program to help people find their way through a real physical setting (Calori, 2007). However, my case study integrated both frameworks to organise the information graphics in the transit map prototype. For example, using the Lynch design framework,

²⁴ A mental map involves a person's point of view in his/her own world. Its concept focuses on the imagination of mapping a geographical settings in human mind (Derek, Pratt, & Geraldine, 2009). Lynch (1960) studied the creation of a mental map as relying on memory as opposed to being copied from a pre-existing map or image from his participants.

I applied the node concept to develop the set of graphical materials about the interchange points system. Meanwhile, Hunt's signage concept was applied to develop the sign programme of passenger types, landmarks, and routes. The interpretative element was defined as the map legend sections in my public transport map.

The different components from both frameworks in my design of public transport map added 'community knowledge'. This knowledge included personal/group points of view that involved their ways of life, folk wisdoms, customs, and local policies. The policy point of view is a new dimension, not limited to the thinking cycle of inhabitants, as in the Lynch method, but also including the perspective of local administrators and experts/technicians. These new points of view uncovered whether or not the local development policy can support the image of the city, with benefits for developing the city economy, culture and society. Meanwhile, the view of experts/technicians were used to describe the key theory which will engage and support the ideology of development policy such as city land used, cognitive learning, psychology, design theory or cultural study. All points of view will be collated as an holistic perspective in order to define the key design concepts, project framework, significant points and/or limitations in public design projects (see more details in the next topic).

Finally, the EGD concept significantly influences how people use a UTS. A good public transport map that can be simply comprehended by people at the first stage of their journey is vital for decision making (Cain, 2007). Many people still prefer to ask someone how to go from point Y to point Z than to follow way-finding information or read a map. Nevertheless, the significance of signage and other visual way-finding cues can assist people in navigating complex settings when they have no one around to ask, or there is a language barrier. Therefore, the studies of way-finding systems and EGD concepts (graphic and signage programme) involves both demystifying human cognition in the complexities of the built up environment and fulfilling the communicating function of informing direction, and supporting improvements in the aesthetic and psychological qualities of an environment (Calori, 2007). Indirectly, the best way-finding and EGD concepts can assist with two-way communication between people and city environments (Lynch, 1960). They can help people become familiar with the city and create tangible opportunities for commercial development, tourism and local traffic development (Turner, 2010). The next topic describes the concepts of a way-finding map and the significance of map symbols in a way-finding (map) system.

2.3 Way-Finding Maps and the Significance of Symbolism in UTSs

This topic reviews the key conceptual framework of a way-finding map and symbolic system. These principles were applied to develop the design process of the Khon Kaen public transport map, which includes the set of graphical materials in the map. It consists of four sub topics to be discussed in the following paragraphs;

2.3.1 Way-Finding Maps

Maps and symbols are the significant elements in basic way-finding supportive services (Golledge, 1999). For hundreds of years, the paper map has been the original map style that humans have used for navigation (O'Connor & Robertson, 2002). It is an extremely good tool with the richness of sources it can provide to assist people to digest this information (Darken & Peterson, 2001). Maps can be isolated into six types: (1) climate maps; (2) economic or resource maps; (3) physical maps; (4) political maps; (5) city maps and (6) topographic maps (Noble, 2000; O'Connor & Robertson, 2002). A city map is the one strategic long-range plan used by every local agency. It includes different sub types of maps, for example: road, rail and bus network maps, and these maps can be called 'public transportation map' or 'transit maps' (D. Smith, 2005). Transit maps have been a valuable tool to help plot an industry's future direction as the main navigation mediator of local features²⁵ (Darken & Peterson, 2001; D. Smith, 2005) (see Figure 7).



Figure 7 City Transit map, New York City

²⁵ For example, transit maps show us how to travel from block A to block G by using roads, buses, and trains, the best choice for saving time and money. Furthermore, it may also tell us about the physical characteristics of each local area if we are tourists and we wanted to find hotels in a convenient area, we notice the structure of road and public transport systems to identify which area is suitable. Meanwhile, businessmen can obtain advantage from road maps by analysing the land use, local infrastructure (road and public transport) and other activity sectors, such as which areas are suitable for investment in shopping centres, accommodation, entertainment, housing, and education.

Transit maps were approved for use in an urban transport system around 1889 with the London Underground project in London (Levinson, 1985). Maps became a way to share and support way-finding processes in a city environment by depicting routes to different destinations (MacEachren, 1986). Comparison of guiding ability, between individual use of a map and direct signs in a city, found that the reading map enables a reader to understand the spatial element of their self-location. A map also aids fast orientation to a point of destination, rather than following a direct sign at a nearby corner all the time (J O'Neill, 1991a)²⁶. Freundschuh (1991) explained that maps can be created so that with self-localisation indicators, using a map is easy, and supports the acquisition of survey knowledge of the reader (see example in Figure 8). One map may be appropriate for many users with many different destinations (Richter & Klippel, 2002).



Figure 8 A comparison between using a map (a) and following street signs (b) for travelling in London

The role of maps makes the basic structures from a spatial geography view of the world into categories of information which are scattered across a real physical environment (Tversky & Lee, 1998). The map structure offers people the opportunity to directly obtain spatial relationship information, which is significant for way-finding missions in a virtual setting (Freksa, 1999). Freksa's ideas supported the research of Arthur and Passini (1992) and Corrae and Jesus (1994), where people were able to identify their locations in an environment when they had information about their spatial orientation. Meanwhile, Tolman (1948); Downs and Stea (1973), and Golledge et al. (1996) argued that to create this knowledge, cartographers (map-makers) have to be concerned with

²⁶ O'Neill footnoted that use of only sign systems can create a problematic journey: (1) a sign only system may see people get into difficulty when surveying a whole city image, missing indicators of self-location when they depend solely on direction sign way-finding (J O'Neill, 1991a). (2) Signs present only directions, not routes, for example: they direct people to one destination in each sign, and then they have to look for other new signs to find a new direction. (3) Signs are one way, for example: when we use the sign A to go to place C, we cannot use the same sign (sign A) to go back to the starting point (J O'Neill, 1991b). This can be compared with the efficiency of a map which presents route structures to indicate several directions. There is no requirement to provide another map at a nearby corner all the time, as with the sign system (Freundschuh, 1991).

the cognitive learning of individuals (readers) in spatial orientation; that is, when people see graphical elements on a map. It was a challenging process for me to make clear the relationships between ‘environmental details’, ‘the design concepts’ and ‘human factors need’ in the structure of the transit map. Finally, the success of making maps is not only duplicating the other (transit map) models or creating a well-designed physical environment, but also the representation of a suitable cognitive map, in which people who can read maps can have the ability to identify their location in an environment.

2.3.2 Cognitive Features of Public Transport Maps

This topic reviews the category development of a public transport map which relates to the cognitive learning of map users. The categorising features of a public transport map style were utilised in the choice of answers in my survey, in order to investigate the proper map style which related to the reading map skill of my target audience.

The Geographical Information System (GIS) is a main principle to specify in the pattern of map making. It is applied for use in a variety of fields, i.e. military, politics, commerce, education and transportation (Avelar, 2008). Most GIS studies have been applied to create great benefits for the transportation field, because the sector has many impacts on a human life-cycle. Small (2007) explained that the transportation systems are the main mechanism to establish human activities. The system also has dynamic power to drive the activities in ecology systems, i.e. social development, environment protection and economic development (Adams, 2006). Nevertheless, the use of GIS pattern styles was a hotly argued issue for many scholars, for example: Garland (1994); Hadlaw (2003); Wolff (2007) and Avelar (2008). Garland (1994) stated that in 1933, the big-bang of transit map patterns was changed after the London underground map was redesigned by Beck. His ideas integrated the interdisciplinary knowledge between graphic design and cartography principles. The 45 and 90 degree theory and grid system were replaced by the geographic pattern (hand drawn-style) represented by graphical patterns in Beck’s ‘diagram map’ (see Figure 9, picture: a, p.55).

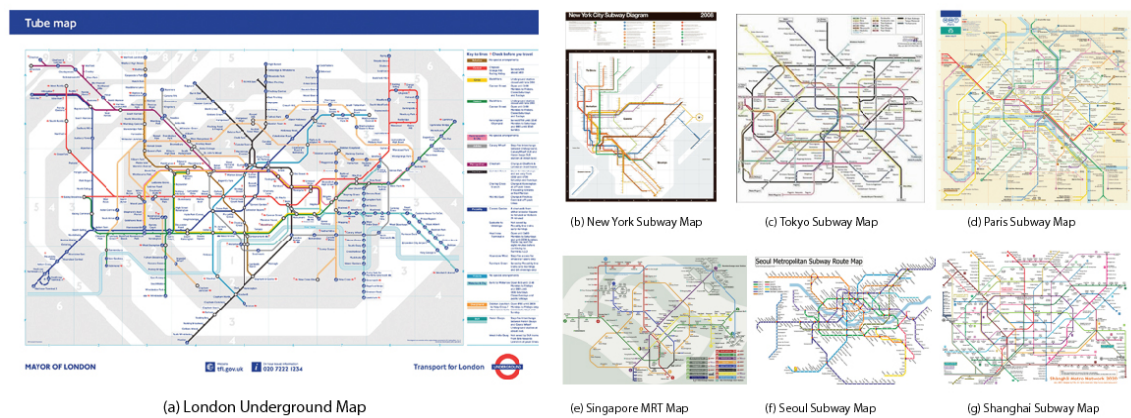


Figure 9 The LUG map (Beck's style) is the prototype for every transit map around the world

Beck recognised that Londoners understood a simple visual logic style to navigate them. Hadlaw (2003) claimed that Beck's style not only clearly presented railway directions and transiting stations, but also had logic, under the printed map, coherent with user experiences. This map style has influenced, and has become the prototype pattern for, most city-transit systems around the world (see Figure 9, picture: b,c,d,e,f and g) (Allard, 2009; Garland, 1994). The pattern has become the universal standard for map designers to follow.

More recent discussion has proposed further ideas. Vertesi (2008) decried that while Beck's maps were easy to understand with simple graphical images, in terms of the physical environment they are different from the real geographic setting of London city (see Figure 10, p.56). Meanwhile, Roberts (2007) explained that the unnatural pattern of Beck's map could only be used by people who have familiarity with or often used the London underground (LUG) service²⁷. On the other hand, research by Wolff (2007) and Avelar (2008) experimented by applying the GIS concept to develop UTS map features of Sydney and Zurich, graphically imaged and based on virtual geography. The aims of their experiments were to see if people wanted to gain more spatial knowledge in a large space, by looking at the simple graphical style related to a real physical environment in a printed maps pattern. This experimental style wanted to provide people with a better understanding of the physical geography of the UTS than the Beck style, for both people who had familiarity, or were unfamiliar, with a transit system (Avelar, 2008; Roberts, 2007; Vertesi, 2008; Wolff, 2007).

²⁷ One of the interviewees in Vertesi's research said: "I'm thinking of the subway map first of all, but that isn't a very useful map for the above-ground" (Vertesi, 2008, p. 23). A new map view of the London underground was published by Maxwell in 2005 (Vertesi, 2008). This map was presented to an official at London Underground Limited. The response was telling: "You should entitle it the Devil's Map" and "I think it's psychologically very disturbing to see London messed around in this way" (Vertesi, 2008, p. 23).



Figure 10 The comparison of visual images between 'the virtual geography on the ground' and 'diagram map style of Beck'

(a) The geographic image of LUG on the ground, (b) The diagram map style of LUG

Therefore, the characteristics of transit maps can be summarised as featuring (1) geographical styles, (2) graphical diagram styles and (3) combinative styles (see Figure 11). Choosing map styles to make people understand the real physical environment of transit systems toward printed maps is a challenge. Four variables: (1) user's cognition (human factors), (2) transit operation, (3) design principles and (4) geographic environments in a city space, must be considered before creating the transit map. Because of the different groups of users, cultures, geography and urban transport system needs, a sustainable map design, needed to communicate in dissimilar ways based on universal standards, is complex. The next topic presents the important and powerful role of symbols in map communication.



Figure 11 Summary of the three transit map features in the case study of LUG maps

(a) geographical style, (b) graphical diagram style and (c) combinative styles

2.3.3 The Significance of Symbolism in Map Communications

Even before humans had a written language and orthography symbols appeared in different forms of signs as a pictographic representation for creating communication as

a common language. (Fritsch, 1947). A symbol is one of the elements that have a powerful significance on the ability of transit maps to communicate. Well-designed symbols can create more general recognition and faster accuracy of understanding of messages than similarly worded signs (Edworthy & Adams, 1996) (see Figure 13). Maps present a complex route image and provide locating orientation diagrams to describe public spaces to passengers, but symbols present visual communication rather than verbal language to people who are not the native speakers in those locations (Gibson, 2009). Walker et al. (1965) and King (1971) compared subjects' ability to interpret the meaning of symbols and word highway signs. The results showed that most people have more accuracy in interpreting symbol signs than word signs. The symbol signs were easier to match for 65% of participants.

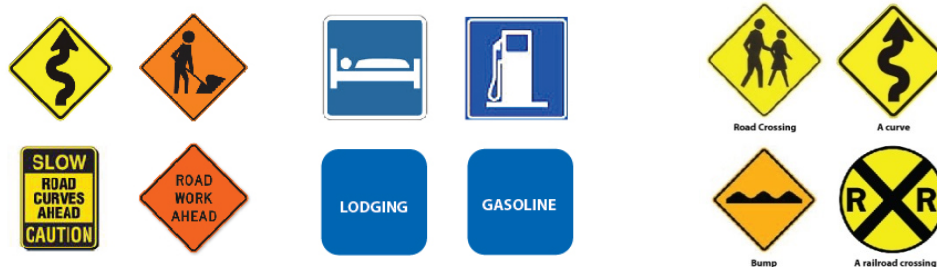


Figure 13 Example of the appropriate use of symbols

Figure 12 Original four 1909 road signs

King (1971) stated that the uniformity of a symbol-based sign system was established for traffic information signs in 1909 by four road signs (see Figure 12). In 1953, the United Nations (UN) continued this idea by specifying fifty road signs in a protocol, making a standard system to apply in thirty countries, mostly in Europe and Asia (United Nations, 2005b). In 1960, the airline industry applied symbols for international travellers in an airport (Calori, 2007). The result meant that international travellers, who do not use the native languages, can understand those symbols (Waller, 2007). This point made the symbols prevalent in many public places, especially in international transit fields. Therefore, symbols have to convey a message which people can understand without needing to speak or be familiar with the native language. It means the symbols require the expectation of visual literacy, which is not universal.

Zwaga and Easterby (1984) listed five criteria for these symbols: (1) use only the essential facts about concepts for a graphic image, (2) the design should be uniform throughout the graphic and the entire graphic system, (3) the symbol should be in as simple a form as possible, (4) silhouette views tend to contain more distinct and useful

information than frontal views, and (5) it must be different enough from other symbols. In 1970, the ISO worked on developing comprehension in public information symbols under the code ISO7001 (ISO7001, 2007a). The ISO tested the procedure of evolving symbol systems design overtime, and also evaluated the variant of systems based on two criteria. The first is ‘appropriateness’. This is a prediction from controlled populations or ‘sampling groups’ for estimating the percentage that will intuitively understand the symbols. The second is the public’s comprehension of those symbols. The ISO suggested a figure of 67% comprehension of the control groups with the symbols system (ISO7001, 2007a). These criteria can help designers to winnow a large number of graphical images to be tested down, for ease of management of a symbol design on a transit map. ISO7001 was applied as the key method to audit the usability of map symbols and the other graphic design sections in my prototype map (see details, p.220 and Appendix D); while the key criteria of Zwaga and Esaterby were influential in designing my map symbols. In criteria number one, I discovered that a designer cannot define which graphic image does or does not have ‘essence’ by him or herself. Some details pertaining to a graphic image in a symbol may be useful in some specific settings or audiences. This is because different places, culture, and behaviour can vary in individual cognitive learning (see discussion details, p.241).

To design a symbol, designers have to clearly understand or evaluate what type of visual symbol matches the cognitive level of target audiences. Rogers (1989) stated that symbols are visual representations, or apply images to symbolise an object, action and concept. Many scholars classified symbols into three different types: (1) image-related²⁸ (pictorial), (2) concept-related²⁹ (signage), and (3) arbitrary³⁰ (symbolic) (see Figure 14, p.59) (Beardon, 1992; Modley, 1976; Y. Rogers, 1989). The last category is difficult to recognise, hard to learn and hard to remember. It requires special context and knowledge. The design symbols will be clearly interpreted if the visual of the symbol matches with users’ cognition, experience and background. Graphical symbols or icons on transit maps should be designed for user’s ease of understanding when they have only a short time to read.

²⁸ It is a highly pictorial representation of the object or action they present, including direct comprehension of the symbol itself.

²⁹ It is based on an example or property of the real object or action.

³⁰ Resembles the object or action they present, but becomes meaningful only through convention and education.

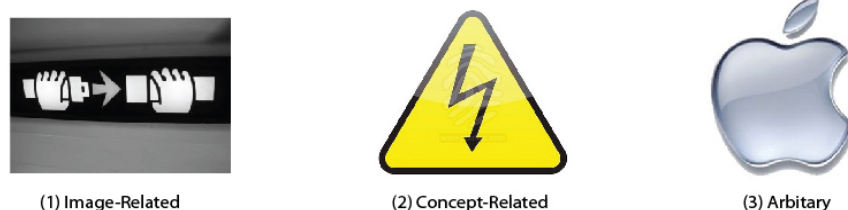


Figure 14 Different types of symbols

In addition, Cowgill and Bolek (2003) noted that the consideration of cultural perception is one of the key successes to creating a useful set of symbols. They stated that although the aim of the international symbol of ISO dealt with intuition in human perceptions, including creating an automatic ability to be read and to communicate with people who are not users of the native language, it is a false assumption that a symbol will necessarily be understood by pre-literate or even literate people (Downing & Cynthia, 2002). The background and culture of people will affect their perception and interpretation of a meaning of those symbols. Lipton (2002) confirmed that different cultures could be impacted with graphical images in different ways, for example: the levels of symbol image, symbol usage, body language, colour and gender. For example, in the case of body language used in the symbol of waiting room services in the United States of America (the man sits on the chair with legs-crossed), the test showed that this communicated with a large number of Western people. On the other hand, testing in China and Japan showed that people were uncomfortable with this symbol, because in their cultures it was impolite behaviour (Downing & Cynthia, 2002). Cultural perception is one of the key investigatory themes in my research fieldwork. This inquiry gave me the advantage of understanding the local background and way of life, to which these variables were applied and transformed to be a part of the key graphic images in my design (see details, Chapter 9, p.258). In this stage, the understanding of semiotic thinking was applied to the design processes. The next topic describes the semiotic and symbolic concepts.

2.3.4 Semiotic Thinking

Semiotics (also called ‘Semiology’) is the study of cultural signs and processes (semiosis), signs/symbols, and analogy/communication (D. S. Clarke, 1987). It informs people’s ability to interpret, e.g. images or other sensory input, and also attempts to comprehend and describe how different meanings are defined, based on variables of context, culture, sender and receiver (Daniel, 2007). The focus of semiotics is the

concept of the ‘sign’ (F.D. Saussure, 1974). Saussure (1983) offered a dyadic model of the sign in his semiotics theory by isolating a sign as being composed of a ‘signifier’ and the ‘signified’. The association between these compositions defined the whole results of the sign (see figure 16). A signifier includes everything which was tangible, i.e. objects (pictorial, written and body language), smells, sounds (i.e. verbal language), and tastes, while the signified is the concept of those tangible representations (Deely, 2005; F.D. Saussure, 1983).

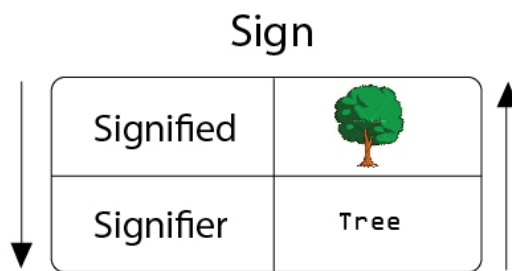


Figure 15 Saussure's semiotics model,

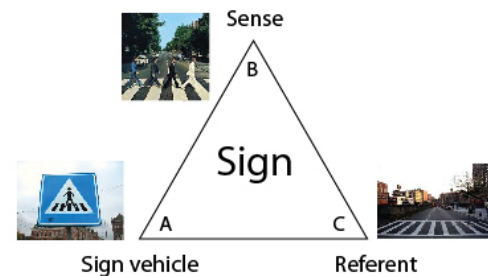


Figure 16 Peirce's semiotic triangle model,

Silverman (1983) and Nöth (1990) referred to Peirce’s (1958) sign model as more suited to apply in the designing processes of a sign, because the model focused on the structure of the semiotic triangle in each sign expression level (see figure 15). Meanwhile, Saussure’s model was generally described in social science perspectives, e.g. linguistics, politics and human recognition fields. A ‘semiotic triangle’ is composed of: (a) a sign vehicle (the form of the sign or any graphical sign system), (b) the sense (the sense made of the sign), and (c) the referent (what the sign ‘stands for’). These represent the meaning of the sign (Nöth, 1990). The model has steps in interpretation from (a) to (c). By emphasising ‘state c’ for design consideration, the success of the sign is communicated. The last state (referent or an object) is the final stage of thinking in humans to understand the meaning of a sign image (D. S. Clarke, 2003; Deely, 2003).

These semiological studies indicated that different cultural perspectives, such as environment, way of life and language, directly influence the process of individual interpretation. For example, although the word ‘House’, in Thai-Isan ‘เฮือน’ uses the same concept of meaning; the character sets of languages are different with respect to the alphabet form. Moreover, the differences of this alphabet system reflect the different root of semiotics thinking. Figure 17 (p.61) compares the mentality between Western and Isan people with the word ‘House’ in their languages. It can be seen that the key

visuals of individual interpretation are extremely different³¹. The geographies make the unique form of the perception of 'house' in their minds.



Figure 17 Comparison of semiotic model between Western and Isan perceptions of the word 'house'

With respect to 'Eating', Western and Isan people have totally different utensils and eating styles. Figure 18 illustrates the process of a semiotic triangle between Western and Isan eating styles, which impacts on an individual's perception when interpreting the meaning of the eating symbol. Therefore, the influence of cultural background impacts on the interpretation and sensation with a visual sign; and includes language signs (character set of language). Both points were investigated in my fieldwork in order to ascertain the appropriate symbol and visual graphics which match with my target audience and reflect the local culture (details are provided in the next stages).

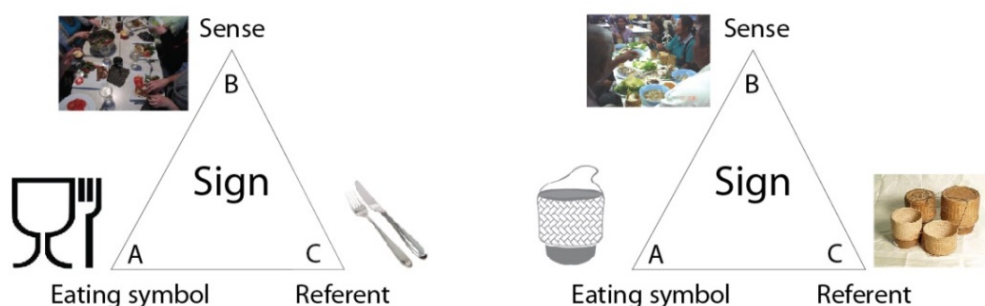


Figure 18 Comparison of semiotic triangle between Western and Isan interpretations of eating symbols

Another key factor which has importance in semiology is the semiotics levels. It involves the study of different cognitive levels of human beings with sign recognition (D. S. Clarke, 1987). The relationships of semiotic levels are able to be divided into three states (1) semantics (the relationship between signs and objects, they refer to

³¹ The key visual element of a Western house consists of a chimney, brick wall, and dense shape because they are generally in cold and windy countries. Meanwhile, an Isan house contains wood put up with poles in order to make the wind flow; because Thailand is a hot country.

denotation ‘denotata’), (2) syntactic, (the relationship among signs in the official pattern), and (3) pragmatics (the relationship between signs and their meaning, defined by people who use them) (D. S. Clarke, 2003; Daniel, 2007). O’Grady and O’ Grady (2008) and Peirce (1994) further classified individual signs in semiology levels as (1) icon/iconic (a literal image that resembles the signified), (2) index/indexical (a signifier with connections with simple images to describe objects dependent on the context), and (3) symbol/symbolic (the signifier does not related with signified. More abstract, the meaning of an image at this level is created by a group of people. Figure 19 presents pictures of basketball player Michel Jordan which illustrate the semiotic level of each individual sign in order to represent him.

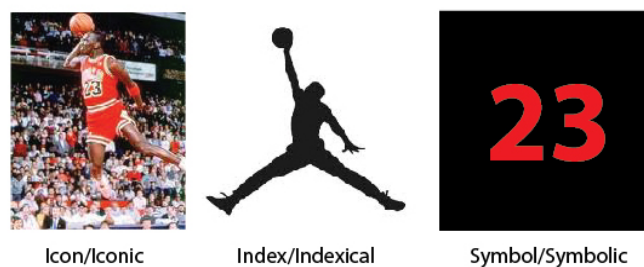


Figure 19 Individual sign in semiotic levels

It can be noted that the semiotic levels and individual sign have a relationship with the concept of symbol types (discussed in the above topic, p.59). In Table 1, I compared the relationship matrix between these criteria of symbol systems which are articulated in human cognitive levels. This is because I believe that studying only the cultural backgrounds of individual/groups in any community is not enough; rather there is a need to consider the level of human cognitive learning with visual perception. This point assisted me to produce the right type of visual symbols and graphic images, suitable for my users’ experience and cognitive learning (see discussions, p.243). The next topic describes the role of map symbols in the map and presents the principles of hierarchy and proximity information in the way-finding map system.

Human Cognitive Levels	Symbol Types	Semiology Levels	Individual Sign Levels
<i>Level 1</i>	Image-Related	Semantics	Icon/Iconic
<i>Level 2</i>	Concept-Related	Syntactics	Index/Indexical
<i>Level 3</i>	Arbitrary	Pragmatics	Symbol/Symbolic

Table 1 Comparative semiotic paradigms relating to human cognitive levels

2.3.5 The Role of Map Symbols in a Way-Finding Map System

A map symbol is the main instrument for representing a pictorial graphic to communicate and navigate people to understand and to go to their destinations. Without a symbol, we would not have a map. Map symbols reduce the complexity of real geography by using a graphical representation (see Figure 20 a,b) (MacEachren, 1982). The design elements, for example: lines, shapes, values, colours and texture have significance to create the characteristics in the meaning of each symbol (Kennedy, 1999). For example, different coloured lines on the transit maps represent the difference between bus and train services (see Figure 20, c). The thick or bolder and thin proportions of lines on the road maps to represent a street can be divided in a street hierarchy, i.e. which are main roads, streets or lanes. To correctly read and interpret a symbol or graphical material on maps, a ‘Map Legend’ is a key to all symbols applied and gives definitions on a map (Avelar & Hurni, 2006). It resembles a directory for map readers to understand the meaning of what the geometric image on a map represents (see Figure 21).



Figure 20 Ability of map symbols to communicate



Figure 21 Examples of map legends

Forrest and Castner (1985), and Clarke (1989) stated that inefficient map symbol design meant tourists lost the skill to understand and determine their directions for journeys. Clarke experimented by comparing two published tourist maps that used different design techniques of map symbols. The results showed that the second map, which was designed using geometric or pictorial symbols to resemble key objects, enabled tourists to depict the mental map in their mind, assisting them to travel by reading the quality map symbols.

Calori (2007) and Gibson (2009) summarised the categories of map symbol functions in a way-finding system, separated into graphical signs followed by: (1) 'Identification signs' displaying a visual symbol, the name, and function of place or space, for example: a room or a gateway, where the purpose is purely to communicate. (2) 'Directional signs' providing the information cues that guide people who need to keep on the move when they have entered a space such as underground parking, or inside a building, at an airport. The main graphic display mostly includes arrows, symbols and typography. (3) 'Orientation signs' explain a complex space that offers to travellers and visitors an opportunity to understand and overview their surroundings, in the forms of directories or site maps. Orientation maps need to be associated with other identifications and directional signs in a display system. (4) 'Regulatory signs' describe what a reader may do or may not do in a place. There should be easy physical images for intuitive recognition, i.e. mobile phone or no smoking signs. However, these categories often merge into the one system in the case of a large space such as: universities, airports, shopping centres, and transit stations. Based on this situation, the design of navigating processes needs to be approached in a hierarchy, and proximity concepts help to categorize a layer of information in the complex spaces.

The hierarchy and proximity concepts intersect in the planning of navigation processes to guide people from general to specific destinations by using the sign information system (Calori, 2007; O'Grady & O'Grady, 2008). From a broad place, these concepts can navigate people to learn their journeys step by step (Tufte, 2001). For example: a woman who lives outside the city wants to go to the lecture room 007 in university 'A' in the downtown city. She must start to travel finding her way to the city. Next, she has to find the way to go to university A within the downtown, followed by identifying the building that her lecture room is in, within the university. Then, she has to locate the floor of the building where room 007 is located. She needs to feel safe all the way. This example (see Figure 22) presents the steps of the journey processes to go to the

classroom. These steps can be identified as ability levels and roles in a sign information system, needing to match with a journey plan.

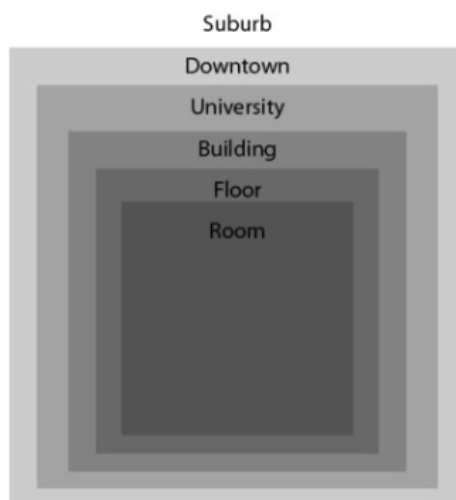


Figure 22 A journey from a broad place to specific destinations

The hierarchy concept is applied for developing sign information by analysing all variables within the project setting (Calori, 2007). The process starts from analysing a section of destinations under the project environment, which guides usage. An arrangement of steps is made, with important destinations of sign usage, before designing and defining a sign information system (Berger, 2005). The proximity concept becomes hierarchical. Information signs at various hierarchy stages have a limited message capacity to display overall destinations by using the full set of sign detail information, which includes pictography, colour systems and typography within the same board (or map) environment (Calori, 2007). The approaching proximity concept defines the scoping area of a way-finding map display, which can cut off other details of other areas that do not relate with the present space³². The ways to cut off a detail and create attractive areas can be designed by applying several techniques (see Figure 23, p.66), for example: (a) putting text details in specific areas, removing text details from unnecessary spaces, (b) cropping zones or areas specific to the present, (c) using a colour and sign in presenting areas and dropping a shade in an unused space, and similar methods.

³² This is because too much information displayed makes readers have to add and delete messages that they read all the time (Barratt, 1993; Kinross & Spiekermann, 1993). This impact can create an 'information overload' or 'map shock' phenomenon (this will be explained in the section of design theory, see chapter 4) that affects human perceptions, making it harder to read and confusing in identifying the location (Toffler, 1984; Wurman, 2000).

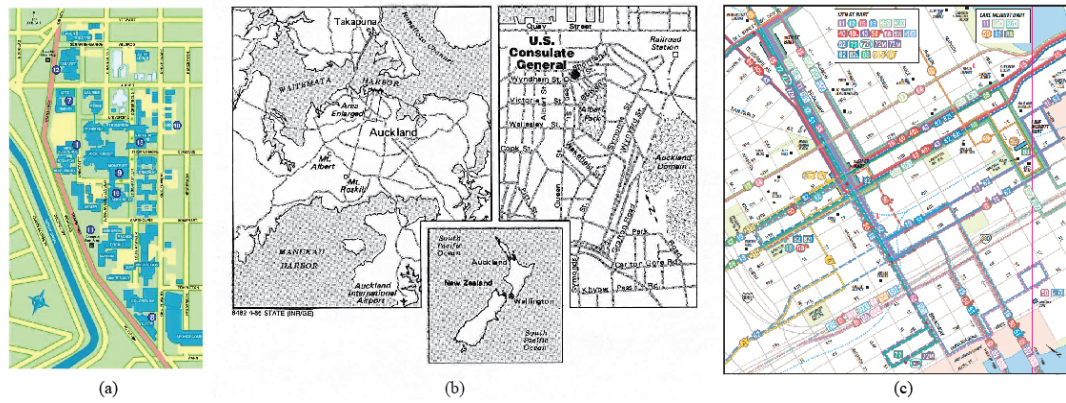


Figure 23 Proximity design techniques for emphasising the scoping area on way-finding maps e.g. (a) cutting details, (b) cropping zones, and (c) using colours, marks and dropping shades

Finally, an understanding of map symbols, legends and types of graphical sign systems assisted me to define the appropriate category of graphical images in my map prototype. These graphical representations were organised based on hierarchy and proximity concepts in order to create the proper design layout for the visual perception of map readers. Meanwhile, the information design, design elements and principles of organisation design theories were the key successes to build efficient graphical materials on the navigation systems, which can be simply communicated and contain the messages for users' ease of interpretation (see more details, Chapter 4). The next section presents the case study backgrounds of developed and developing countries which have used and developed way-finding maps for their UTSs.

Section 3: Case Studies

This section studies the developing concept of a public transport map in the UTS with two groups of countries: (1) developed and (2) developing countries. The interesting points in these case studies are described as the overview of the conceptual framework in issues of improving navigation system processes in a UTS, solving transit problems in urban areas, analysis of improving a transit strategy, and passenger behaviours. It also includes examples of the advantages, problems and barriers to improving a public transport map in UTSs.

3.1 A Case Study of a UTS in the UK

I selected the London Underground as one of my case study backgrounds in order to describe the evolution of the oldest (transit) map in the world. This case study presents the overview concepts of a transit system and developing a Public Transit Map model,

which impacted the cognition of the inhabitants. These factors are evidence to indicate that Westerners have a long experience and familiarity with using maps in their travelling behaviour.

3.1.1 Overview of London Underground (LUG)

London Underground (LUG) is the oldest mass rail transit system in the world (Day & John, 2001). The origin of the LUG conceptual framework came from the 'District Railway' for commuting Londoners between the city and a district (Wolmar, 2004). In 2007 'Transport for London' (TL) recorded the number of trips since 1863 as 1.1 billion journeys (Transport for London, 2007). In 1890 LUG developed a new transit system by applying the 'electric train' to replace the 'coal' systems to protect the environment and reduce traffic congestion. The new operation system of LUG was called the 'Tube', controlled by regulations of London City (Green, 1987). In 1933 TL targeted the LUG as the main vehicle for transferring a passenger to other public transport in urban and sub-urban areas within London city, for example: buses, trams and ferries (Transport for London 2010). In 2010, LUG operated the most stations (270) in the world for serving a passenger system (Rose, 2005). With so many stations to serve people, the LUG system might have been a nightmare for people who did not live in London. Although the LUG system appears complicated, the operations of LUG have organised guiding service systems for any passengers including train services, timetables, ticket management, convenience for locating stops and stations, and safety (Wolmar, 2004).

3.1.2 Transit Operation of the LUG System

The LUG operation teams have not only focused on the transit infrastructure of the Tube systems, i.e. number of track services, the quality of transit facilities, commercial, financial and rental management in stations, and transit technologies, but they also emphasised navigation systems for travelling (Levinson, 1985). This system is specified on the navigation (transit) map systems which provide the LUG transit data. If we look at the components of the LUG system carefully, it can be divided into three elements: (1) passengers; (2) places; and (3) services (see Figure 24, p.68). To connect those elements, we must find some of the connecting variables. Wolff (2007) described the purpose of public transport maps as being easy for guiding the use of transit networks for passengers. They must also help passengers to quickly answer their common journey questions, i.e. "How do I get from X to Y?", "Where do I have to change trains?", "How many stops are left?", or "Where do I get off the train?" (Wolff, 2007, p. 1). The

variable that connects the gaps between these elements is ‘Information’ (maps) (O’Grady & O’Grady, 2008).

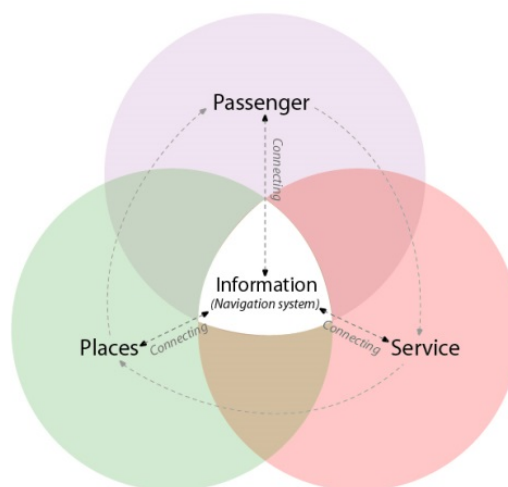


Figure 24 Dividing the major elements of the LUG system

McDermott and Davis (1984), and Passini (1984) stated that most human beings will lack the ability or skill to identify their location when they are unfamiliar with physical environments. A way-finding map (information) is the keystone to guide people to feel able to arrive at their destinations (Gibson, 2009). Where passengers do not comprehend the lists of information of transit services (e.g. train routes, ticket fares, and timetable station services), they may get confused, get lost or be too dissatisfied to use the transit systems (Abdel-Aty, 2001).

3.1.3 Development of the Public Transport Map for the LUG

Since 1890 London city has tried to develop the LUG map to create easy understanding of train route services for passengers. This map applied the design concept from the railway plan of London (see Figure 25-a, p.69) (Levinson, 1985). The first map of LUG was issued in 1902 by using a two colour concept. The blue colour was used to represent the railway services, while the red colour described schematic streets (see Figure 25-b, p.69). However, use of the blue colour design for several track services made passengers confused about separating the service lines. Therefore in 1908, the design was changed by adding more colours to make the diversity of tracking services easier to understand (Ellis, 2005). Designers also dropped the background colour (schematic streets) for building the colours of LUG track services with more contrast than the previous style. It was the first time the ‘symbolics’ and ‘map legend’ systems

were used on the LUG map (see Figure 25-c). In 1910 more information was put on the LUG map, giving details of a user's position, and station addresses, controlled by using the grid system to identify a location on the maps (see Figure 25-d).

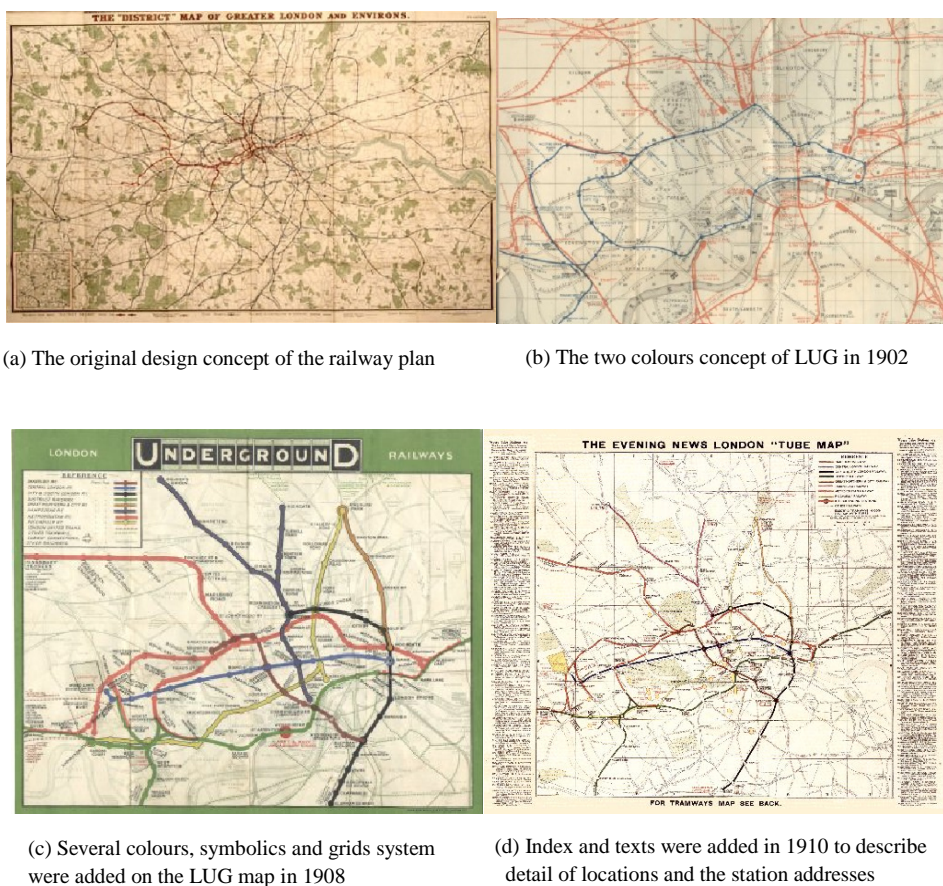


Figure 25 The development of concepts in LUG maps

In 1933 the features of the LUG map changed with Harry Beck's design. He introduced the new diagram map concept, by integrating the knowledge between graphic design and cartographies (Halliday, 2001). Ninety and 45 degree techniques were applied to design the new visual logic on transit map communication. Beck used this design concept to create simple logical images to communicate with readers by changing the geographic map form (or drawing map technique) toward the diagram map style (graphical materials) (see Figure 26, p.70) (Wolff, 2007). He believed that the new map features could attract reader's concentration and focused on the overview of LUG track services, rather than reading a complex shape of geographic lines. Hadlaw (2003) argued that Beck's work shared a common sensibility and coherence with user experiences to make them understand the logic of map reading with information graphic representations. This big radical change of a new LUG map feature created a positive view of the new personality of the LUG service, which became the modern transit

system overnight. This map feature also became the prototype for any UTS maps to apply and follow, for example: in cases of New York, Tokyo, Seoul, Paris, MRT (Singapore), and Shanghai subways. (see Figure 6, p 49) (Albert, 2008; Garland, 1994).

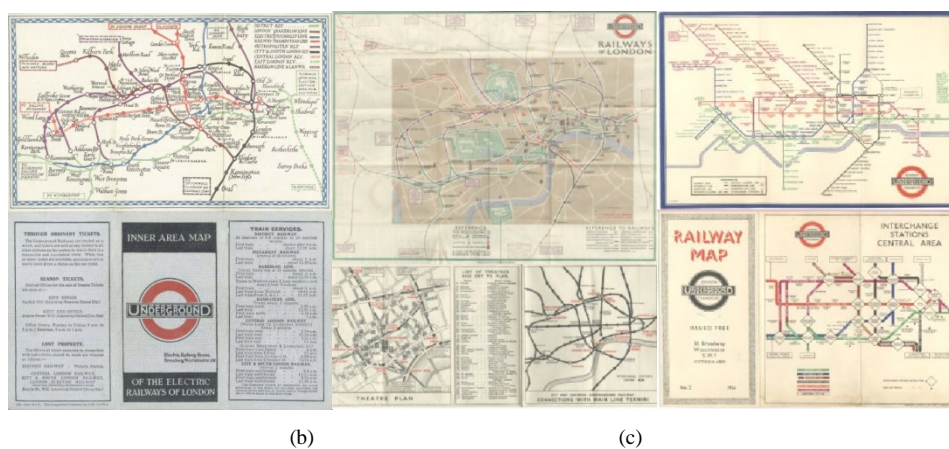


Figure 26 The two styles of LUG maps

The (a) and (b) pictures illustrate the drawing (geography) maps style while the picture (c) is the new feature diagram map style. (a) LUG map in 1924 designed by Betts; (b) LUG map designed by Stingemore; (c) LUG map in 1933 designed by Beck

3.1.4 Supporting other Guidance Systems

The navigation system in London and other developed countries developed the way-finding map on the ground to make these coherent between their ‘UTS’, for example: buses, trains, and trams; and ‘journey systems’, for example: pedestrians, cycles, and tourists, working together. For example, TL developed and released a ground navigation system map around London city for providing journey information to pedestrians and tourists (Turner, 2010) (see Figure 27).

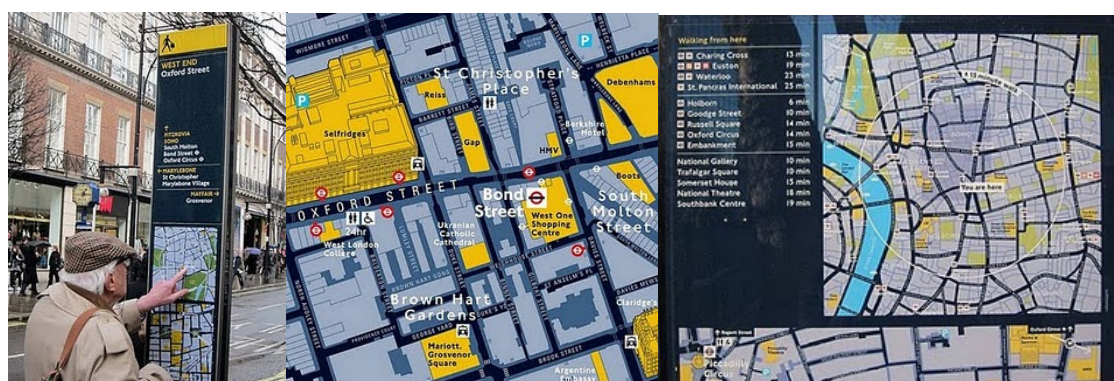


Figure 27 London navigation systems

This system also serves as information that connects with London's UTSs, such as locations of bus stops (BRT) and LUG stations, and also includes places of interest for pedestrians and travellers, for example: markets, shopping centres, state agencies, parks, and sightseeing places. This project applied Lynch's design concept (1960) that consisted of what the five traits of the navigation system in a modern city should be (as described in section 2). The London navigation system map enables people to understand an overview of London's city image that includes road information, transit points, and remarkable places. It is also advantageous for tourists who come to travel in the city (Turner, 2010). With the above processes, the sustainable transport development of London City is one of the paramount models that integrated land use planning and transit-oriented development (TOD) collaborative concepts. This matching concept of TL coheres and supports the concept of sustainable development that is concerned with the three ecosystems parts. London's UTS is a model other countries have followed as the prototype for developing their urban transport strategies. Creating good-transit planning and functional systems are not enough; the effectiveness of UTSs still depends on the availability of infographic materials that improve the capability of users to navigate in a system (Avelar & Allard, 2009).

As previously mentioned, it can be seen that the evaluation of guidance systems in Western public transport has been applied and articulated in the lives of Westerners. The reading map experience for travelling is embedded in most of their transit behaviours. In comparison, some developing countries are still far removed from this behaviour. The next topics illustrate some of the problems in creating a public transport guidance system in developing countries. We can see the comparative situation between different user experiences and the different evaluative processes in the public transport guidance system.

3.2 A Case Study of a UTS in Chile

This section provides overview of the obstacles in the development of a public transit map in Santiago, Chile and Bangkok, Thailand. The first case study reflects the impact of radical change by reforming the UTS and introducing a new guidance system for a new transit operation in Santiago. The problem in transport strategy that affected the transit culture in Bangkok is the key case study to understand why Thailand is behind other countries in the context of a modern UTS and in transit map experience.

3.2.1 Context of Transportation in Santiago

Santiago is the capital city of Chile and has a population of about 6 million people/1,400 km² (Muñoz & Ortuzar, 2008). Many residents spend time travelling more than an hour each way to cross the city to go to work (J. Allard, 2008). The origin of the city's urban transport system (UTS) was the 'chaotic bus system' usually called 'Micro', but referred to officially as the 'Bus Rapid Transit' (BRT³³) system (see Figure 28). Accidents on city roads and traffic were caused by inefficiency of the transit organization of the Micro bus system. This situation also affected the transit and commuting behaviors of drivers toward passengers. For example: most of the Micro bus drivers were owners of buses that were snatching customers at a bus stop or stopping a bus anywhere. These behaviors made for a heightened risk of accidents with people and other vehicles on the road³⁴ (Mintegiuga, 2006).

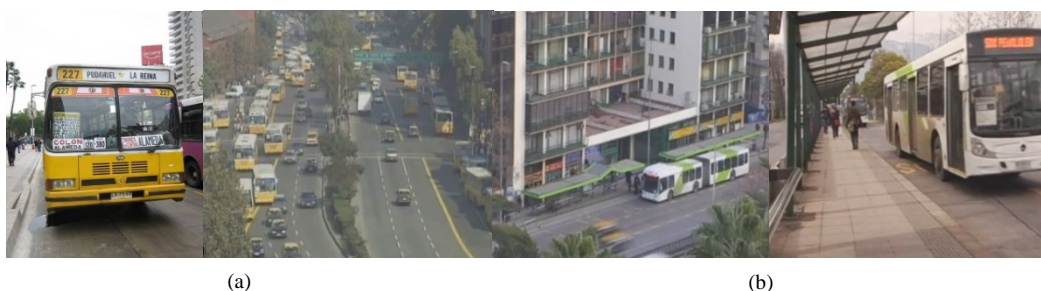


Figure 28 The 'Micro bus' and new BRT of Santiago, Chile

Picture (a) presents the old system (micro) reformed as local bus lines (feeders), while picture (b) presents the new system (BRT)

In 1975, Santiago opened an underground train system, the 'Metro' project, in order to support the rapid population growth in the city that had increased by more than 50 percent from 1920 to 1944 (Darbera, 1993). In 2010, around 2.3 million passengers in the city were served by five service lines and 101 stations of the Metro system around Santiago (METRO Santiago, 2010).

³³ BRT is a transit system using buses to provide faster service in commuting passengers on the special (bus) lanes (R. Cervero, 1996).

³⁴ It also affected the behaviour of customers when they caught a bus, for example: walking on a street, competing to get on a bus, and catching a bus at any location, even if it was not a bus stop area. Drivers (owners) with long driving periods (morning until midnight) would become too weary and could sleep on duty, again risking accidents with drivers and passengers. Users were confused in planning their trips with unpredictable time tables that were not provided or available. The Micros created noise and pollution. These were not clean and well maintained buses. The only thing to motivate customers was the low fare of the bus service (US\$ 0.65 cents per time) (J. Allard, 2008). There was poor management of the UTS in Santiago, and it changed transit behaviours, and built a transit culture that got harder to solve.

3.2.2 The Big-Bang Project of Transantiago

In 2007, the different UTSs of Santiago combined together into one system called the ‘Transantiago’ project. The Transantiago (TS) project reformed all of the transit modes in Santiago by integrating with the local Micro bus feeder lines, the main bus line (BRT) and the subway (Metro) network (McConville, 2010). It also included consolidating the fare systems of all transit modes together with a ‘Prepaid Smartcard’ (Muñoz & Ortuzar, 2008). This system allows users to use Metro to Metro, Bus to Bus or Bus to Metro and Metro to Bus transfers for the price of a single ride. Allard (2008) stated that the main aims of the project were to improve user quality of UTSs, and also eliminate the competition of vehicles on streets, increase the bus fleets, and reduce the number of buses and air pollution. These objectives were defined for making Santiago meet the development concept based on urban sustainability.

3.2.3 Graphic Integration of the Transantiago Network Map

With integration of the new transport project, the TS team not only responded to new services and management, for example: route integration, new fare and payment systems, and better-transit monitoring, but also the team needed to manage and deliver user information to guide passengers on how to use the new system (Gschwender, 2005). In contrast, the team in charge of managing information emphasized promoting the TS project as a commercial product, more than presenting information about how to use a public service. This was the cause of users’ confusion on the first day when the TS operated (J. Allard, 2008). Overnight on February 10, 2007, the big radical change of the brand new transportation network (with the new routes, user information, transfer stations, bus stops, and the payment system) that operated and ran around the city, made citizens become like tourists in their own city (see Figure 29, p.73) (Avelar & Allard, 2009). The complaints were from users who criticised poor user information, for example: the graphical navigation systems that included bus lines, and bus numbers. Without good preparation of the brand new transport network, instructions created ‘infinitely complex’ situations when users read the new network maps (Economist, 2008). The overcrowding of graphical materials, for example; network maps (BRT, Metro and Feeder routes, main transit stops and stations, interchange points, symbols and map legends, thermometer diagrams of fare, the ‘You Are Here’ map (for interchange points), and so forth) made most users, who did not have experience of

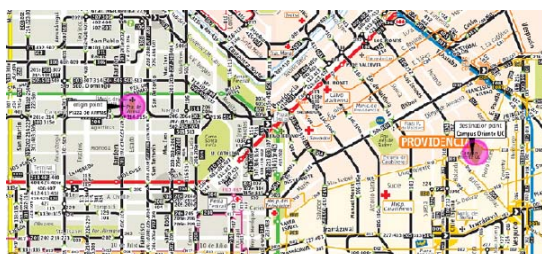
reading a network map diagram before, confused. Upgraded maps were needed (J. Allard, 2008).



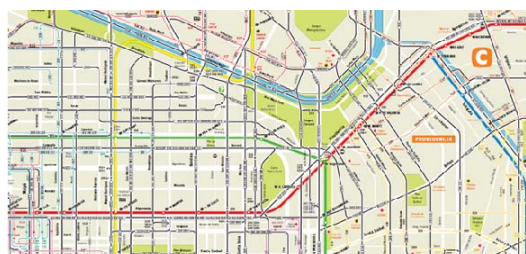
Figure 29 Outcomes in the first period of Transantiago operation

- (a) The busy situation in the first day when TS operated and TS users learning how to use the new system on a bus shelter

This set of TS network maps probably became the most complex design of transport navigation systems in Chile (J. Allard, 2008). The design had to deal with a complicated system that looked hard to read for users who did not have experience or had limited knowledge about the system. Users had to learn dual systems in the brand new transport system, trying to read and interpret overcrowded maps. Averlar and Hurni (2006) reported that improving navigation systems in transport not only helped people understand their transit networks, but these visuals also became an effective instrument for representing the physical environment of the city (see Figure 30).



(a) TS network map (2007) between J, B and C zones that was looked complicated with overcrowding of the graphical style



(b) The last update of TS network map (2010) that looked clean, but still is complicated to use

Figure 30 Comparisons of the map network of TS between first edition (2007) and last edition (2010)

The design was changed by reducing the size of typographies and the thickness of super express lines (black colour) and decreasing the overcrowding of graphical materials (information)³⁵.

In summary, the graphic navigation system is not only the keystone to guide users in finding their way, but also mitigates people's feelings of 'information anxiety' situations (this will be described in the design theory section) (Barratt, 1993; Kinross & Spiekermann, 1993). This problematic situation in Chile represented a mistake of the TS design team, who did not take users as participators into account in the process of

³⁵ The full map version is available on http://mapas.tcs.cl/transantiago/PDF/Mapa_General.pdf

design. In fact, the study and testing of user perception during significant stages, to define which design pieces might be successfully incorporated to better communicate, were not utilized.

3.2.4 Map style and Language Problems

The complexity of transit networks may be simply organized by using a GIS mapping style. The use of graphical images that relate to the real physical geography can help professionals easily to apply their networks and structures into the map. However, GIS may not be appropriate for general purposes (Garland, 1994). However, this map style was provided as the official map network in TS navigation systems (Avelar & Allard, 2009). The map concept created was too complicated for common people, with intricate symbols, colours, routes, and road images that were overlapping in some zones (J. Allard, 2008).

Although English is an official language of the world, in some countries they use English as a second language and it is still a main barrier to communication (Gallois & Callan, 1995). Those countries have been confronted with the hard job of communicating and interpreting using English. However, the transport maps have to deal with communicating at both local and international levels (Noble, 2000). Even though Spanish is the official language in Chile, many streets, public places, and landmarks, have names in Mapudungun (Mapuche language) that is the Chilean native language (Rector, 2003). Usage of Mapuche names is very uncommon, combining characters (long spelling) and accents in Spanish usage. This problem created a jumble of characters on the (complex zones) map that agitated optical perceptions. To facilitate the visualization, the typographers designed a TS typeface system by setting up traditional abbreviations and signs for replacing full names “(such as ‘Hosp’ for Hospital, ‘Muni’ for Municipalidad (Town Hall))” (J. Allard, 2008, p. 169). In addition, the TS network map and all database information, such as the official website, fell short of the international standard for language communication. They did not provide any English in the information, making their information facilities, for example: navigation systems and websites, hard to understand for foreigners to use the systems well.

In summary, the development of the TS project has similarities with my case study (see details, Chapter 3, p.94). However, this project occurred before the Khon Kaen BRT project’s commencement date. It can be seen that the problems in this case study came from the operating team lacking real participation from inhabitants. The outcome of the

public transport map and other guidance systems were the result of a failure to communicate with the end users. The inquiry of stakeholders includes user's knowledge³⁶ as a key factor of the communication successes ('users' know how to use the 'system') in creating a way finding system (Allard, 2009; Gibson, 2009; O'Grady & O'Grady, 2008). Studying the usability and piloting of new navigation systems and providing information about public services before operating the UTS, means we can decrease the communication errors with a user of transit services. I believe that the TS project is a valuable case study for every city creating their new UTSs. Lessons can be learned, especially for Khon Kaen city. The next section provides the background of UTS development in Bangkok, Thailand. These materials reflect the trend of public transport culture which illustrates the overview of transit use behaviour in this country.

3.3 A Case Study of a UTS in Thailand

3.3.1 The Evolution of Basic Transportation in Bangkok

In 1350 Bangkok or 'Bang Makok' (the previous name) was established by natives during the Ayutthaya Kingdom. Since 1782, Bangkok or 'Krung Thep Maha Nakhon' (in Thai) has been the capital city of Thailand. It has also become one of the largest metropolises and main hubs of transport, trade and investment in South East Asia. In the past (1350-1900) Bangkok residents settled along the Chao Phraya River and other canals, and people commuted, trading goods, working, and living by using boats (Korff, 1986). Occupants in Bangkok lived and travelled using waterway networks in their daily life (Beek, 1995). The local waterways conditioned their way of life. Water transport was the main instrument for travelling in Bangkok and also gave the city a reputation as 'Venice of the East' (Ross & Pongsomlee, 1995; Rujopakarn, 2003) (see Figure 31).



Figure 31 Chao Phraya River was the centre of commercial areas in the city of Bangkok

³⁶ e.g. social behavioural, cultural background and cognitive experts

In the mid-1800s Thailand was confronted with a period of colonisation from Western countries. To protect the independence of the country, many treaties were made by the Thai government and Western countries for trade and commerce. Thailand needed to modernise its facilities and technology to obtain acceptance (Sneddon, 2000). Major complaints from foreigners about trading and travel conditions throughout the Bangkok area caused the Thai government's decision to start constructing roads and bridges in the city (Bhamorabutr, 1987; Montgomery, 1994). Roads expanded into rural areas. Housing began to be installed alongside the roads, replacing riverbank development, while people spent more hours on roads instead of rivers (Suthiranart, 2001). From that period onwards, the pattern of water-based transport in Bangkok transformed into a road-based transport system.

3.3.2 Problems in the Bangkok Transport Strategy

Rujopakarn (2003) stated that Bangkok started out to maintain and protect against traffic congestion by investing significant resources on constructing new roads and motorway networks, rather than improving the UTS. Applying land use controls and a UTS concept to create sustainable transport development had never been an issue. The 1st to 3rd NESD plans (1962-76) emphasised economic growth by developing the basic road network. However, these roads were developed without the land use concept (Bongsadadt, 1987). In 1975 the first Act of Bangkok land use was designed by a German agency. This Act was included in the recommendations of the 3rd NESD plan (Rujopakarn, 2003). The key detail in this recommendation referred to this Act as a master plan to combine (1) construction of roads, and expressways, (2) install mass transport to support the Thai economy. Nevertheless, in the 4th NESD plan (1977-81) this combination concept was rejected by the government. They allocated 10 billion Thai (TH) baht to construct only some major roads in Bangkok's inner circle. The construction did not include any costs of mass transport projects (Dunford, 1980; HFA Consultants, 1985). This combination concept continually failed to be resourced. For example, in the 7th NESD plan (1992-96) a huge investment of around 210 billion TH baht was allocated to plan, study and construct infrastructure for the mass transport system in Bangkok. With the inert processes, the team management failed to construct the first mass transit line in this plan (Rujopakarn, 2003). In 1999 the first mass transportation operated under the name Bangkok Transit System (BTS), a Light Rail Transit (LRT) system consisting of two track services. However, in the 10th NESD plan (2007-11), while the Thai government still allocated budgets of 70.6 TH billion baht to

the Ministry of Transportation, 90% (62.8 billion TH baht) of the budget was provided to the Department of Highway and Rural Roads (Bureau of the Budget Thailand, 2009). It appeared that the key combination concept between road construction and mass transport, since the 3rd plan, was still incomplete in terms of the time line for the master plan.

In summary, from the 1st to 10th NESD plans, Bangkok had not done much concerning development of their UTSs, but in 1999 and 2004 they opened the new sky train (BRT), followed by the underground train project (Foerster, Singpatanakul, & Theramast, 2006; Naik, 2007). By 2010 Bangkok had planned to operate mass transportation under the project ‘Bangkok Mass Transit’ (BMT) with 10 service lines, but they could operate just 4 lines. This illustrated the passive and inert approach of the Bangkok management team failing to develop mass transportation projects and land use systems together. From the 1st to 10th NESD plans, the Thai government used out-dated strategies to administrate the UTSs project in Bangkok. They invested great budgets on road and express way construction, not thinking of the transport system covering the travelling demands of residents. Bangkok developed without direction. This was a hindrance both to acceleration of the Thai economy, and to the creation of sustainable development for this capital city.

3.3.3 Transit Culture in Bangkok

The lack of parallel developments between mass transport and land use planning during long periods has directly affected the transit culture and behaviour of people in Bangkok. This problem led to a growing number of private vehicles, and informal transport has developed in Bangkok (Dissanayake, 2004). Although Bangkok provides the Bangkok Mass Transit Authority (BMTA in Thai ‘ขสมก’) as the main public transport, service times are uncertain and there is no provision of guidance information, for example: routes map, timetables, and interchange points (see Figure 32).



Figure 32 The BMTA Bus is the main public transport system which services the inhabitants of Bangkok

It is inconvenient for people to plan their trips and confusing using the system. A person who does not have experience with the BMTA must ask people around stops or use another option. Moreover, BMTA has not covered the travel demands of citizens in Bangkok. These experiences were the cause of informal transport that spread in large community and transit hubs in Bangkok; for example, motorcycle-taxis, van-taxis, motor-tricycles or ‘Tuk-Tuk’, and mini-buses or ‘Song Thel’ (BRT Bangkok, 2010; R Cervero, 2000) (see Figure 33). In addition, transport was inefficient in service qualities, such as safety, time tables, fares and convenience. It affectively increased the awful situation in urban areas, for example: traffic congestion, air pollution and accidents on the roads.



Figure 33 Informal transportation in Bangkok

These situations made Bangkok’s citizens prefer to purchase their own vehicles, rather than using non-standard transport in the city. With a private vehicle they could hope to control the time of journeys, safety and convenience (Tanaboriboon & Satiennam, 2005). The inefficiency of the UTSs in Bangkok affected the urban ecology, for example: the economy (cost of living); environment (air pollution from traffic congestion) and society (quality of life, rush hour-lifestyles, and health problems). It not only impacted on urban ecology, but also affected the trend of developments in the future.

3.3.4 The Starting Point of the UTS in Bangkok

In 1999 the first mass transport system in the capital city was begun by the Bangkok Mass Transit System Public Company Limited. The project was called the ‘Bangkok Transit System’ (BTS) or better known as the ‘Sky Train’ (BTS, 2003). Its first operation in 1999, consisted of 2 service lines, one with 23 stations and the other with 25 stations. In 2004 the underground train began, operated by Bangkok Metro Public Company Limited (BMCL) under the project ‘Mass Rapid Transit’ (MRT). Its system consists of 1 service line with 18 stations. Both systems cooperated to serve passengers

in Bangkok (BMCL, 2005). Since 1994 both services had plans to merge the network under the ‘Bangkok Rail Transit’ project. This project was to create 7 service lines (291 km) by 2009 and would increase to 2 more lines (295 km) by 2012. However, by 2009, this project could only be operated to service 41 km, far from the aim in 1994 (Dailynews, 2009) (see Figure 34).

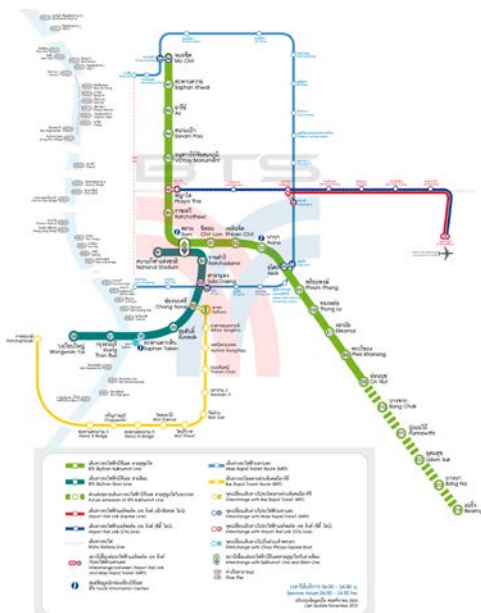


Figure 34 The mass transport map in Bangkok, updated 2013

After the end of 2009, this project was transferred to and controlled by the ‘Office of Transport and Traffic Policy and Planning’ (OTP), a new department under the Ministry of Transport. The OTP changed the project name to ‘Bangkok Mass Transit’ (BMT) and also planned to create 1 more new service line (total 10 lines). The project estimates the year of completion as 2029 (Dailynews, 2009) (see Figure 35).

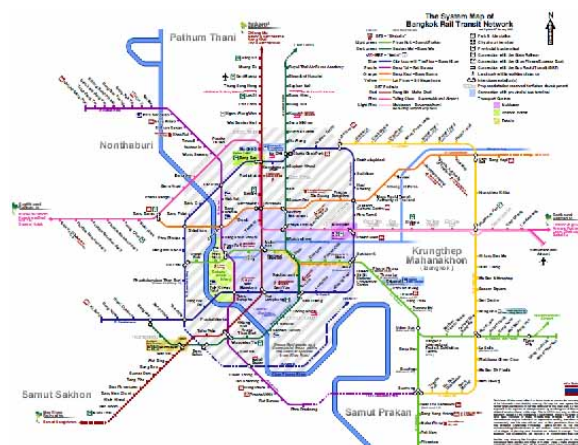


Figure 35 The BMT master plan of Bangkok, designed 2005

Bus Rapid Transit (BRT) is the oldest transit system in some countries but it is a brand new system for Thai people. On May 2010 the first corridor of the BRT system begin operating in Bangkok with 12 stations. The master plan of this project was to open 5 corridors in 2012 and to increase to 14 corridors in 2022 (BRT Bangkok, 2010). The major role of the Bangkok BRT system is transporting passengers from 5 neighbouring provinces around Bangkok. It also includes reducing the population density (9.1 million), environmental problems and traffic congestion (BRT Bangkok, 2010). In addition, the services of the BRT project will be connected with the BTS and MRT systems. This connection aims to transfer passengers to complete their journeys in several directions around the city.

From about 1999, the mass transportation system came to be a part of transit behaviour in Thai society, but only in Bangkok. People live with new transit systems that are occurring every year in Bangkok. Their lifestyles must adapt by following the new transit innovations. According to the master plan, in 2029 Bangkok will have completely reformed their transit operations (Dailynews, 2009). These operational systems will come to replace an informal transport service. The provision of transport guidance information will become a significant issue in Bangkok's UTS. However, the Transantiago project is a good example of failing to prepare guidance information (J. Allard, 2008). This is the reason why the LUG team developed navigation map systems as they constructed the system more than 100 years ago. They wanted Londoners to learn and be familiar with how to use their updated systems every year, as changes were made step by step. The Bangkok case study reflects the backwardness in developing UTSs in Thailand. The mistakes and good points of those case studies provide lessons for us. We have to learn and adapt in developing UTSs for land use, environment, and travelling clients.

Summary

This chapter has presented the influence of UTSs with people in the community. The geography, living behaviour, and specific populations are the key factors which create a different mode of transit model. A UTS can support urban sustainable development with respect to social development, environmental protection and economic development. These advantages mean many cities want to improve and develop their UTSs. However, the way-finding system is significant for connecting people and ensuring they understand how to use the system. The public transport map is one of the way-finding

tools which directly respond to this great task. Behind the scene, this type of map has to deal with visual complexity from huge city structures and transit information. In developing these graphical materials (such as symbols, icons and pictograms), we need to understand stakeholders' knowledge concerning the relationship between an individual and sensation, memory, subconscious, social behaviour, policy and way of life. These issues are discussed in greater depth in Chapter Eight.

The study of information design and human-centred theories are key principles applied to organise the information, visualisation, and need of human factors in the transit map. Both theoretical frameworks assisted me with developing the set of graphical materials in the map that reflect the cultural background and cognitive learning of my target audiences. These issues are described in more detail in Chapter Four. Finally, the case study backgrounds illustrated a different point of view in urban transport background, development, experiences and reading map skill for travelling, between Westerners and Thai people. The next chapter presents my case study. The materials in this chapter describe the special characteristics of the Isan and Khon Kaen community and include in-depth details of the UTS in the community.

-Chapter 3-
Regional Settings

Introduction

The purpose of this chapter is to describe the historical background of the Isan culture and Khon Kaen city. This city is the case study for my research. The chapter consists of three sections. The content will reflect the meaning, concept and influence of the Isan culture on the local people; their ways of life, amusements, folk art and wisdom. Also included is information and analysis about the UTS policy and trends, transit behaviour, and the current transit situation in Khon Kaen city. In addition, some of the content of this chapter will be used and referred to in the discussion stage. It must be noted that Khon Kaen city is my home town. I have lived there for more than 30 years (since 1983). This review calls on my experience, as some data usually available from official and surveying information sources for such planning, does not exist.

Section 1: Isan Culture

This section is an overview of Isan cultural concepts, including ways of life, amusements, folk art and folk wisdom. The relationships between the Isan people, their faith, practices and the natural world are explored. Some significant resources will be triangulated with the other (primary) findings in the field work (Chapter 6 Key findings), in order to create the internal and external validities before elaborating on them in the discussion chapter. Finally, we can imagine the colourful culture of Isan; arts, wisdom, customs and ways of life.

1.1 What is Isan?

The north-eastern region of Thailand is better known by the name of 'Isan'. This name represents 19 provinces, the population (about 21,300,000), traditional practices and the ways of life in this region (Grandstaff et al., 2008) (see Figure 36, p.86). From 1326 to

1778, the Lan Chang Empire covered the area of the Mekong River, Laos and north-eastern Thailand, some parts of Cambodia, Myanmar, Vietnam and southern China (Khon Kaen Municipal, 2010a). The inhabitants shared the same culture and beliefs. Especially, the Isan and Laotian people are close in terms of culture, temples, festivals, dress, customs, arts and language (Isan-Lao dialect). Buddhism is the main doctrine in this region; it influences the minds of the inhabitants. The tenets of Buddhism have created the local customs, rules, beliefs, rites, practices and have formed the Isan culture (Duk, Sinrarat, Boonnark, & Jiwachaisuk, 1993). Buddhism is maintained as cultural inheritance from generation to generation. The basis of Isan culture follows the same conceptual framework which follows.



Figure 36 Map of Thailand and North-eastern region

Left: North-eastern Thailand, (the red zone); and Right: provinces in this region.

1.2 Isan Ways of Life

Agricultural practices are the life of the Isan people but the natural environment of this region is barren. Therefore, their rites and oblations reflect the belief that life will bring blissfulness and progression into both planting, and the family (Phaya, 1971). These rites are performed every month. The Isan people call this ‘Heat Sim-Song or 12 traditions’, in Thai ‘ฮีต๑๒’. These traditions are the cultural heritage which combines the trust of Buddhism and agricultural concepts (Duk et al., 1993; Grandstaff et al., 2008). These religious ceremonies distinguish the Isan character from that of other regions with respect to eating, food, dress, folk art and amusements³⁷. Although the Isan region

³⁷ For example; in January (called Boon-Khao-Gum in Thai ‘บุญข้ากรรณ’), the Isan people give blankets to monks (as it is winter). They also prepare foods for summer such as ‘Pickled fish’ in Thai ‘ปลาข้าว’. This is a traditional ingredient that Isan people prefer to

shares common traditional practices from ‘Heat Sim-Song’, each province has its own strong folk wisdom. For example: in April (called Boon-Par-Weight in Thai ‘บุญพระเวส’), the Isan people will weave Isan textiles for decorating their temples. They will listen to the ‘Chadok’³⁸ sermon given by monks. In the Roi-Et province, people will paint the Chadok stories on long canvas pieces and wrap this around pagodas (see Figure 37).



Figure 37 Chadok religious ceremony in Roi-Et City, Thailand

Left: The local cloth people make for decorating their temple;

Right: painted Chadok stories on canvas in Roi-Et city.

In June (called Boon-Bang-Fai in Thai ‘บุญบังไฟ’), a rite asking for rain includes a fireworks display. Yasothon province has the biggest Isan fireworks competition. In November (called the end of Buddhist Lent in Thai ‘ออกพรรษา’), people have a big event to give food offerings to monks. In the afternoon some provinces will have a longboat competition. Nong-Khai is one of the famous provinces organising this activity. At night, they will have a light boat competition. Nakhonpanom is famous for this event. Meanwhile, in December (called Boon-Kathin in Thai ‘บุญกฐิน’), there is the religious ceremony of presenting robes to the monks. Some provinces, such as Ubonratchathani, have a beeswax candles parade to celebrate this event (see Figure 38, p.87). These traditions are the cultural heritage of the country. Central government supports these as tourism events in this region.

use. Meanwhile, in March (called Boon-Khao-Gee in Thai ‘บุญข้าวจี่’), Isan people give thanks for their farmland. After the harvest the rice is grilled. Sticky rice is mixed with egg and salt and given to the monks with some other food. In Isan culture, sticky rice is the staple. It is like bread in Western cultures.

³⁸ ‘Chadok’ or ‘Jataka stories’ are the stories of the Lord Buddha’s birth. Most of the Chadok stories present just the last 10 worlds from 1,000 of the Lord Buddha’s world (‘world’ means the cycle of birth and death).



Figure 38 Traditional events in the Isan region

(a) Isan fireworks, (b) longboat competition, (c) light boat competition and (d) beeswax candles

Meanwhile, ‘Krog Sim See’ (กรงจระเข้) is the concept of 14 practices which control the manner, ways of life and rules of the Isan people in their community (Phaya, 1971). The concepts were used with all hierarchies in Isan society, and are followed by royalty, governors, monks and commoners. The overview concepts of the practices can be summarised in two perspectives by following: (1) the practice of good manners that relate to the individual and family, society and monarch; and (2) the practice of royal customs alongside the government and people, based on the concept of Buddhism. These practices aim to create peace and harmony in the Isan society (Jiroadpan, Sakulnapat, & Chakewong, 2008).

1.3 Isan Amusements

‘Morlum’³⁹ (หมอลำ) or Isan country folk music is the most entertaining for the people of Isan⁴⁰(Miller, 1998; Pongsburus, 2008). Morlum occurred in Laos and the Isan regions

³⁹‘Mor’ (หมอลำ) means expert song; while ‘Lum’ (ลำ) means singing content based on line, rhythm and melody.

⁴⁰Miller (1998) stated that ‘Morlum’ is not only an Isan amusement; people see it as teacher, entertainer, moral force, and preserver of tradition, which reflects the attitudes of the Isan rural and urban people.

which used to be the Lan Chang Empire. The characteristics of Morlum songs include a strong rhythmic accompaniment, vocal leaps, and a conversation style of singing that can be compared to American rap (Miller, 1998; Pongsburus, 2008) (see Figure 39). Morlum music can be separated into several types which are based on dance, rap content, types of lines and use of musical instruments e.g. Lum-Toi (ลำเตี้ย), Lum-Konor Lum-Reuang(ลำกลอน/ลำเรื่อง), Lum-Phun (ลำเพลิน) and Lum-Sing (ลำซิ่ง) (Miller, 1985). Morlum bands have a lot of music components (e.g. Vot, Phin, Ranat, Khong, Sing, Kap and etc.), ‘Khaen’ (แคน) is the key musical instrument in each type of Morlum style (see Figure 40).



Figure 39 Isan folk (Morlum) and Khaen player



Sing



Ranat



Kap



Vot



Phin



Khaen

Figure 40 Some of the musical components in Morlum bands

‘Mor Khaen’ (หมอลำแคน) or Khaen players have essential components showing who will blow a Khaen louder to create a frenzied performance. Khon Kaen is the one major city in the Isan region where the Thai government has set up a television station. Most television programmes present MorLum shows. In term of composing, Miller (1998) claimed that Khon Kaen is one of the well-known cities for creating the technical content of the Morlum (four) lines melody (Lum Phun)⁴¹. Hence, the city has become the hub of MorLum performances. In 1957, Khon Kaen was called ‘the city of Khaen players’ (Library of Treasury Department, 2000).

1.4 Isan Folk Art

In respect to folk art, ‘Hooptam’ (ฮูปแต้ม) or Mural Art is Isan art representing the religion, wisdom, art skills, manners, history, stories, society and environmental contexts in the region. This type of mural art can be divided into three groups: (1) local artists, (2) artists who have received Thai Royal style and (3) artists who have received the Lan Chang and Thai Royal styles (Udom, 2004)⁴². The preferred theme of the Isan mural indicates the story of (1) Jataka stories (Chadok tale), (2) Legend of Sin-Chai⁴³ and (3) Ramayana. The stories were drawn on the walls of ‘Sim’ (ฉิม) or ‘Buddhist temples’ by the colours which were distilled from plants in the region (Tawanchai, Sarun, & Thing, 2006; Udom, 2004) (see Figure 41, p.91).

⁴¹ ‘Lum-Phum’ applied from ‘Lum-Mou’ (ลำมู่). Both styles use a lot of dancers but Lum-Phum has a faster rhythm and a more entertaining melody than Lum-Mou (Tummawat, 1985).

⁴² In group one, most of the artists lived in the central areas of Isan (e.g. Khon Kaen, Mahasarakham and Roi-Et). While, the second group of artists lived in the southern areas of Isan (e.g. Nakhon Ratchasima or Korat). The last group is the artists who lived around the Mae Khong Riverbank (e.g. Nong Khai, Nakhon Panom and Mukdahan).

⁴³ The Legend of Sin-Chai is one of the stories in the Chadok Tales, concerned with ‘Pang-Jan city’. In Thai, the Chadok tale explains that Sin-Chai is the King of Pang-Jan city (NKPCO, 2008). Pang-Jan city and the Sin-Chai story are directly related to historical geography, the sites and monuments in Nong-Khai province. Around 1200 BC, Pang-Jan city was established by local people in the ‘Ratanawape district’ (Nong-Khai province); most people believed that Sin-Chai used to be the king of this ancient city (NKPCO, 2008).

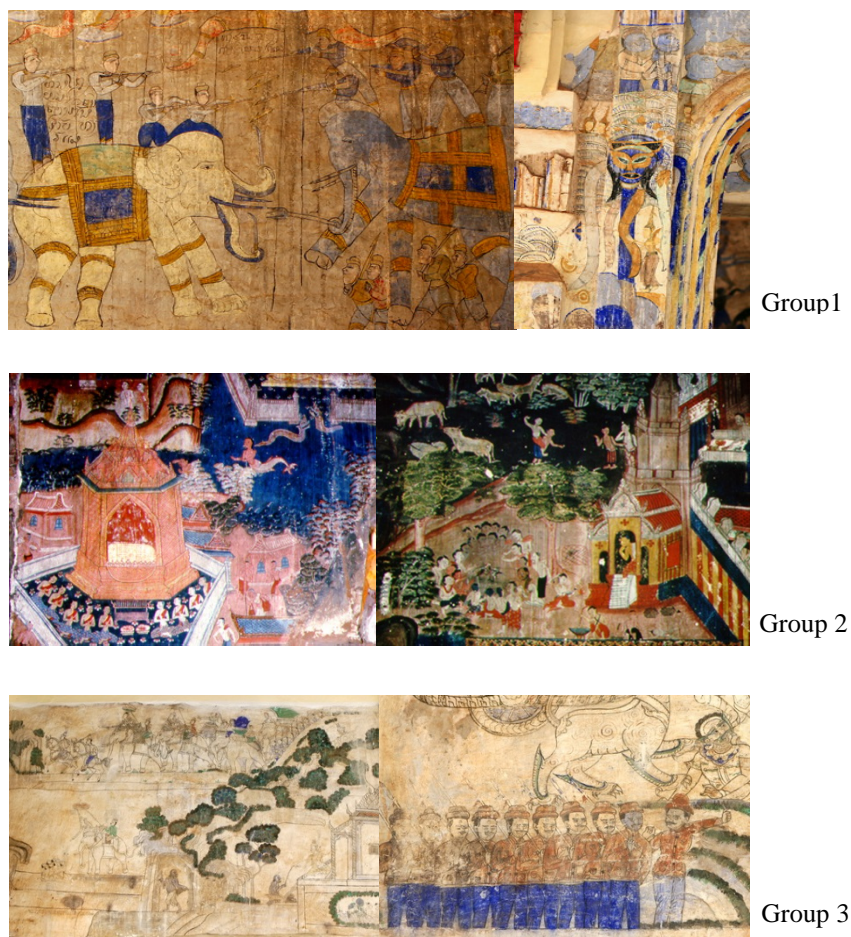


Figure 41 Hooptams are in most provinces in the Isan region

In Khon Kaen province, Hooptams were painted in three temples; (1) Sabuakaew ‘วัดสระบัวแก้ว’, (2) Chaisi ‘วัดไชยศรี’ and (3) Sanuan-Wari-Phatthanaram ‘วัดสวนวาริพัฒนานาราม’. The murals in these temples were influenced by mixed concepts from King Rama V of Thailand. A lot of soldier figures were drawn in these Hooptams. The Ramayana stories⁴⁴ were depicted on the walls of Sabuakaew temple. Meanwhile the legend of Sin-Chai⁴⁵ was portrayed on the walls of the Chaisi and Sanuan-Wari-Phatthanaram temples (see Figure 42, p.92).

⁴⁴The Ramayana story is the Indian tale that was composed more than 2,400 years in Sanskrit. This tale came to Thailand after the ‘Ayutthaya Empire’ (in 1350-1767). In the past, this tale was popular only in the central region of Thailand (Danai, 2007).

⁴⁵Sin-Chai is the legend of the MeKong River culture in the Lan Change Empire. The contents relate to the Chadok tale (Tawanchai et al., 2006).

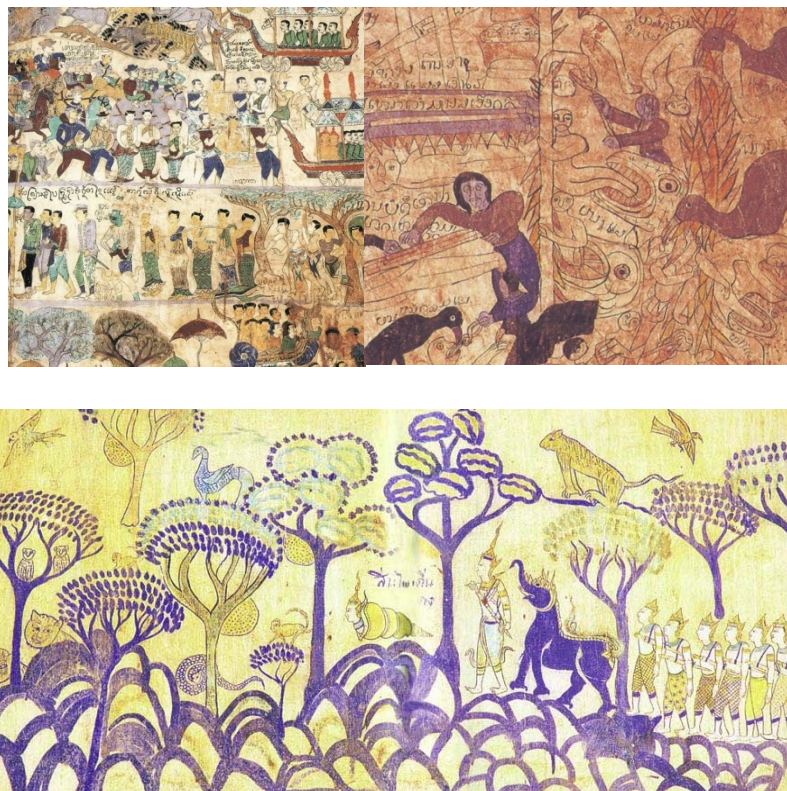
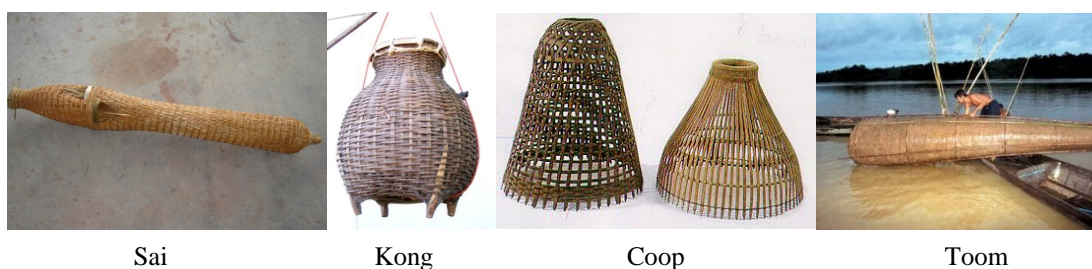


Figure 42 Hooptam in Sabuakaew, Chaisi and Sanuan-Wari-Phatthanaram temples

Top-left: Hooptam in Sabuakaew temple. Top-right: Hooptam in Chaisi temple;
Bottom: Hooptam in the Sanuan-Wari-Phatthanaram temple

1.5 Isan Folk Wisdom

In term of Isan folk wisdom, Isan's handicrafts such as basketwork and textiles are the things which distinguish local wisdom in this region (Pongsurus, 2008). Living in a farming community surrounded by nature, the Isan people find their inspirations from nature, for example the lotus, cowbell, flowers, centipedes, animals and other natural organisms. Meanwhile, bamboo, the mulberry tree (ต้นหม่อน), silk worm(หนอนไหม), cocoon (รังไหม) and cotton tree (ต้นฝ้าย) are the key natural materials which Isan people use to produce their handicrafts (Monthien, 1994; Siri, 2001).



Sai

Kong

Coop

Toom

Figure 43 Several types of Isan handicrafts

Isan basketwork was designed to respond to agricultural life. ‘Tok’ (ตอก) or the bamboo line is the key technique for ‘Jak’ (จัก) or weaving the Isan baskets. Coop (ขุ้ม), Toom (ตุ้ม), Sai (ไซ), and Kong (คอง) are designed to catch fish, frogs or chameleons for food (see Figure 43, p.92). Meanwhile ‘bamboo wood basket’ is a household container for keeping sticky rice warm. Sticky rice is the main staple for Isan people (Pongsburus, 2008) (see Figure 44). Therefore, it can be seen that bamboo is the common material for almost every form of Isan handwork. This is simply because of its availability and flexibility which is similar to plastic. These handcrafts are one of the prominent aspects of Isan Folk wisdom.



Figure 44 Kra Ttip Kau with sticky rice and Isan foods

Isan textiles have reflected the Isan folk wisdom and knowledge base of creativity, application and innovation formore than 3,000 years (Siri, 2001). They contain two materials: The first is silk which is made from the mulberry tree (silk worms which are grown and then the cocoons are rolled and spun onto a bobbin, then installed in shuttles for weaving in a ‘Loop’ (ล๊อ) fashion. The second one is cotton from cotton trees. The rolling and weaving principles also have the same process as the silk technique. Both silk and cotton are dyed using natural colours from local trees, like the Hooptam colours (Siri, 2001; Songpan, 1991; Udom, 2004).

The patterns of Isan textiles can be divided into several techniques such as ‘Jok’(จก), ‘Khid’(ขิด), ‘Yok’(ยก), ‘Puen’(พูน) and ‘Mud-Mee’(มัดหมี่)(Siri, 2001) (see Figure 45, p.94). Pongsburus (2008) stated that Isan people prefer to weave the Khid pattern for special purposes such as religious ceremonies, cloth for worshipping Buddha’s image, auspicious pillows and events (see more detail about Khid design, Chapter 6, p.211). They do not like weaving the Khid pattern for sarongs. Khon Kaen is the province

famous for weaving Mud-Mee and Khid silk cloths. The province also has a name as the centre of Isan silk cloth (Library of Treasury Department, 2000).



Figure 45 Isan techniques and patterns

A common design of Isan textiles consists of the Major pattern and Sub pattern. An Isan weaver finds his/her inspiration from the natural environment around their communities, e.g. animals and flowers (Songpan, 1991). Inspiration also includes the Buddhist faith and legends, e.g. Phraya Nak (a kind of snake in Isan Buddhism) (see Figure 46).



Figure 46 Animal, flower and plant patterns

With respect to traditional Isan dress, the women wear ‘Sin’ (ซิ่น) or a sarong (Isan skirt) that is woven from cotton. Meanwhile, men wear ‘Seua Morhom’ (เสื้อม่อฮ่อม) Isan shirt and trousers with ‘Pah-Kao-Mah’ (ผ้าขาวม้า) or Isan loincloth⁴⁶. These clothes are symbolic of the Isan style; this distinguishes them from the clothes of other ethnicities (Pongsburus, 2008; Siri, 2001; Songpan, 1991) (see Figure 47).



Figure 47 Pah-Kao-Mah patterns for Isan clothing

⁴⁶ ‘Isan loincloth’ is not only used for dress but is also used for turbans, bathing, baby hammocks, blankets etc.

Section 2: Overview of Khon Kaen Contexts

Khon Kaen province (Chang-Wat) was established in 1783 with 330 people by Rajakruluang. He was the leader of Khon Kaen in the period of King Rama I (Tourism of Thailand, 2010). Nowadays, Khon Kaen province consists of 26 districts (Amphur), 198 sub-districts (Tam-Bon) and 2139 villages. The Khon Kaen district is the centre of administration in this province, controlling 18 sub-districts and 267 villages (Tourism of Thailand, 2010). Khon Kaen city or Khon Kaen city municipality is the CBD in Khon Kaen district. Khon Kaen CBD consists of two parts; North CBD (1) and South CBD (2). It is also the administrative centre for three sub-districts and 82 communities in both areas (Khon Kaen Province, 2010). The city is located in the centre of the Isan Region of Thailand and next to nine neighbouring provinces (see Figure 48).



Figure 48 Location of Khon Kaen city

The Khon Kaen province is one of the five major provinces under the 5th NESD plan (1982) of Thailand (NESD, 2010a). Its geographical location and development policies have made Khon Kaen province a centre of business, education, technology, medical professions and transportation in the region, including the Indo-China areas of Cambodia, Laos, and Vietnam (NESD, 2010b). The National Statistical Office of Thailand 'NSO' (2009a) reported that Khon Kaen province had the fourth largest population at 1.76 million people, while the CBD contained 250,000 (census registrations) people. These figures did not include people who came to work, study, and conduct business (see Figure 49, p.96).



Figure 49 CBD in Khon Kaen city

The business section of Isan consists of three clusters (North cluster (2 sub-groups), Central cluster, and South cluster (2 sub-groups)). In 2008, NESD reported that the central cluster was the leader of economic growth in the Isan region, having a GDP averages the same as the nation at 5.7%. Khon Kaen is the leader of this cluster. The economic growth rate of the city is one of the top five in the country (Department of Provincial administration, 2008). In 2009 Khon Kaen had the highest household income in the Isan region at 19,779 baht per month (NSO of Thailand, 2009b). Khon Kaen is the centre of education in this region which consists of nine universities, seven colleges and 11 polytechnics (Khon Kaen Municipal, 2007). Meanwhile in 2009 the number of employees who graduated from high school and had undergraduate degrees ranked 9th and 4th respectively in Thailand (NSO of Thailand, 2009c). Khon Kaen is the hub and capital city of the Isan region (see Figure 50).

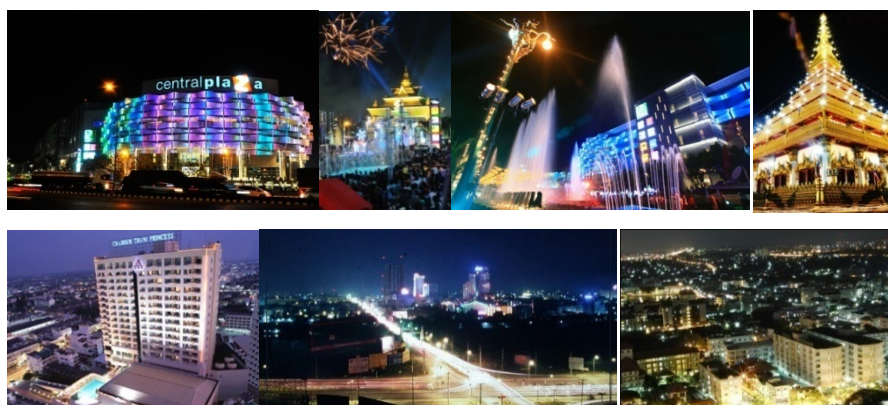


Figure 50 Night-time views of Khon Kaen city

2.1 The policy and development plan of Khon Kaen City

Since 1991 the administrative government structure of Thailand has used the principle of a chronological system of top-down administration from the centre (Bangkok) to the provinces (Khon Kaen province) to local administration (Khon Kaen city) (Terapanmayte, 1994). The provinces and local administrations have designed their

development policies and strategic plans by themselves, but their policies have to be concerned with holistic developing frameworks in the NESD plan (10th, 2007-11). Therefore, the strategic and development plans of Khon Kaen city need to sit alongside the main policies and strategic developments of the NESD and Khon Kaen provincial plans. One of the major policies to improve and develop the Thai economy is investment in transportation systems for the efficient transfer of goods, services and people (NESD Board, 2007). This investment is one of the ongoing developments creating economic strength for Thailand in the future. This policy is reflected in the provincial strategic and development plans of Khon Kaen province towards Khon Kaen city. However, policies at each administrative level need to be adapted to local and community problems, for efficient development.

The strategic and development plans of Khon Kaen province, and in particular the three-year plan 2010-12, related to solving and improving Thai economic problems, following the concepts of the 10th NESD plan (2007-11)⁴⁷. Transportation issues are contained in the vision statement and major mission of this plan. The vision of Khon Kaen province's plan indicated that "Khon Kaen will be the centre of commerce, investments, services and transportation in this region and internationally" (Khon Kaen Municipal, 2010a). The mission statement on transportation developments prioritises development of basic economies and economic competitiveness, by developing basic infrastructure for transportation and communication (Khon Kaen Municipal, 2010a). Meanwhile the vision statement of the Khon Kaen department of local administration (three-year plan 2010-12) supports the Khon Kaen provincial plan. "The organisation wants good standards of management and administration to assist in building up Khon Kaen as a pleasant city with sustained development" (Khon Kaen Municipal, 2010a). The organisation also designed the mission statement (Article 5) that supported the transportation development strategy of Khon Kaen province through developing a public transport and transit network to meet high standards of efficiency. The transport development strategy was reflected in the major mission statement of Khon Kaen city (municipal) under Article 3. This article also mentions increasing the city's potential for economic competition. The two main strategies that relate to transportation development under this Article were (1) the development of sustainable transport systems within the city environment, for increasing efficiencies of the public transport

⁴⁷ This was the plan which was current when fieldwork was conducted

system and traffic; and (2) the emerging improvement of infrastructure and land use systems in order to assist sustainable development (Khon Kaen Municipal, 2010a).

Khon Kaen province was the first province, after Bangkok, to present research and study plans about the new public transport system to the Ministry of Transportation. The details demonstrated the possibility for constructive investments, risk management, impact factors and environmental issues of the proposed new public transportation system (BRT) in the CBD areas. It also included details of expansion of the system into neighbouring sub-districts around Khon Kaen district (Manager, 2010). This mega project from Khon Kaen province was presented to support NESD plans to develop transportation systems in Thailand. Nevertheless, the details of Key Performance Indicators (KPIs) at each stage of the Khon Kaen plans, from the province to city municipal levels, show that most of the KPIs focused only on infrastructure, road networks and structural techniques, for example, improving road textures, installing electricity poles along the roads, installing underground wiring in some CBD areas and developing footpaths (Khon Kaen Municipal, 2010a). The transport study and these KPIs showed that the Khon Kaen operations team focused only on improving operating systems and techniques in public transport, for example, budgets, project worthiness, costs of construction, techniques of traffic management and road network supports, as opposed to community and population priorities.

2.2 The New Role of the City

In 2015 the south-east Asian nations or ‘ASEAN’ will combine as the AEC. The AEC consists of 10 member countries⁴⁸ in this community system (Vo, 2005). Since 1982 Khon Kaen province has been promoted by central government to be one of five major cities in Thailand (NESD, 2010a). This promotion means Khon Kaen has to make adaptations in the logistical and transport hubs in the Isan region, in order to support the aim of the EWEC of the AEC.

⁴⁸The AEC consists of Indonesia, Malaysia, Philippines, Singapore, Thailand, Brunei, Burma, Cambodia, Laos and Vietnam (Hew, 2005).



Figure 51 Map of the EWEC route

This area is the centre for distribution of goods to Indo-China: (a) the EWEC route, (b) the central region and (c) the hub of Indo-China

EWEC consists of two-way railway lines and motorways from Burma to Thailand, through Laos and stopping in Vietnam (Banomyong et al., 2010). Figure 51 shows that Khon Kaen city is located at the centre of the Isan region and Indo-China (Indo-China consists of Cambodia, Laos, Thailand and Vietnam). (NESD, 2010b). Any goods need to be stored before distribution. Transit passengers must be accommodated in the city. These reasons prompted the Khon Kaen municipality to introduce a new public transport plan (under the name of “Khon Kaen BRT”)⁴⁹. This plan also supports transit commuters (e.g. workers, investors and tourists) system, and reforms the urban transport system.

2.3 Khon Kaen City Structure

Khon Kaen city is one of the cities in the Isan region that has had good management in land use planning. An analysis of land use shows that the CBD of Khon Kaen city was divided into two areas in 1999, by using the conditions of the Land Use Act (1975) (see Figure 52, p.100 and 53, p.100). The Act consists of North-CBD(1) and South-CBD(2). Both areas are connected together by combining the areas that are the central city (Satiennam, Oshima, Fukuda, & Klungboonkrong, 2005). This land use instrument was designed to reduce densities of populations in the central city, and to support the city growth trends in the future. It was beneficial for urban ecosystems. For example: (1) Economic systems: Khon Kaen city could urbanise the outskirt areas by following the directions for city land use; the value of land development could also be increased, i.e. by land pricing⁵⁰ and housing developments. These advantages also included the dispersal of people with reasonable incomes around the city outskirts. (2) Social systems: good land use can reduce the social costs of living, for example, rental

⁴⁹ ‘BRT’ are transit systems that use buses to provide a faster service for commuting passengers in the special (bus) lanes (R. Cervero, 1996).

⁵⁰ Khon Kaen city was the city that possessed the highest land values in the Isan region, and one of the top five in Thailand at 200,000 baht per sq/m (Treasury Department of Thailand, 2010).

accommodation. (3) Environment systems: without the sprawling city and density of populations, the Khon Kaen population may have better mental health and fewer physical health problems.

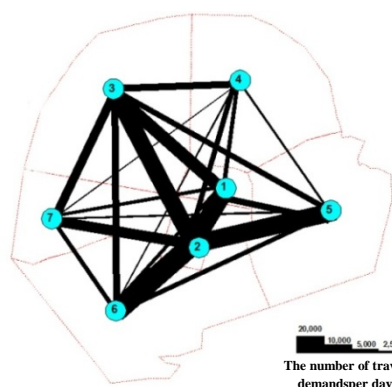


Figure 52 Important features of Khon Kaen land use

The number of travel demands:(1) North CBD; (2) South CBD; (3) KhonKaen university areas; (4) North Eastern Land use; (5) Eastern Land use; (6) Southern land use; and (7) South-west land use.

In addition, the Khon Kaen land use plan divides the areas in each section of the city efficiently. Town planners divided commercial, state agency, residential, agricultural and manufacturing industrial areas from one another.

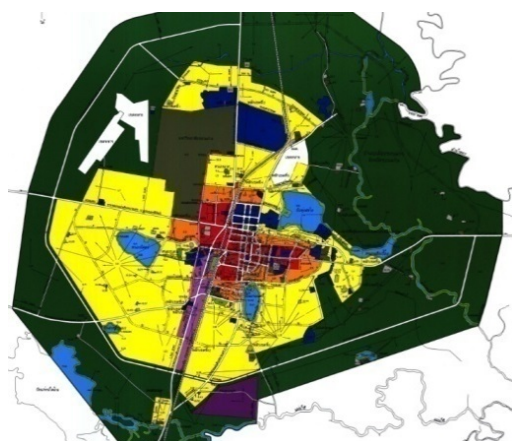


Figure 53 Kohn Kaen land use

The colours represent the various areas in the city. (*Red* is the business areas (high densities); *Orange* means housing areas (between high and medium densities); *Blue* means state agency areas; *Yellow* means housing areas between medium and low densities; *Light blue* and *green* means water resource and agriculture areas; *Purple* and *white* means industry and military areas)

Section 3: Transportation contexts in Khon Kaen City

The three transport modes in Khon Kaen city are (1) Mass transportation between Khon Kaen and other provinces (train, bus (two hub-stations) and air services), (2) Private transportation (motor-tricycles (Tuk-Tuk), tricycles and taxi cabs), and (3) local transportation (minibuses) (see Figure 54, p.101). The minibus system has priority for Khon Kaen city to reform in order to support the strategic development plan of the Ministry of Transportation.



Figure 54 Transport modes in Khon Kaen city

3.1 Current UTS and Transit Nodes in the Central Business District (CBD)

The current UTS in Khon Kaen city is the local (minibus) system, usually called ‘Song-Thel’. Song-Thels have serviced people in Khon Kaen city since 1975. This local service is one of informal public transportation in Khon Kaen city, providing passengers with 21 service lines and 900 mini-buses which run around the city (Khon Kaen Land Transportation Authority Office, 2010). The administration of the Song-Thel system lies with the group of entrepreneurs that ask for registration from the Khon Kaen Land Transport Authorisation Office (KKLTAO). The regulations that control this transit system are found in the Land Transport Act (1979) (Act of Land Transport (Thailand), 1979). There are two fare rates: (1) concessions for students at 8 (TH) baht, and (2) adults at 10 (TH) baht per service (Khon Kaen Land Transportation Authority Office, 2010).

My observations and analysis showed that the transit nodes in Khon Kaen city used the polycentric model (the urban village version) trip pattern to organise the node systems within the city (Donald et al., 2003). The CBD of Khon Kaen city has three large transit nodes, divided into the one large node in the North CBD and the two large nodes in the South CBD (see picture in Chapter 6, p.187).

3.2 Navigation Systems and Transit Facilities in the UTS of Khon Kaen city

Although Khon Kaen city provides a UTS that covers every area in the city, it does not have any transit navigation systems or public transit information to show people how to

use it. Even the large transit nodes in Khon Kaen city provide no public information or any transit facilities for passengers, for example: stations, bus shelters, seats, a navigation system of Song-Thel with maps, timetables, and fare rates. The only things that give information to people are the old and small information boards. This includes some information in the Thai language about the place names. The information is on the outside and inside the Song-Thels and is only useful for local people. Passengers wait on footpaths just 1.50 or 2.00 metres wide. Some stops or bus shelters are worn-out and unpleasant environments. The example pictures are provided in Chapter 6, Figure 79 and 80 (p.188).

3.3 Transit Behaviours and Cultures in Khon Kaen City

Without a strong policy and systematically organised cohesion from Khon Kaen City municipal authorities, Song Thels have become an informal transport system without operating standards. For example: uncertain stop points, timetables of peak and off-peak times and services on each Song-Thel line, no week-day and weekend service time tables, no rules on maximum numbers of passengers on Song-Thels for safety reasons, and so forth. These system failures mean the UTS does not have the navigation systems and public transit information that are key to guiding people to use the system (Gibson, 2009).

These problematic situations impact on the transit behaviours and cultures of the two groups, Song-Thel drivers and transport users. Without a strong policy to regulate standards at stop points, availability of timetables and limiting numbers of passengers, Song-Thel drivers stop or sometimes park at the bus stops for a long time. They also stop their vehicles in the second lane to pick up and set down passengers (Satiennam et al., 2005). Drivers also pick up and stop for passengers in places that are not stop points. During the peak periods (mornings and after school) passengers crowd into and bulge out of Song-Thels in unsafe conditions. These behaviours are major causes of traffic congestion and traffic accidents in Khon Kaen city (see Figure 55, p.103).



Figure 55 Dangerous Behaviours of Song-Thel drivers in the city

(a) this driver parked his car at an intersection to buy a newspaper while he had passengers. (b) Song-Thel drivers stop in overlapping lanes for passengers to get on or off and (c) drivers stop for passengers for long periods in no-stopping areas

The absence of a navigation system and service standards for the Song Thel system over a long time period has modified the transit behaviours of transport users in Khon Kaen city. As a result, people cannot independently help themselves to use the UTS in Khon Kaen city. People who are not familiar with the 21 service lines of the Song-Thel system ask other people or the traffic police about a bus stop, or catch Song-Thels and ask for route information (see more details, Chapter 6, p.193). These behaviours have spread to most cities in Thailand. Thai people rarely travel by themselves using the UTSs in other cities, and need to connect with local people because cities in Thailand do not provide navigation systems for passengers, except for the BTS, MRT and BRT in Bangkok. This conduct has become the transit culture of Khon Kaen city. It is difficult to change if the city officials, who are in charge, make no changes.

These problematic situations also impact on Khon Kaen residents competing with the Song-Thel system. Khon Kaen residents who have middle and high incomes, have preferred to purchase private vehicles, for example cars and motorcycles, because they have more control over the times, safety and convenience of their journeys⁵¹. This behaviour demonstrates the transit culture and urban lifestyles of some Khon Kaen people. Many of them believe that Song-Thels provide transportation for low-income people or students who have limited driving licenses. These situations must be addressed in Khon Kaen province, as local officials prepare a plan to reform the UTS

⁵¹Statistics from the Khon Kaen Provincial Transport Office (KKPTO) in 2005 showed that the numbers of private vehicles registered in the Khon Kaen province were around 700,000 vehicles (sedans, van and pick-ups, and motorcycles) (NSO of Khon Kaen, 2005), representing about 45% of the total number of Khon Kaen residents of 1.76 million people. Residents of Khon Kaen city's municipal area used private vehicles for travelling in the city 68% of the time, but they used the UTS for 15% of their travel, and walked for 17% of the time (NSO of Khon Kaen, 2005).

through investment in the new mega-project, ‘Bus Rapid Transit’ that will operate from 2017 (Than-New, 2009).

3.4 A New Urban Transport System in Khon Kaen city Bus Rapid Transport (BRT)

BRT are transit systems that use buses to provide a faster service for commuters in special bus lanes (R. Cervero, 1996). Cities that operate a BRT system include Auckland, Brisbane, Santiago and Singapore (J. Allard, 2008; Dale & Simon, 2001). The BRT system is a brand new transit operation system for Khon Kaen city and other areas in Thailand. The Khon Kaen BRT project originated from co-operation between the Khon Kaen city municipality and the ‘Centre of Lifelong Infrastructure Development’ (CLID) at Khon Kaen University, to reform the UTS (Song-Thels) in the city (see Figure 56).



Figure 56 BRT models of Khon Kaen city

This project will radically change with a whole new operating system of public transport in Khon Kaen City. For example, merge and cancellation of the old local transport system (Song Thel); installation of the brand new public transport system (BRT); reducing the complexity of track service routes (Song-Thel) from 21 lines into 5 lines (BRT) (see Figure 57, p.105); creating a new network route service; adapting city land use planning for long-term development; defining new interchange stations, stops, fares, timetables, and payment methods.

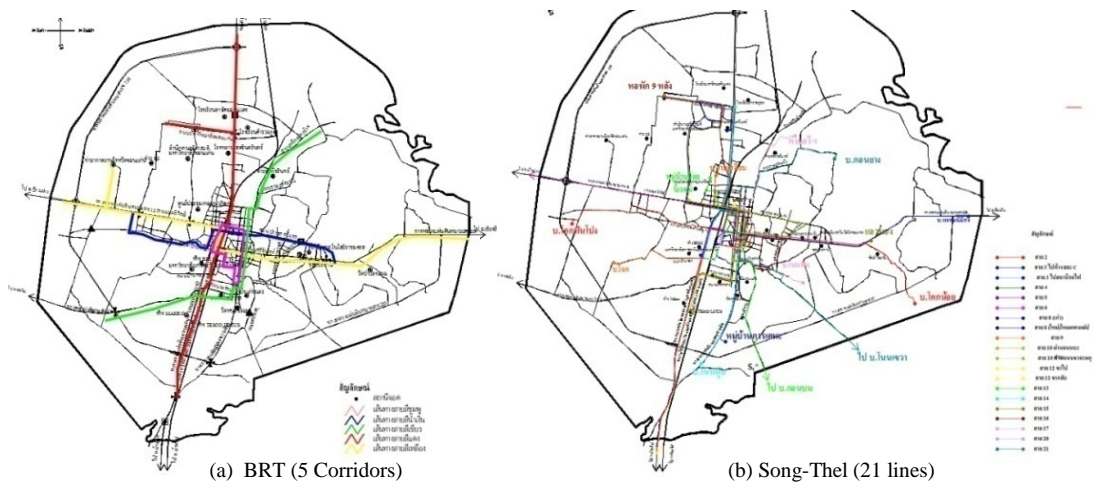


Figure 57 Comparisons of the service routes between the new UTS (BRT) and the old UTS (Song-Thel)

The BRT project in Khon Kaen city is a model research project for all major cities in Thailand, following Bangkok’s attempt to operate the first corridor in 2010 (BRT Bangkok, 2010). Everything in the Khon Kaen project will influence the standards and case studies for other major cities and lessons for the future. The Khon Kaen BRT plans to invest around 7 million baht for constructing five new corridors (125 km with 82 stop points) which will replace the 21 service lines of the Song-Thel system. The project will operate the first corridor in 2017. All five are expected to be completed by 2029 (see Figure 58) (Than-New, 2009).

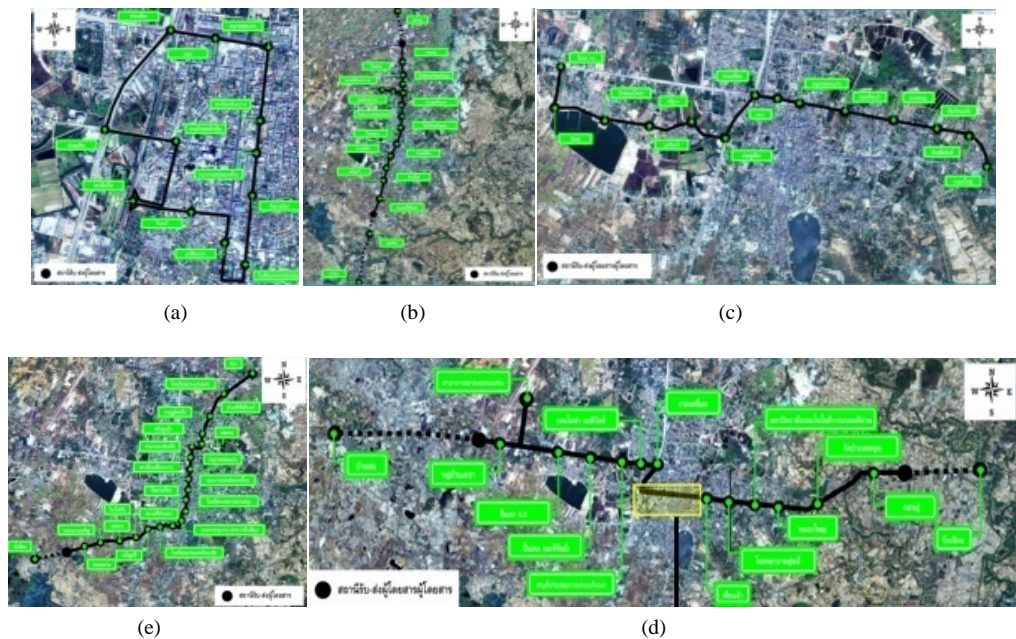


Figure 58 GIS views of BRT Khon Kaen with 5 corridors

(a) Corridor 1; (b) Corridor 2; (c) Corridor 3; (d) Corridor 4; (e) Corridor 5. The first route to be constructed is corridor 2.

In 2010, I studied the research of the Khon Kaen City municipality and CLID, and found that they emphasised the issues of infrastructure, road structures, trends of traffic in the future with the developing BRT, vehicle speeds with increasing auto numbers, environmental effects after the installation of the new UTS, budgets for construction, and project worthiness (Manager, 2010). I noticed that the important issues missing in this research were studies of learning processes, and how the Khon Kaen people would learn to use and understand the brand new UTS (BRT). Also missing was discussion of standard conditions for designing navigation systems for this project. Most Khon Kaen and Isan people do not have any experience of using a BRT system. This new system is also faced with a need to change clients' transit behaviours - so guiding people to help themselves by using navigation systems that include route maps, map legends, map symbols, fare rates, and timetables. In addition, the different purposes for using the UTS in Khon Kaen city have created different groups of passengers that differ in their background and knowledge, for example highly educated groups (office workers, official agency staff, and university students), low-education groups (rural people, and farmers), Thai and international visitors, and people with disabilities. Navigation systems are significant equipment for the Khon Kaen BRT. Users need to read and understand the navigation systems to answer 'how do I choose the service lines?'; 'How do I find the bus numbers?'; 'Where are the stops to get on and get off the buses?'; 'How can I buy tickets?'; 'How many baht?; For what distance?' Design processes of navigation systems that are coordinated with users' learning processes are a very important part of the Khon Kaen BRT. These can reduce the burden on users who will have to learn about the brand new BRT and its navigation systems. The ease with which customers can navigate the system will also affect the number of people using the system.

Summary

Every country needs to understand language, symbolic systems, and their own culture. Since 1868, the culture crossover from western countries came to Isan a long time ago, the time of King Rama V (Rujopakarn, 2003). Western culture has been influential with its perspectives. But in fact, for the Isan people, these Western perspectives are very different from the traditional practices of Isan culture such as eating, language, folk arts, belief systems, clothes and nuances of perception. These ways of life infiltrate the cognitive learning and experiences of the Isan (Khon Kaen) people, and also relate to the processes of visual literacy. Different cultural backgrounds affect individual

cognitive learning, which comes out of the subconscious and an individual's experience. It includes effecting long-term memory in the process of semeiotic thinking and creating different interpretations (Cowan, 2001; F.D. Saussure, 1983). The application of Western graphical material design standards to make (Khon Kaen) people understand, connecting the gap between (Khon Kaen) passengers and the (BRT) system, is not the best solution for this case study. Thai (Khon Kaen) people lack experience in reading graphical material and/or navigation systems for travelling, particularly those designed from a Western perspective. The development of design concepts needs to be based on cultural perceptions and social behaviour, creating graphical materials which will help people understand the symbols with confidence. Therefore the design of the Khon Kaen public transport map must consider the background knowledge of users, and focus on local perspectives, in order to create the graphical design framework which matches the knowledge base of users. Tufte (2001) and O'Grady and O'Grady (2008) argued that the design concept which coheres with one's own culture and local identity will increase the readers' ability to understand visual information. However, some Western design standards are still important in the process of designing the Khon Kaen BRT navigation systems, for example map scale, colour codes, language (English version), typeface and size systems, in order to generate a navigation design system easily understood at local and international levels.

-Chapter 4-

Theoretical Framework

Introduction

This chapter describes my development as a designer, which in a theoretical context. My development as a designer influenced the design development for creating a new public transport map in areas of the Khon Kaen municipality. I thought systematically through philosophies (co-design, epistemology and axiology) to cover the design framework, and participatory design, systems psychology and design theory, using what key ideas the Western paradigms could offer to my Isan cultural and Thai design contexts. Stakeholder analysis, human-centred design and information design assisted my inquiry into the knowledge base of the stakeholders in the community reflecting the local way of life, culture and perspectives of the Isan people. These human factors (variables) formed the original map design concepts in order to make identity sets of graphical materials reflecting the local people's cognitive experience and meeting usability design concepts. This chapter is divided into two sections. The first describes my systematic thinking and the integration of ideas from Western literature. The second section presents the components of key concepts that were used in the case study.

Section 1: Western Theoretical Influences

1.1 Systems Theory

Systems theory is interdisciplinary for example; linguistic, biological, ecological, management, organisational, educational systems theory etc (Banathy, 1993; Hammond, 1997; Odum, 1983; Senge, 1990; Von Bertalanffy, 1966). It is applied to investigate and/or describe any group of objects which work together to produce a result. Jörg (2011) and von Bertalanffy (1968) claimed that the general concept of systems theory has been articulated with the two conceptual frameworks: 'complexity

theory' and 'cybernetics'. They believed that both concepts have significance to the origin of the concept of systems theory.

Jörg (2011) and Laszlo and Krippner (1998) stated that the core concept of 'complexity theory' is 'emergence'. They described an emergent property as the theory of multiple and integrative functions, in which each component relates and interacts with other elements in a complex system; such as the working process of cells or pixels. The system is present when particles work in relationship to each other (Reid, 2007).

'Cybernetics' is another concept that relates to systems theory. This is an interdisciplinary approach for inspecting regulatory systems, structures, controls and possibilities (Francois, 1999). The analysis process of cybernetics focusses on controlling mechanisms, rather than analytic science, in order to find a single property (Hyötyniemi, 2006; Umpleby, 1990; Wiener, 1948). Although cybernetics was applied to the study of social, political and educational systems, it is more aligned to the study of mechanical, physical, engineering, digital, electronic, biological or zoological systems (Eden, 2011; Francois, 1999; John, 2008; Umpleby, 1990; Wiener, 1948).

A property of systems theory is the integration between cybernetics and complexity theory. A significant trait of systems theory is the development of thinking processes to inform 'systemic thinking'. This trait is applied to organise and categorise complex factors and conditions (e.g. process, method or structure) between theories in order to make them work together⁵². (Banathy, 1996; Von Bertalanffy, 1968). The difference between systems theory and cybernetics in the controlling mechanism (or process) is that systems theory uses a controlling system based on the concept of holistic analysis (Laszlo & Krippner, 1998). Laszlo and Krippner (1998) and Von Bertalanffy (1968) stated that systems theory proves all elements in a small system are one part of a large system. Meanwhile, a small system also has sub-systems that act on the existing small and large systems: for example, individual, household, village, sub-district, district, province, state, country, region, and world. These examples have relationships in the large system; however, they also have relationships in their own systems.

Von Bertalanffy (1968) suggested that: understanding the interaction and feedback between elements and systems in the phenomena is a key aspect, and systems

⁵²This approach synthesises a workflow in a complex theory in order to find and match the relationship factors and conditions between theories. Then, it will be arranged and categorised as an hierarchical concept in order to create a new workflow to control the new system of process or theory.

theory changes the thinking perspective of a study from ‘structure (inflexible)’ into ‘process’ (flexible). Core concepts of systems theory consider the holistic relationship between elements and factors. This reading challenged me to apply the core concept of systems theory to investigate the needs of human factors in my case study.

1.2 Western Research Paradigms

My research paradigm needed to assist would assist me to identify the key human factors⁵³ which came from the original knowledge base of the stakeholders in Khon Kaen community. These key factors (variables) could connect the people with the graphic materials (information) about their new UTS. My research paradigm considered the contexts of ethnography, phenomenology, sociology and psychology (recognition, visual perception and interpretation).

Co-design⁵⁴ studies the multiple perspectives and different ideas from all the people⁵⁵ that any design project needs to deal with (L. Sanders, 2008; H. Sanoff, 2005). Billington (1974) stated that a co-design concept come from the American pragmatist tradition. He contended that grass-roots democracy is based on the rights and freedoms locals have to participate. Creighton (1994) supported the notion that citizens’ participation has a broad value to community life because it (1) engages the public, (2) builds trust, and (3) makes better decisions for the community. Sanders & Dandavate (1999) and Sanoff (2005) stated that in many cases, using citizens’ experiences can increase the chance of success compared with simply using outside professionals. This is because citizens are more realistic regarding local context. But, what is co-design in the reality of Thai and Isan contexts. I have lived in both Western and Thai contexts, and they are different. In the West, individualism is a focus. The Buddhism of Thailand emphasises the group. The philosophy of co-design in the West speaks of a ‘collaborative practice’ from each individual in a community or system. In a Thai context, co-design means integration of ‘multiple perspectives’ when voices in a

⁵³ Human factors are the incorporative disciplines which study the comprehension of interactions between humans and other elements of overall system performance in order to design a system, equipment, media or divide which fits with the human body (physiology), cognitive ability (psychology) and environmental contexts (culture/society) (see more details, p.120).

⁵⁴ Billington (1974) stated that a co-design concept came from the American pragmatist tradition. He contended that grass-roots democracy is based on the rights and freedoms locals have to participate. Creighton (1994) supported the notion that citizens’ participation has a broad value to community life because it (1) engages the public, (2) builds trust, and (3) makes better decisions for the community. Sanders and Dandavate (1999) and Sanoff (2005) stated that in many cases, using citizens’ experiences can increase the chance of success compared with simply using outside professionals. This is because citizens are more realistic regarding local contexts.

⁵⁵ For example: a sharing of; individual visions, social learning and mutual comprehension among all key stakeholders. It also includes consideration of different perspectives and expectations (David, Rega, Vannini, & Cantoni, 2013).

community or system comes to share and work together. I defined the meaning of co-design this way because in Thailand we usually practice things together in the same way. I expected that the design outcome would receive simple recognition and acceptability from the community stakeholders.

Axiology crucially studies notions of value. Ethics and aesthetics are the main focus in this philosophical framework (Nicholars, 2005). ‘Right’ and ‘good’ in individual and social behaviour are the key concepts of ethical investigation. Meanwhile, aesthetics focusses on the concepts of ‘harmony’ and ‘beauty’ (attractiveness) (Arneson, 2005). I employed this philosophy to organise the design materials and information needs based on the values of community, attractive features and usability.

Epistemology involves the study of nature and a range of knowledge. This philosophy questions what knowledge is and how it can be obtained (Hay, 2008). The knowledge can extend to any relevant principle, subject or entity in order to answer a question or acquire other knowledge (Hendricks, 2006). Most of the examination in this field studies the nature of knowledge and how it is connected, e.g. truth, belief and argument (Dougherty & Rysiew, 2013; Laurence, 2002). I applied this philosophy to define how to acquire knowledge or arguments from my case study by understanding social behaviour, cultural background and community systems (policy). These were the key factors which affected the learning psychology in symbolic systems, interpretation processes, and information needs. In addition, applying this philosophy supported me to understand the relationships between knowledge from other philosophies. For example; the knowledge from ‘co-design’ gave me the idea of how to identify the stakeholders and target users who have a role in my design case study. This knowledge underpinned how to use the collection tools to acquire feedback from the participants. Their knowledge (key factors) was integrated with the secondary data toward my design concepts. The concepts were merged with the design theories (‘axiology’) to organise and transform the information, stakeholder needs, and transit data into the graphical representations. Hence, it can be seen that the epistemology is the medium philosophy to connect the relationship factors between the knowledge inside my case study, and finding how to collect knowledge and combine them.

1.3 Key Principles in Research Framework

Stakeholder analysis⁵⁶ is a key theory in participatory design. I employed this theory to classify participants who would be the sample groups (Froome, 1999). These sample groups were the informants who would give information, feedback and evaluative results in my design process (Goodwin, 2009) (see details in Chapter 5, p.136). Meanwhile, **Human-Centred Design (HCD)**⁵⁷ is the key principle that I applied to conduct my research (design) method in order to inquire about the key human factors (psychology, physiology, and society/culture) from concepts of systems psychology (see more details in the next section). The last key theory is **information design**⁵⁸. I applied this principle to manage the two domains in my design process: (1) categorising the set of data and (2) organising the collaborative use of design theories (see more reviews and details in the next section and Chapter 9, p.258).

These ideas influenced the design of the appropriate public transport map for Khon Kaen city. The next section will describe the principles of key theories and introduce my application ideas to the design process.

Section 2: Influential Theoretical Concepts

This section describes the key theory concepts which I applied to conduct my research and to organise the findings of my design process. Information design and human-centred design principles are the key theories that I employed. The stakeholder analysis is explained in the next chapter (p.136).

2.1 Information design

This topic is divided into two sections. The first section describes the definition and transforming processes of information. It also includes my early ideas on how to apply these principles into the design process. The second section explains the categorising principle of information design to manage structure of contents. It also includes an explanation of the role of design theory in information design principles in order to create the optimisation of legibility and cognitive learning in design materials.

⁵⁶ Most business studies such as marketing, management, or human resources identify the role and influence of people who they are dealing with in their businesses or organisations (Kotler & Keller, 2011).

⁵⁷ HCD is a procedure and a set of techniques employed to develop new solutions for the world. This process involves situating the human at the centre of the technology, service, environment, interaction system and design product (IDEO, 2010).

⁵⁸ Information design was applied to address the organisation and performance of data; its transformation into valuable and meaningful information (Shedroff, 1994).

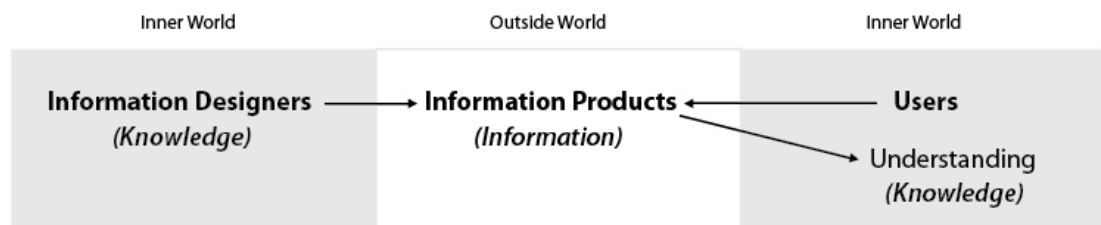
2.1.1 Definitions and Transforming Processes of Information Design

The International Institute for Information Design (IIID, 2012) defines the aim of ‘information design’ as the transforming of data into high-quality information to empower people to achieve goals (Wurman, 2000). The attribution of high-quality information needs to obtain accessible, attractive, complete, interpretable, relevant, objective, understandable and valuable concepts (IIID, 2012; Wang & Strong, 1996). This principle involves the defining, planning and forming of the contents of a message and the environment in which it is presented. It also points to meeting the information needs of, and satisfaction from, recipients (IIID, 2012). Tufte (2006) described this terminology as an umbrella for articulation with other related fields; for example, graphic design, interaction design, information architecture, and usability engineering. The information design disciplines can be applied to a variety of works in many different environments and types of projects, i.e. printing, online and environmental designs (Baer, 2008). Many researchers, such as Shedroff (1994); Jacobson (1999); De Rossi (2001); Schuller (2007); Walker and Barratt (2007) have tried to develop definitions of information design disciplines. Shedroff explained that information design is solving the presentation and organisation of data; it will transform data toward meaningful and valuable information for communication. Jacobson stated that information design is the collaboration between the arts and sciences for providing information. It also can be used to achieve efficiency and effectiveness. De Rossi believed that information design is based on the principles of psychology and physiology. It also involves how to design information to meet users’ learning styles and capacities to remember information, for example, the impact of colours, shapes and patterns. Schuller illustrated that information design is the transference of complex data into forms of 2D visual representations and also deals with the user’s comprehension of certain data promptly. Walker and Barratt explained that the practice of information design requires a multiple approach. Its practices combine a variety of skills that are needed to develop the understanding of users. These include graphic design, typography, ergonomics (human-factors), applied sciences, psychology, computing, and editing, among other things.

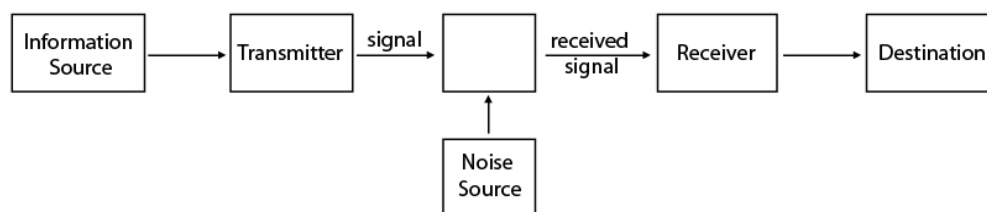
In summary, an information design principle is the integration of a variety of fields; for example, the arts, social and scientific sciences for creating concise messages or information graphics (Infographic). It focuses on how people access and easily comprehend accurate information based on responsible design. This focus should be

adapted from general and specific knowledge sets of the end user. The attributes of information design can be applied to organise complex data in my project, e.g. UTSs, urban plan, places, services, information (transit) needs, etc. In addition, it assisted me with arranging the massive amounts of data; and gave consideration to the usability design which relates to the optimisation of legibility and layers of reading contexts (details are illustrated in the next stages and Chapter 9). The following paragraphs explain the transforming process of an information design concept.

The transformation of the information design process started with information designers who transformed their knowledge into information representations or ‘information products’ (Orna & Stevens, 1991). These products can be software, CDs, books, websites, plans, bars, charts, graphs, navigation, way-finding systems, maps, signs or symbols. These products would assist their target users to perceive and transform (interpret) these information products into their knowledge (see Figure 59, picture a). The interpretive process of information products will fail if information designers cannot blend the principle of information design and the end user integration (E. Spiekermann, 2002). From this point, it can be seen that the role of information designer is the transmitter who creates a signal to receivers in the basic communication model (see Figure 59, picture b).



(a) The information design process adapted from Orna (2005)



(b) The communication model process adapted from Shannon and Weaver (1949)

Figure 59 The transforming process of information to communication

In my design, I applied myself in the role of information designer (transmitter) by integrating the principles of information design and needs of end users in my design

project. The role of information design in my design process can be divided into two phases. The first phase is managing and categorising raw data. The International Institute for Information Design (IIID, General Assemblies 1993 and 2000) defined one of the core competencies of information design principles as “the defining, planning and shaping of the contents of a message and environments in which it is presented, with the intention of satisfying the information needs of the intended recipients” (Peter, 2007, p. 8). In this phase, I employed the principles of information design to organise the set of raw data using the taxonomy aspect. The complexity of data units in each: (1) transport structures (transit modes and route systems), (2) city planning (GIS and road systems), (3) transport systems (BRT and Song Thel), and (4) stakeholders’ requirements (key findings/transit information needs) were the complex details that needed to be categorised (see more details in the stages). Meanwhile, in the second phase, I applied the principles of information design to transform design (from data into infographics). In this section, information design is applied to organise the visual ergonomics in my graphical materials which is part of the human factors (more details in the next stages). This discipline was used to apply relevant principles, methods and data to create the optimising design and overall system performance (International Ergonomics Association, 2010). In essence, it is the study of creating equipment that fits the human body (eye) and its cognitive ability. In this phase design elements and principles of organisation design will be involved to create the optimisation of legibility (the details are described in the stages and Chapter 9). Meanwhile, psychological and cultural factors are the key human factors, which I applied to define the key design concepts; before I created the graphical materials in the transit map (see more discussions, Chapter 8). These factors are the inner-world experiences of stakeholders which gave me ideas to create the original figure of design materials related back to their experiences, faiths, cognition, and memories. These consistent variables can support the design materials to obtain simple recognition from my recipients.

This integration idea can support the legibility requirement for information features, including matching a user’s cognition, informed with data, about the real end user (see the evaluative results in Chapter 7, p.220). The next topic describes the principle of information in respect to the concept of categorising contents and development of cognitive learning in visual perception based on design theory.

2.1.2 Information Design Principles and Cognitive Learning

Categorising contents: Information design principles involve the organisation of information. It categorises contents by using principles of organisation design and design elements in order to create a graphics form which can enable people to learn, retrieve, store, understand and apply knowledge (O’Grady & O’Grady, 2008; Sless, 2007). Without the organising of content, people’s ability to receive messages is strongly affected. The overwhelming and jumbling appearance of information will generate disconnections in transmissible communications with viewers (O’Grady & O’Grady, 2008). Wurman (1990) developed his organising information model by isolating five ways to group contents under the LATCH principle. This principle consists of, (L)ocation: the structure of information based on the physical geography, for example: transport routes, maps and travel guides. (A)lphabet: the content structure based on a letter sequence, including telephone books and dictionaries. (T)ime: is the functional information that users need to understand the sequence of events, for example: timelines of travel boards, calendars, and cooking instructions. (C)ategory: a group of information sets with similar types or features, for example: sports’ shop websites often group goods by sport’s type (golf, football, tennis, and basketball) and specify a brand in each category sport type. (H)ierarchy: information structures, which involve presenting measured data, for example: large to small, light to dark, ranking, levels and weights.

The organising principle of information design can be integrated with other communication principles. O’Grady and O’Grady (2008) explained that a pyramid style of writing journalism can be applied to categorise structure of information product contents, for example: websites, infographics on newspapers. This pyramid consists of three stages to categorise contents followed by: (1) lead; (2) supporting information; (3) details. These stages work as the narrowing of hierarchy and sequence to explain the information contents. For example in the case of website design, the lead stage will categorise the main group of data before designing the home-page and the main toolbar option. Meanwhile the stage of supporting information uses design sub-contents in each topic under the main toolbar. The details stage will organise the background technical details, i.e. site-map systems, link-pages systems and programming.

Location	Alphabet	Time	Category	Hierarchy
Developing countries -Asia -Thailand -Isan region -KK province -KK CBD	Official languages -Thai language -English language	Timetables of bus line service -Peak times -Off Peak times	Navigation systems -map symbols -map legends -routes map & maps handout -fares rate Design guidelines • Design condition of navigation systems -colour codes, sizes system -type families and faces • Design condition of Street furniture -Street furniture plan for each transit node, e.g. interchange bus stops, bus stops and stops	Fares rate Timetables Number of buses system

Table 2 Experimental category framework applied from the LATCH Model

Following analysis, I found that the LATCH theory could be efficiently adapted to categorise and group the complex information of the Khon Kaen UTS. This is because the five ways of grouping content in this theory can clearly divide the specific details in each dimension. It also covered every design function in this case study⁵⁹ (see Table 2). However, the pyramid principle could not be applied to my information contents. It appears that the pyramid theory may work with fewer categories with less content in a small project; for example, university maps, design articles, or newspapers columns. This is because the grouping dimensions in this principle have been narrowed to clarify the details of the Khon Kaen BRT as compared to the LATCH model (see Figure 60, p.117). However, the LATCH model is only applied to categorise the information structure of Khon Kaen transit systems, services and information need. It does not include the arrangement of cultural perceptions or the defining of design concepts in this case study.

⁵⁹ These are my categorising ideas based on the LATCH model. **Location:** I identified the setting of this case study by arranging the continents, countries, regions, provinces and cities. This hierarchy reminded me about understanding the context areas of my design. However, this data also led me to understand the key factors, e.g. (1) the language factor in the alphabet section and (2) the local time use systems between Thai (24 hr) and Western (12 hr). **Alphabet:** This group related to the language that the target users commonly used in my design location. A common language was the key instrument that I needed to categorise before providing the transit messages. In this case study, the Thai language was the alphabet from which to communicate and design a typographic system for the map. English was the second language that I designed to provide support for international users. Meanwhile, the Isan concepts (from the key findings) are the key visual language that was applied to develop the graphical materials in this map. **Time:** In respect to service times, I could only make a prediction because the BRT project is not operating yet. Meanwhile, the Song Thel system does not have service timetables. In this case, therefore, I could only predict the timetable services of the BRT from the project report of the Khon Kaen municipality. In the future, if both systems have a certain timetable, arrangements can be made, e.g. peak/off-peak service timetables on weekdays and in weekends. **Category:** In this section I categorised the group of navigating systems in the transit map. The systems consisted of: (1) identification, (2) orientation and (3) regulatory signs (Calori, 2007; Gibson, 2009). Meanwhile, the map legend, logo and bus timetable sections were categorised as the main group in this section. **Hierarchy:** In this part, I categorised the information structures of the Khon Kaen transit systems. The taxonomy concept was applied to rank the level of category units in each key transit structure e.g. transit mode, transit nodes and fare rate system. The details of my LATCH model are provided in Chapter 9, p.262.

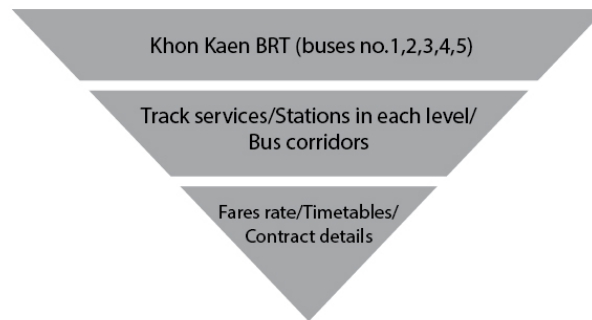


Figure 60 Experimental category framework applied from the LATCH Model

Principles of organising design to improve cognitive learning: The principle of organisation design⁶⁰ is applied to support the categorising information. Under this principle, the design elements⁶¹ are the main instrument to organise a design form in each group of contents, in order to improve the efficiency of graphical representations to meet with human cognition and legibility concepts (O’Grady & O’Grady, 2008; Tombre & Lamiroy, 2008). Krause (2004) divided the main principle of organisation designs into two forms; (1) harmony and (2) variety. The style of balances, proportions, dominances, movements, and economies (cutting details) in each design image means deciding which are the best harmony, or variety, forms. These styles are generated by using design elements such as lines, shapes, values, textures and colours (Lupton & Phillips, 2008). For example, the London Underground map uses a variety of colours to present the service lines. It also applied the abridging technique to summarise details from the real geographic setting into the diagram map style. Its diagram uses simple lines to represent a direction of service tracks.

These design elements are the major components to create graphical materials associated with graphic design principles, for example: typographic designs, colour theories and grid systems (Lupton & Phillips, 2008). This association will relate to the psychological processes of human cognitive learning to create information literacy. In addition, it will be concerned with an individual’s ability to recognise, evaluate and analyse available information (James, 2010; Meyer, 1997). For example, in the case of typographic design, the Americans with Disabilities Act (ADA) reported that proportions or ‘scales’ of type sizes will affect the legibility of readers. Therefore ADA defined the standard of viewing distances, which are legible for every age (see Figure

⁶⁰ The principles of design are concepts used to arrange and organise the structure of design elements. These principles consist of; (1) balance, (2) proportion, (3) rhythm, (4) emphasis, contrast and (5) space. They affect the expressive content or the message of the work, in form of harmony and/or variety designs (Ronnie Lipton, 2007; William, Holden, & Butler, 2010).

⁶¹ Design elements are the basic units of drawing, painting, visual and design pieces.

61) (American Diabetes Association, 1999). Meanwhile, line spacing will affect readability of words. This problem creates slow reading time. It also hinders the ability of readers to locate the starting point of the next line in a paragraph (James, 2010). In addition, some typefaces will affect readability for people, especially in groups of older viewers. Nini (2006) experimented with comparing the vision of young to middle aged, and groups of older people. The result presented bold features and letter spaces of typefaces which directly improved the blurred vision of older people.

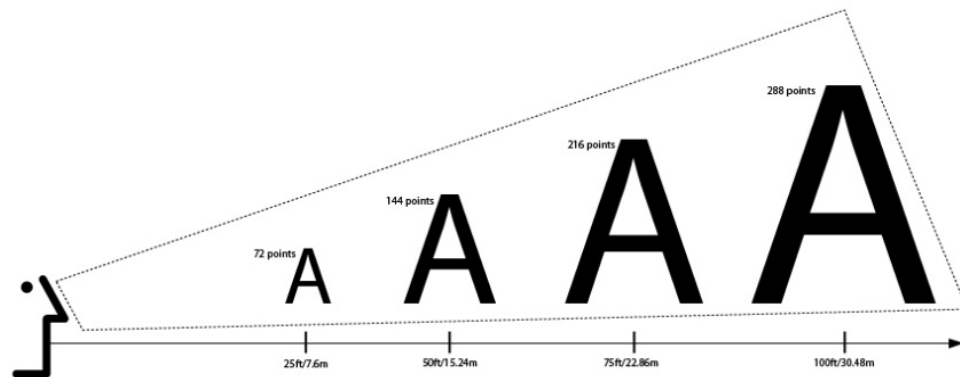


Figure 61 Viewing distance from ADA

The grid system is used for organising content (images and text), including managing the clarity of a message. This system can be applied to several fields, i.e. prints, digital contents (websites), 3D works, and maps. Lupton and Phillips (2008) illustrated that grid systems can generate the form of documents, for example: construct compositions, patterns and layouts by using the grid system. The design technique under grid systems works with the number of columns, vertical and horizontal relationships, and width of margins and gutters (Jute, 1996). The hierarchy system in grid principles creates a sequence in reading steps. Its system will also affect the reader's ability to process content more quickly (O'Grady & O'Grady, 2008). Maximising the usability of the grid system will occur when the designer collaborates with physical human eye-tracking principles. For example, the result of individual testing on eye-tracking of website layouts indicated that readers preferred to focus on the area of their left hands and move to the right hand side (Schroeder, 1998). Therefore, a web designer should adapt the grid system to match with natural human eye-tracking. These design principles are the key instruments, which I applied to organise the features of my graphical materials in order to make these graphics relate to the visual ergonomics of my target users. The

design prototype was evaluated by the users before being adapted to the final version (details are described in Chapter 7 & 9).

Finally, without the information design theory to combine interdisciplinary features, for example graphic designs, organising contents, design theories and human psychology, the information is overwhelming. It also affects accessible skill levels and the cognitive learning of human beings⁶²(O’Grady & O’Grady, 2008; Schuller, 2007). My case study not only organises and designs the complex data of a UTS by using design principles; but I also had to consider how I could make these graphics better connect with people’s cognition in this community. Thus, the challenge was to have people in Khon Kaen recognise the new public transport map which should come with the reformation of the UTS, particularly when most of them have never used this guiding system for travelling in the city before. People would be confronted with two obstacles; (1) studying the new UTS in the city, and (2) adapting to learning the new guidance system for travelling in the city (graphical map). In this case, using design principles to organise the information is not enough. I needed to study and include the human factors from the people in order to help me define the direction of the design concept, which reflected their social background. I believe that these variables are a key success in creating the empowerment of communication between users and my design. The next topic describes the principles of human-centred design, a concept that puts the human at the centre of the design process. The details are provided in the following sections.

2.2 Human-Centred Design

This topic is divided into three parts. The first part describes the overview concept of the HCD principle. The second explains the relationship between human factors and usability concepts. The last section addresses the development process of HCD which I applied to develop the research methods in this study.

2.2.1 Overview of Human-Centred Design

Before use of the terms ‘human-centred design’ (HCD), now well known as ‘user-centred design’ (UCD) were common these features of design was termed ‘usability

⁶² These affecting phenomena are described by the term ‘Information Overload’. This term appears when presenting complex graphical content (Toffler, 1984). The individual has insufficient ability to assimilate, process, and understand information. This phenomenon mostly appears in cases of reading maps; it is called ‘map shock’ or sometimes called ‘visual shock’. People are faced with the complexity of map details, i.e. pictorial (icons, symbols), text, number or diagram representations (Toffler, 1984). Wurman (2000) and Spiekermann (2002) agreed that this problem contributed to a black hole between data and the knowledge of viewers. Viewers cannot connect both factors into an interpretive process. It leads to the occurrence of ‘information anxiety’ situations that appeared in the case study of the Transantiago project.

engineering' (Nielsen, 1993). This term was used to guide the new design process for creating usability⁶³ of products. The usability concept aimed to accomplish specified purposes of product usage with effectiveness, satisfaction and efficiency (ISO9241-1, 1997; Jokela, Iivari, Matero, & Karukka, 2003). In 1999 the ISO 13407 defined the guiding standard of interactive systems to improve the usability of information systems and software design processes under the term HCD (ISO 13407, 1999). Since then, this term has become famous as a prototype of the design system in interactive fields. Although HCD is often used in the field of computer interactions, HCD's philosophy can be applied to the development of any design artefacts, for example: 3Ds, interactive designs, or print-based materials (O'Grady & O'Grady, 2008). This is because the principle and developing paradigm of HCD requires placing the user at the centre of the design process. Its processes are based on research concepts in order to make (information) products meet with desirability (desirable), feasibility (usable) and viability (functional) of measurements from users. These efficiency developments meant modern companies preferred to change their direction in their developing products. In the past, the process of product development was based on market research with limited innovation for evaluating product forms. More recently, companies emphasise development of products based on user research. These concepts focus on users' needs and the holism of users' experiences, which comes from human factors (Chayutsahkij, 2002). This PhD project applied the key principle of HCD to develop the research method which ensured my design connected better with the stakeholders I served. These human factors transformed into new actionable design ideas⁶⁴. The next section explains the relationships between human factors and usability concepts, which I used to define my design concepts and evaluate the design prototype.

2.2.2 Relationships between Human Factors and Usability Concepts

The term 'human factors' represents a broad area of study and understanding of human behaviour and capabilities (Meister, 1999). The usability concept tests specific products to meet the demands of specific users. It focuses on efficiency, effectiveness and satisfaction in a specified context of use (ISO9241-1, 1997). It also includes satisfying assessments of learning ability, errors and the memory of humans (Nielsen, 1993).

⁶³ Usability is about efficiency, learnability, errors, memorability and satisfaction (Nielsen, 1993).

⁶⁴ In many cases, using citizens' experiences can enhance the chance of achievement, when compared with simply using external professionals (E. B.-N. Sanders & Dandavate, 1999; H. Sanoff, 2005). This is because citizen participation has a broad value to community life as seen through (1) public engagement, (2) building trust, and (3) making better decisions for the community (Creighton, 1994). These advantages helped my design and increased the speed and effectiveness of developing new solutions; e.g. cognitive learning in map-reading skills (see more discussions in Chapter 7 & 8).

Therefore, the major role of human factors in design means studying the secondary data of human physiologies on limitations and cognitive capacities. It also includes collecting specific variables (primary data) that consist of three main factors; physiology, psychology, and society and culture from target users (Chatpinyakoo, 2010). These resources need integration with theoretical studies (dependent on the context of projects), in order to create useful merchandise which meets with usability objectives. For example, in my case study, I applied HCD as the design method to inquire about the key human factors from my stakeholders which influence their cognition, sensory memories and social backgrounds. The area of my inquiry was based on three main domains of human factors (physiology, psychology, and society and culture). These factors were investigated with both primary and secondary data in order to find and confirm the real need from my end users⁶⁵. The key human factors were triangulated with the other key findings (secondary data), before defining the key design concepts. The data were collected using mixed methodologies including qualitative (ethnography and phenomenology) and quantitative (descriptive research) methodologies. Both primary and secondary resources were integrated and the data analysed together. The findings were used to define the design concepts for creating the design prototype of the Khon Kaen UTS. These designs were assessed by sample groups in feedback to test usability, and then applied to develop the design prototype before adapting and creating the final work. The details are described in the following chapters.

2.2.3 Developing a Process to integrate HCD

The developing process of HCD is driven by research seeking evidence of the human factor requirements of the target user and organisation (Jokela et al., 2003). Much research in HCD processes is used for collecting primary data (human factors). These factors can be integrated with documentary and/or theoretical studies depending on the requirement in each project. This integration is developed to create the design conditions and evaluate the piece of work to meet with the real requirements of users and organisations (Baer, 2008). Although the development of HCD processes can be applied with several projects (or models), they still share the common theme of investigating satisfaction and requirements on the target user (O'Grady & O'Grady,

⁶⁵ For example, in respect to physiology, I focused on the visual ergonomics in order to create legibility with the graphical materials by investigating both (1) the standard of design principle of ADA and (2) the feedback from testing results with the sample users. The design principles will be applied to organise the graphics on the map prototype as the first stage. Meanwhile, the feedback from the testing prototype of the sample groups will be adapted at the last design stage; before being developed into the final map version. Details about the defining of design concepts and processes are provided in Chapter 8 & 9.

2008). For example, Maguire (2001) designed his HCD process for software development starting from (1) ‘plan the human-centred process’; (2) ‘understand and specify the context of use’; (3) specify the user and organisational requirements; (4) product design solutions – evaluate designs against requirements; and (5) ‘meet requirements’. Weissenberger and Thompson (2009) presented their HCDs to develop a software project starting from (1) planning project success; (2) researching the users’ goals and tasks of market needs; (3) design by defining the system from the users’ perspective; (4) adapting unforeseen limitations; (5) measuring by testing the product’s effectiveness, efficiency, and satisfaction; and (6) the final design. Meanwhile, Yano (2007) explained her HCD activity phases in developing websites as like ‘choosing a present for a friend’ by studying (1) user surveys; (2) analysis of user requirements; (3) prototype; (4) assessment of usability and design revisions based on feedback received; then going to (5) the final design. Although the HCD development process can be adapted to include other features, key performance criteria still cover the four phases of HCD in ISO 13407 concepts. This consists of (1) ‘specify the context of use’; (2) ‘specify the user and organisational requirements’; (3) ‘produce design solutions’; and (4) ‘evaluate design against project requirements’ (ISO 13407, 1999).

In research the HCD concept can help a designer to clarify the relative theory/documentary, and key variables of users’ requirements. This assists designers to pursue design solutions and develop design products to meet the real end user’s needs, and usability concepts (Weissenberger & Thompson, 2009). The efficiency of the HCD concept is one of the main conceptual frameworks in designing research methods in this PhD. HCD can inquire holistically about stakeholders in Khon Kaen city using a three part human factor approach: physiology (human body, age, and gender), psychology (cognitive learning, semiotic thinking), and society and culture (beliefs, customs, language, transport experience, and symbolical). These factors could help understand the Khon Kaen communities’ knowledge bases, which are different from Western perspectives. These perspectives will become the key variables that will be integrated with information design theories in order to create original graphics materials of the Khon Kaen BRT navigation systems, reflecting local people’s cognition and learning experiences. This PhD applied the key principle of HCD to develop the research method which ensured my design connected better with the stakeholders I served. Figure 62 presents my research method applied from the HCD cycle (ISO-13407). It consists of

four essential processes that were conducted in order to incorporate the usability requirements. I extended the essential process into six phases. The overview follows:

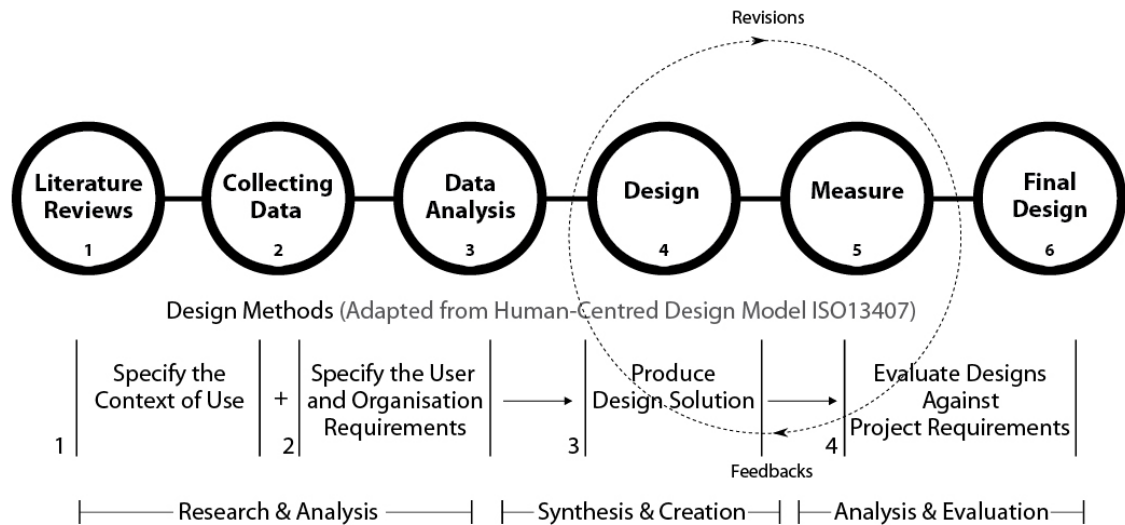


Figure 62 Both models present the relevance between my design method and the original HCD development concept of ISO 13407

Phase 1) Literature reviews: data collection began using content analysis (secondary data) to review research documents (e.g. city, transport policy and cultural contexts). Theoretical studies were also included in this process (e.g. information design, HCD, usability design, design elements and semiotics).

Phase 2) Collection of data: this phase applied the stakeholder analysis to identify the group of people related with the Khon Kaen BRT transit map. The technique of stakeholder mapping was the main strategy for recruiting potential research participants. This technique extended understandings of the different perspectives, relationships and roles of people in the Khon Kaen community (see details in chapter 5, p.136).

Phase 3) Data analysis: the process of integration and analysis of holistic data using triangulation techniques included the triangulation of methods (content analysis, realist ethnography, and survey research), triangulation techniques of data collection (questionnaires, observations, in-depth interviews), and the triangulation of sources (local/ non local people, expert groups, and key performances group (a) and (b)) (Maxwell, 1992). The key findings (human factors) were defined as the key design concepts. These concepts were integrated

with the UTS structure information and design content using the design theories in the next step.

Phase 4) Design architecture: this section integrated three parts: (1) design theories (e.g. information design, the LATCH model, design elements, principles of organisation, grid system, etc), (2) human factors (e.g. key variables and usability results from sample groups), and (3) UTS structure information (e.g. the city, land used, public transit systems, transit routes, timetables, fare rates, stopping points, landmarks etc), to create the design prototype which was used by the sample group of stakeholders in the next step.

Phase 5) Evaluation: this phase was created to develop a BRT transit map prototype using the focus group technique in orders to trial it with a group of representatives. This phase also included in-depth interviews with key informants and experts. Investigations involved the usability design concept (usable, desirable and functional) in order to improve and correct missing aspects of the design prototype before completion in the next phase.

Phase 6) Final design: feedback from phase 5 was used to correct and improve the prototype for the completed design, thus meeting with the usability in a real context.

HCD principles applied to my research would focus on the stakeholder as the centre of the design process. The research design gave these participants a chance to share place experiences, need and usability in the design process. These human factors have wide practical and emotional importance to the individual action and interpretation process. The selection of stakeholders for my case study is described in Chapter 5. Finally, the above discussion presents the integration processes of the key theories. This interdisciplinary study is a new model for developing public design (an urban transit map) both in Khon Kaen community and in Thailand (see model in Figure 63, p.125). Although Khon Kaen city municipality had conducted a public hearing about the new UTS issue, in terms of public design processes (e.g. city identity and UTS corporate designs), they had not sought feedback from stakeholders in this community. (See discussion details, Chapter 8 in section 4, p.249). However, I believe that city identity is not just about how the city looks; it is about how people look at the city. Consideration

of community voices is significant for creating proper (public) design materials which reflect community ownership, uniqueness and cultural values.

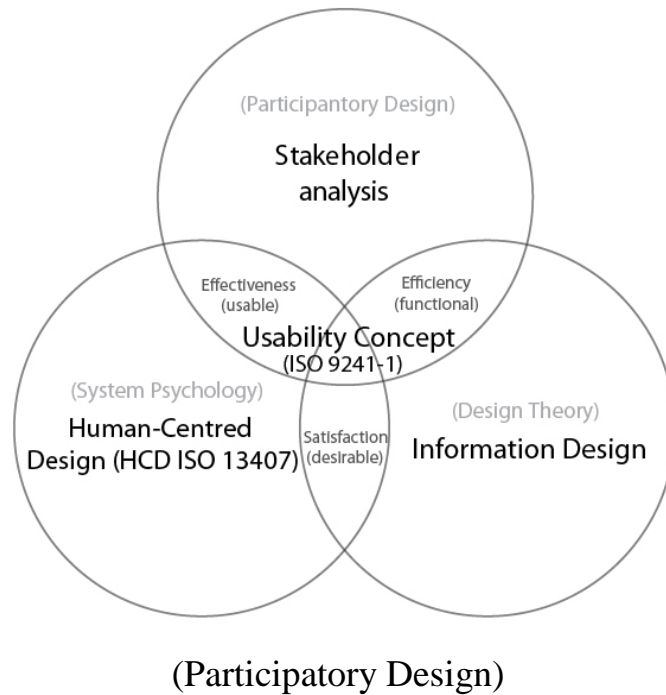


Figure 63 The key design theories' model

Summary

It can be seen that my thinking systematically through a holistic approach played an important role in the root of my research framework. This model facilitated my understanding of key components, including the paradigm, methodologies, participants and methods. With this research framework, I could uncover the knowledge base of community stakeholders. The self/group experiences were shared to create a map design, based on the voices of community participation. The details of my research design are provided in the next chapter.

-Chapter 5-
Research Design

Introduction

This chapter presents the outline of my research design, including choice of participants, methodologies, methods, and research instruments. The aim of my research design is to inquire about key human factors from various perspectives and different ideas of the Khon Kaen stakeholders. This knowledge base of stakeholders was studied in the area of local cognitive learning and included psychology, physiology and social (culture) factors. These key factors contributed to the original design concepts and materials on the Khon Kaen transit map system.

The research process consisted of two stages. In the first stage, the results from the data collection and analysis created a design outcome as the Khon Kaen transit map prototype. The second stage evaluated and adapted the prototype to create the final version. The world view of the researcher and designer was transparently integrated to investigate the sampling unit, and analyse the data. Mixed methods were provided to match the type of investigation theme and sampling unit. The key finding and design outcomes will be discussed in Chapters 6, 7 and 8.

Section 1: Research Design

This section summarises the key concepts of a methodology, and a particular selection of methodologies used in the research (Somekh & Lewin, 2005). It also includes explanations of ‘research paradigms’ that influence the development of a theoretical perspective of research (Walter, 2006). As a framework, a research methodology addresses the principle of methods in research design (Creswell, 2003; Mackenzie & Knipe, 2006). My research design consists of research paradigms and methodologies, which were applied as main principles that underpinned the structure of my research methods. Figure 64 (p.131) presents the outline of my research methodologies. The blue

part shows the area of my choice of methodologies; the pink section presents my key research paradigms.

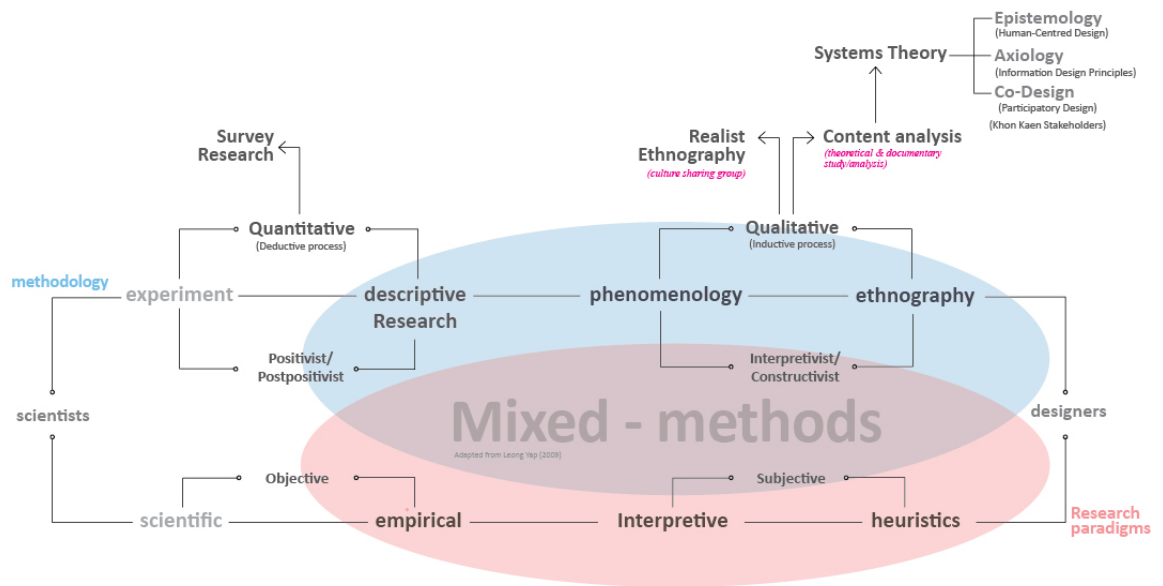


Figure 64 Influential methodologies

1.1 Research Paradigm

Bogdan and Bikinlin (1998) noted that before researchers define the structure of the research process, they have to understand the theoretical framework, as distinct from a theory, or sometimes referred to as the paradigm. The choice of paradigm represents the intent of the way knowledge is studied, interpreted and developed when undertaking a study (Cohen & Manion, 1994). Without a paradigm, there is no basis for the choice of research methodology, literature review and (research) methods (Mackenzie & Knipe, 2006). To create my research design, I started analysing the context of my case study in order to define the research direction by setting up the research paradigm at the first stage⁶⁶. My Thai co-design philosophy helped me to generate the group of people who became participants in my design project. My choice of stakeholders (detail, p.136), comprising of a selection of sampling groups in Khon Kaen city, encouraged me to combine the deductive and inductive processes to investigate the objective and subjective factors in my natural event. The next section will describe the choice of paradigms in my research design.

⁶⁶Bogdan and Biklen (1998) explained the term ‘paradigm’ as “a loose collection of logically related assumptions, concepts, or propositions that orient thinking and research” (p.22).

1.2 The Choice of Research Paradigms

A paradigm is a set of beliefs, techniques and values shared by a community of people (Kuhn, 1970). In the research field, a paradigm is the world view of researchers to verify the natural events (Sarantakos, 1998). The positivist (scientific) and interpretivist (naturalistic) paradigms are fully accepted within research communities (science and social science) (Bogdan & Bikinlin, 1998). Both paradigms, consisting of theories, mythologies, methods and measured validities, address different aspects when conducting research (Creswell, 2003; Mac Naughton, Rolfe, & Siraj-Blatchford, 2001).

1.2.1 Positivist/Postpositivist Paradigms (Empirical)

Mertens (2005) depicted the postpositivist paradigm as seeking the answer, in a natural event, in the form of a deductive process (objective). Most findings come from a modified experimental approach, based on probabilities, to generate empirical results. A quantitative method of data collection and analysis is involved with this research paradigm. Its method studies specific themes and questions from a large number of individuals. The data collection is in the form of statistics in order to acquire the average scores of groups of individuals in, for example, educational settings (Creswell, 2008). A quantitative approach offered one appropriate way to examine overall individual experiences, perspectives, and needs in the UTS and culture of Khon Kaen city. This deductive process enabled me to gather a large amount of data. The results demonstrated a range and an average of people's behaviour, perspectives, and knowledge, needs and trends in this community.

1.2.2 Interpretivist/Constructivist Paradigm (Interpretive and Heuristics)

This paradigm seeks to understand "the world of human experience" (Cohen & Manion, 1994, p. 36). Researchers in this field rely upon the "participants' views of the situation being studied" (Creswell, 2003, p. 8). They also recognise the reflection of their own background and experiences. Creswell (2003) clarified that normally constructivists do not begin to investigate the evidence with theory; rather, inductive processes are used to develop a theory or pattern of meaning throughout the research process. In interpretivist/constructivist, the qualitative approach is the most likely method used by a researcher to collect and analyse data. My research involved a small group of people (see details in p.137), and sought to investigate their perspectives, beliefs and cultures

(Lincoln & Guba, 1985). Therefore the interpretive and heuristics methods were involved with this investigation.

Interpretive research focuses on people interactions about their own subjective meanings with the world around them (Orlikowski & Baroudi, 1991). Research attempts to collect the meaning domain of human action, as a social construction by human actors. My research dealt with the study of ethnography and the multiple perceptives of local people. The background of their own cultures and the diversity of status and social classes (e.g. age, gender, education, occupation and income) meant they had several point of views to describe and define the meaning of the world around them, especially in term of visual perspectives (Cowan, 2001; F.D. Saussure, 1983). Interpretive research also includes discovering views of the researcher and applying these views to interpret the meaning of data equally with the sources of participants (Walsham, 1993). Wood (2000) proposed that heuristics is the way many designers discovered their appropriate design method. This is because naturally, creative production is not linear (Scrivener, 2000). Moreover, heuristics is principally used to find out a rapid solution which is close to the best possible answer or ‘optimal solution’ (Russell & Peter, 2003). My position in this practical based PhD is a researcher, designer, local and user. Hence, I believed that some of my voice needed to be included in the design project in the form of my experiences and knowledge of design skills; in order to transform the findings to create the graphical materials and design solution grounded in the knowledge base of this community.

1.2.3 Pragmatic Paradigm (Mixed-Methods)

In my case study, sample units involved both large and small groups of representatives as well as an investigation of a holistic view of people in the community. Therefore, the sources needed to be analysed and described in terms of statistical (objective) and descriptive (subjective) formats. The pragmatic paradigm has been chosen as it allows for multiple methodologies and methods, in data collection and analysis, that are used in this study (Cohen & Manion, 1994; Creswell, 2003). As can be seen in Figure 64 (p.131), the world views of scientists and designers are combined in my PhD. This combination could strengthen reliability, as well as the internal and external validity of my results.

1.3 Methodologies

Methodology is the body of methods and theories in a particular branch of knowledge (Mackenzie & Knipe, 2006; Madden, 2010; Walter, 2006). Good methodology offers effective methods, theories, techniques of data collection, and structure of data analysis. All these help establish research methods (Herrman, 2009). The scientific and designer paradigms overlapped in my research, and further included human factors, involving beliefs, and the culture and experiences of stakeholders in a large community. My methodologies involved deductive and inductive processes. They were descriptive research, phenomenology and ethnography.

1.3.1 Descriptive Research

Leedy and Ormrod (2001) stated that descriptive research is the key methodology in a quantitative approach. This uncovers a mass of human perspectives describing and identifying the characteristics of a population and phenomenon being studied. The result can provide an accurate and valid representation of those variables. The summary provides some perspectives of the environment (Aaker, Kumar, Day, & Lawley, 2005); but does not attempt to change or modify causal links between variables under investigation (Webb, 1992). Survey is one of the key methods in descriptive research. Through aggregated quantitative data, it may describe the opinions, attitudes, characteristics, or behaviours of a population (Creswell, 2008).

My field work involved a large target population (see detail in p.137). Survey research with randomisation was a good option. My process used random selection, with the two sampling groups (prior study and sample groups), testing my questionnaire and collecting the data. This method was used to investigate holistic cultural perceptions, transit behaviours/experiences and the need for transport information for the people in the Khon Kaen community. The detail of survey development is described in the research process (p.139).

1.3.2 Phenomenology

This methodology involves the study of individuals' perspectives or consciousness from their experience (Merleau-Ponty, 1996), and overlaps with other qualitative paradigms that share the common theme of subjective and personal investigations. These qualitative paradigms include ethnography, hermeneutics and symbolic interactionism

(Moran, 2000). The pure research of phenomenology prefers a description rather than explanations, without the setting of preconceptions and hypothesis (Sokolowski, 2000). The basis of phenomenology is to study a different structure of human experiences, which ranges from emotion and desire to imagination, perception, memory, embodied action, linguistics and social activity (Moran, 2000; Sokolowski, 2000). I applied this methodology to investigate human factors from representative groups of the general public, experts and local administrators in the Khon Kaen community. The transit requirements of people were investigated, integrated and narrated in this thesis. In-depth interviews and focus group techniques were used to collect data and evaluate the design product (see details in research participants and research process). Phenomenology had a significant role in my questions to uncover the live experiences of my key informants. Their experiences helped me to understand the relationship between their positioning backgrounds and their interpretative worldview with the Isan context. These voices were key variables I used to triangulate with other data sources.

1.3.3 Ethnography

Ethnography involves analysis and interpretation of data to understand the cultural settings that involve a pattern of culture-sharing groups (Walter, 2006). It includes human behaviours, beliefs and languages that are developing all the time (Creswell, 2008). Ethnography overlaps with political and economic structures, communication and interaction styles, and life stages, all of which influence social actions (Creswell, 2008; Hammersley & Atkinson, 2007; Madden, 2010). Therefore, field work is essential to study “the phenomenon from an insider’s point of view” (Walter, 2006, p. 373) and “the patterns of a culture-sharing group” (Creswell, 2008, p. 473). An ethnographer primarily uses observation and/or interview techniques to understand phenomena in a natural event. Another source of data collection includes documents such as political and economic sources.

This methodology was applied to my research field work, in order to uncover the key variables involved with a culture-sharing group, for example: background knowledge, communication styles and the experiences of people in the community. I have been familiar with the city of Khon Kaen for more than 25 years. Thus, this methodology also had a role in my own heuristic research practice.

Section 2: Research Participants

Stakeholder theory is an important conceptual framework, in order to select a group of people to be involved with this study. This theory assisted with identifying representative groups from real target populations in my site. The dependent variable from this sampling unit became representative knowledge-based human factors of citizens in the Khon Kaen community. These factors were analysed and transformed into the key findings in order to contribute to the original framework for this experimental design concept (transit map).

2.1 Stakeholder analysis

Stakeholder analysis is the main strategy for recruiting potential research participants who could be involved with the process of data collection (Frooman.J, 1999). This concept further extended my understanding of the different perspectives, views, relationships and roles of people in the Khon Kaen community (Fletcher, Guthrie, Steane, Roos, & Pike, 2003). Stakeholder analysis helped me create an appropriate direction to develop research methods, instruments of data collection and data analysis techniques (as described in the research process, p.139).

2.1.1 Methods of Stakeholder Mapping

Applying the stakeholder matrix is a method for analysing a group of stakeholders – that is, the research participants. This approach is an important part of developing a useful participant commitment plan. It is a method commonly used by applying the table of two variables (Frooman.J, 1999). One side (the left) of the square represents a ‘power/influence’ level of people in Khon Kaen city, who were involved with the decision making in terms of the administration system. The top side represents an ‘importance’ level of people in the city decision making structure, those who would be involved with the outcome of my designs (see Figure 65, p.137).

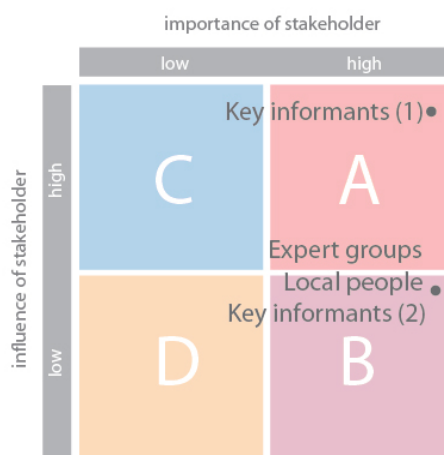


Figure 65 Stakeholder matrix and participant groups

I categorised the main group of participants, who were the representatives of Khon Kaen stakeholders, as follows: (1) local people, (2) experts, and (3) key informants, which consisted of two sub-groups: (A) local administration groups and (B) community users/drivers of local transportation. These groups were placed in different positions on the stakeholder matrix.

Box A: People of official significance, knowledge, influence and high importance in the community and the BRT project. This group consisted of five heads of local administration.

- Key informants group A:

- 1) Khon Kaen city municipality (Mayor)(1 person)
- 2) Khon Kaen transport centre (Head officer) (1 person)
- 3) Khon Kaen economic chamber (Chairman) (1 person)
- 4) Khon Kaen tourism centre (Head officer) (1 person)
- 5) Khon Kaen sport and local tourism (Head officer) (1 person)

Box B: People who had high importance, differing sets of knowledge and experience, but low influence in the community and the BRT project. It consisted of three groups: (1) local people, (2) a second group of key informants and (3) academic and specialist experts in key relevant categories.

- Local people:

Within the group of local people, 8 sub-groups existed: (1) people with disabilities; (2) elderly persons; (3) students; (4) workers; (5) business people; (6) high-income people; (7) low-income people; and (8) monks. The total number of participants was 131 people, with equal numbers of males and females.

- Key informants group B:

- 1) Community users of local transport (representative 1 people) (female)
- 2) Community drivers of local transportation (representative 1 people) (male)

- Expert groups:

- 1) Transport engineering field (1 academic)
- 2) Urban design field (1 academic)
- 3) Isan folk Art and Isan culture fields (1 academic)
- 4) Isan textile fields (1 academic and 2 local specialists)

2.2 Sampling Techniques

Sampling technique enables researchers to use sample units in place of the target population (Sarantakos, 1998) in order to gather data representative of the whole population. Sampling techniques consist of probability and non-probability sampling (Creswell, 2008). Probability sampling is based on rules of the selection process. Equal and systematic selections are required in every unit of the population. A high degree of accuracy is necessary to compute a number of representatives in terms of statistical standards (McMurray, Pace, & Scott, 2004). Non-probability sampling is less strict and has no requirement for representativeness. A researcher can make a decision about which sample units should be selected. This method is applied in exploratory research or qualitative approaches (Sarantakos, 1998).

Variable control is sometimes difficult when using natural selection which is more flexible (Lincoln & Guba, 1985). In addition, the study of people, beliefs, traditions and

cultures is difficult to verify by setting up a specific number of sample units. Therefore, I used non-probability sampling to create a flexible investigation into my data.

2.2.1 Purposive Sampling (non-probability)

I employed non-probability sampling by choosing a purposive technique to select my sample unit. This technique was used in conjunction with a stakeholder matrix to identify the characteristics of a group of people and define a sample number, who were representatives of the wider population for the purposes of my research. Utilising a purposive technique ensured I obtained useful variables from a range of stakeholders, rather than gathering massive amounts of data from a probability sample. (The detail of sampling will be explained in the research process).

2.2.2 Snowball sampling (non-probability)

The technique of snowball sampling is employed for different cohort groups. A researcher asks participants to recommend individuals to study (Madden, 2010). This technique is employed to suggest peers as participants, and this may happen during the process of data collection or after analysing the data (Creswell, 2008; Sarantakos, 1998). This sampling technique was employed after I analysed the data and revealed key findings in the first stage of data collection. One expert and two specialists in Isan textiles were interviewed in-depth in order to gather data before designing the map prototype. (More details will be presented in the collecting strategy, step5, p.153)

Section 3: Research Process

A research process includes a method, techniques of data collection and data analysis (Nachmias & Nachmias, 1996). These methods, tools and techniques are divided into quantitative and qualitative approaches (Neuman, 1997). Quantitative research is involved with setting up a hypothesis and verifiable phenomena, using statistics, mathematics and algorithms to analyse data (Creswell, 2008). A major instrument of quantitative research includes “survey research, structured interviewing and secondary data analysis” (Walter, 2006, p. 380). Qualitative research is involved with the study of people or characteristics of a group and society. The understanding of meanings and relationships in these social worlds are required before a researcher interprets the data. Major methods in qualitative research include in-depth interviews and participant observation studies (Creswell, 2003; Neuman, 1997). However, the selected approach needs to be based on the research question and context.

3.1 Mixed Methods and Data Collection

This section outlines the methods and research instruments that I employed in the field work. My research used a mixed-method approach, with both quantitative and qualitative methods, chosen because I dealt with large and small groups of people in the community. Therefore, I needed to combine several approaches, for example: deductive (quantitative) and inductive (qualitative) processes to investigate key variables. I found that mixed methods could provide a better understanding in this research, and several dimensions for analysing and interpreting results. Figure 66 presents the outline of my mixed methods and techniques. My research used more qualitative (QUAL) than quantitative (QUAN) approaches (see research timeline in the Appendix L).

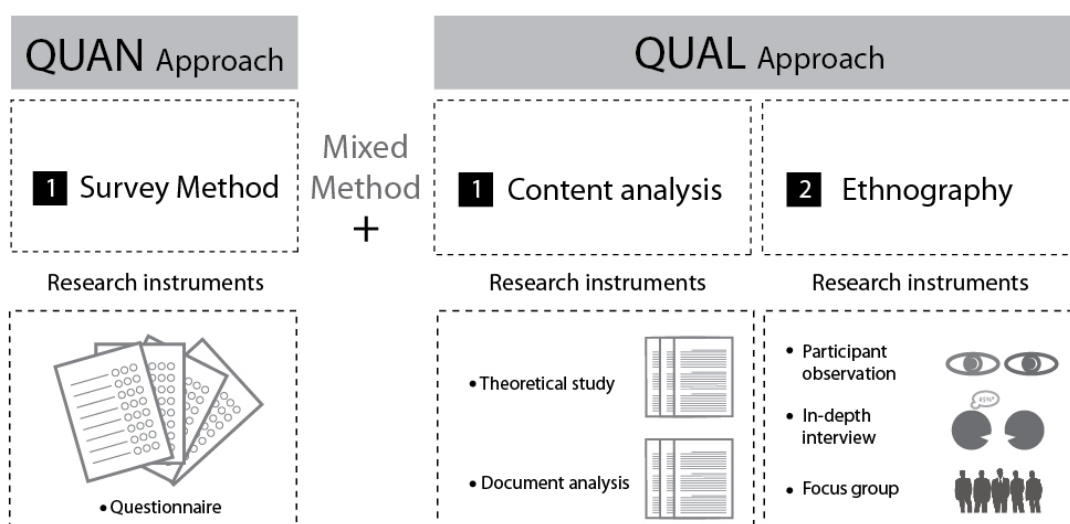


Figure 66 Overview structure of my mixed methods and the basic instrument of my data collection

3.1.1 Quantitative Approach

A quantitative approach follows the logical process of the empirical method to acquire data from the stakeholders. The descriptive research approach was to obtain data using the 'survey research' method.

Survey research: is one procedure in quantitative research and involves surveying a small group of people (called the sample) from a large group of people (called the target population) (Creswell, 2008). Themes examined are concerned with opinions, attitudes and behaviours. This method is efficient and enables a large amount of data to be collected in a short period of time. This procedure captures people in a large social group and can be used to compare

variables across and within different groups, for example: age, income, education, and gender (Leedy & Ormrod, 2001; Walter, 2006).

Questionnaire: is a technique for data collection that underlies survey research (Creswell, 2008). This technique uses three question formats: (1) rating scales, (2) open and closed questions, and (3) semi-closed questions (Creswell, 2008; Neuman, 1997). These formats are chosen dependent on the theme of inquiry and the research questions.

I used a questionnaire as the main instrument to survey the sample group of target populations (local/people). The questionnaire was a deductive process. The three-question format was used to create various dimensions for responses and data analysis (see Appendix G). The questions were administered by interview, because some groups of participants may not have been able to read, or may have had disabilities. I undertook a pilot study to test my questions, and choice of answer format (see more details in footnote 67, p.149). Results from the pilot survey were not included in the process of data analysis.

I organised data collection team (see details, p. 151). I edited the questionnaire to the final version, and my team used this version to collect data from 130 participants (see, p.152). Random selection, with purposive sampling techniques, was used to select potential participants (see how?, pp.151-152). (More details of data collection are provided in the collecting strategy, p.144)

3.1.2 Qualitative Approach

Documentary analysis was used to identify the context of transport, transit behaviour, transit structures and local culture (see Chapter 3). This analysis also included development plans and policy documents, which related to transport development in Khon Kaen city.

Realist ethnography: includes ethnographic studies on social and cultural human interactions within the field of anthropology (Creswell, 2008). An ethnographer looks at an entire group; in particular, a group of people who share a common culture.

I used realist ethnography which emphasises a narration of 'fact' from a natural event (Van, 1988). This type of ethnographic design is useful for data collection and understanding the complexity in a particular culture (Creswell, 2008). I applied the three

techniques of data collection: participant observation, in-depth interviews and focus groups.

Participant observation: is an instrument associated with qualitative research (Creswell, 2008). This tool involves gathering data at the first stage by observing people and places in the research field (Leedy & Ormrod, 2001).

I was in the role of the participant observer because I have lived in Khon Kaen for 30 years, since 1983. For many years I have used different forms of public transport in Khon Kaen. In my field work, I could interact with people in the various research sites, during my entry process. This process enabled me to see natural behaviour, actions, and the relationships of people who were observed. I used field-note (see Appendix F) techniques to record observations and applied auto-ethnography to record my perspective (designer voice), which I obtained from reflections in this site work. These processes provided for a transparent relationship between myself and my hometown (Boyd, 2008). My recording devices were a digital camera and written field notes.

In-depth interview: involves individual data collection (Walter, 2006). Face-to-face contact is a popular technique to collect interview information. An interviewer can observe the actions and feelings of interviewees. The face-to-face technique can assist interviewers with controlling interview situations, rather than using the telephone, mail or electronic-mail interviews (Creswell, 2008). The approach of an interview consists of two main patterns: (1) structured and (2) unstructured interviews (Sapsford & Jupp, 2006). Both patterns are derived from the format of questions. Most of the structured interviews will be prepared with specific questions to ask the interviewee. However, researchers may not receive much of the interviewees' perspective (Denzin & Lincoln, 2005). With an unstructured interview, the researcher will get fuller ideas from interviewees.

In the first stage of data collection, I applied a semi-structured format which included closed (structured) and open-ended (unstructured) questions (see in-depth protocols in Appendix B, C, D and E). I used unstructured questions to define the framework of questions, creating a relaxed atmosphere during the interview process. The sample group for my in-depth interviews were (1) the key informants in group (a) and group (b) (see, p.137), and (2) the expert groups (see, p.137). The snowball technique was

required after I analysed the data, as I needed other key informants with knowledge about Isan textile skills (see details, p153).

Focus group: involves collecting data from a group of people who discuss and share experiences on the same theme (Walter, 2006). This method requires people who participate together (at least three people), including the researcher (Creswell, 2008).

I applied this method in the second step of data collection, in order to evaluate my design prototypes. This data collecting step was followed by the development process of HCD (see more detail in Chapter 4, p.123), which was applied to measure the usability test of any design products (ISO 13407, 1999). My focus group was set up in the form of practice (user testing), survey and discussions using a workshop process. I used questionnaires, noted discussion ideas, and screened (classified) the group of participants as part of data collection (consisting of 4 groups which will be explained in the data collection, p.154). I used television for presenting my research overviews. I used real-design prototypes for measurement and voice recorders to code comments.

Section 4: Data Collection

This section describes the data collection process of my PhD, in particular the two stages of data collection. The diagrams describe the research methods in this topic. Figure 67 overviews the two stages.

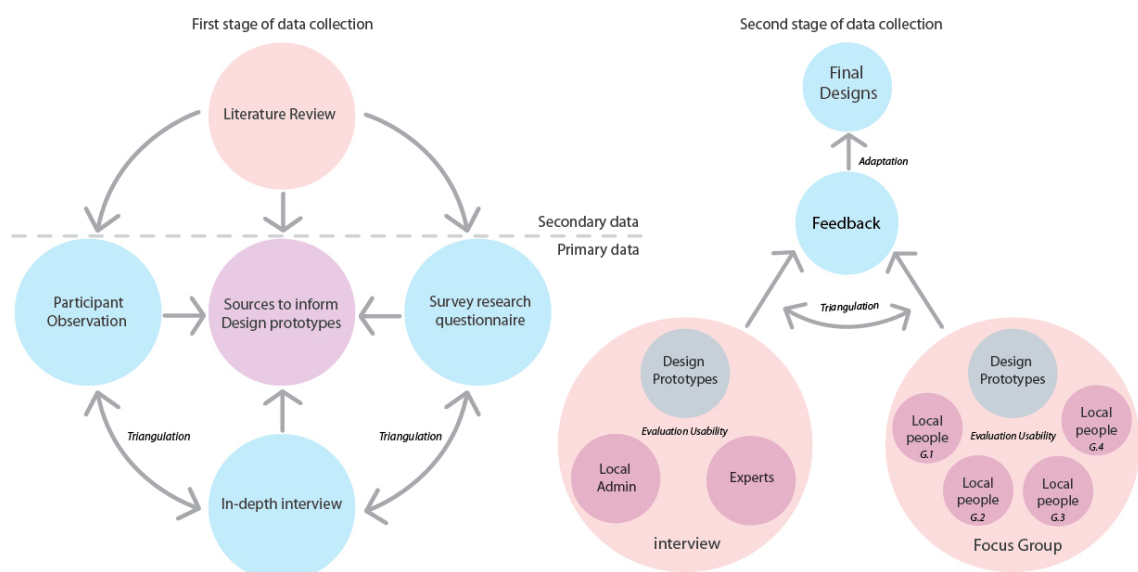


Figure 67 Key processes and elements of my research approach

This diagram shows the relationship between the methods, techniques and steps of my research operation. The left-hand side explains the first stage of the design method before designing the first prototype. The right-hand side describes the second stage. This is concerned with the usability test (design evaluation) concept. Feedback in this stage was used to adapt the design prototype before creating the final design of Khon Kaen BRT transit map.

4.1 The First Stage of Data Collection

In the first stage, I studied secondary data involved with the UTS, navigation system maps, case studies, cultural perspectives, historical sites, local policy, related design principles and theoretical study contexts using document analysis. These resources made me understand (1) the outline of map design evolution in developed western countries; (2) the problem of providing an urban transport navigation system (map) in Thailand and in Khon Kaen city; and (3) the related design theories and key principles needed to create an efficient map design based on the usability test. This secondary data uncovered areas of local needs and perspectives, which the review documents, existing in databases or journal articles, did not. Hence, the first stage of data collection was to design questions for inquiring about the missing source (primary data or human factors/knowledge base). The question themes followed the local transit behaviours, reading map experiences, cultural perspectives, visual perception in cognitive learning and the needs of stakeholders in the community (including those in administrative positions). The collecting strategy steps are explained in the following paragraphs. Meanwhile, Figure 5 outlines the structure of my data collection stage 1.

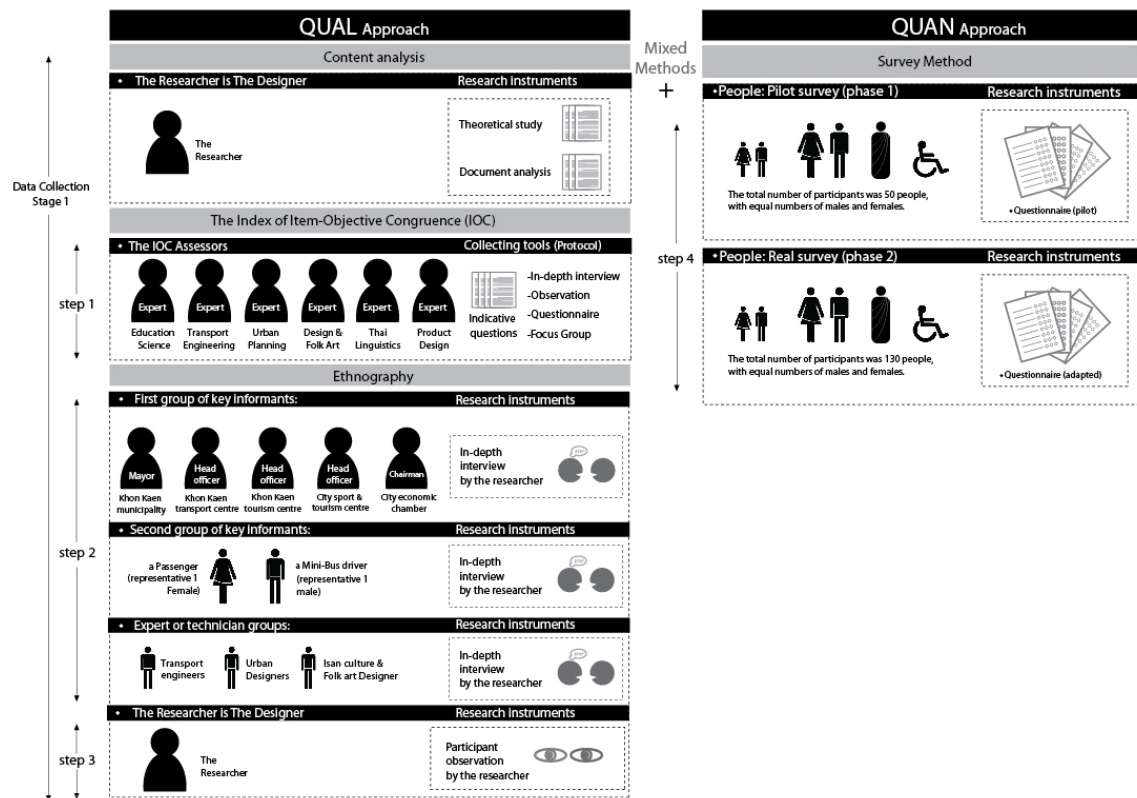


Figure 68 Collection strategy, stage one

The details show the combination between the QUAL and QUAN approaches in my collecting technique.

- Step 1:** I evaluated my data collecting instruments with the expert groups in the fields of (1) education science, (2) transport engineering, (3) urban planning, (4) local and Isan folk art cultural design, (5) product design and (6) Thai linguistics, by using the index of the item-objective congruence (IOC) technique. This technique is the macro for test developers to access content validity approaching the IOC measure (Rovinelli & Hambleton, 1977). Three evaluating experts are the standard in the IOC process. A content expert will assess each item by giving the item a rating of '1' (for clearly measuring), '-1' (for clearly not measuring), or '0' (for unclearly measuring). This means if the set of indicative questions receive the IOC rate at 0.50-1.00 points; it is worth investigating to find an answer that matches with the purpose of the research. However, if the IOC rate is lower than 0.50 points, this indicates that the set of indicative questions needs to be improved (Rovinelli & Hambleton, 1977). The formula of IOC is $IOC = ER/N$ (ER = the sum score from experts and N = number of experts). The details of using IOC to evaluate the collecting research instrument are as follows:

- *The indicative question for an in-depth interview: Key informants group 'A' (see Appendix B)*

This indicative question was prepared for in-depth interviews with the local administrator groups. The question themes involved administrative ideas about (1) local cultures, (2) public transport, and (3) the trend of urban transport development.

IOC Assessor: (1) Expert in education (an assessor in research tools); (2) expert in urban planning; (3) expert in transport engineering; (4) expert in local and Isan folk art cultural design; (5) expert in Thai linguistics

Commentary: Some of the experts recommended adapting the unclear terminology of 'Khon Kaen city' to 'Khon Kaen municipality'. This is because the second term can be defined clearly as the administrative area of the city and research case study.

Average IOC score: 1.00 point (the sum score from all experts)

- *The indicative question for an in-depth interview: Key informants group 'B' (see Appendix C and D)*

These indicative questions were designed for in-depth interviews with community users of local transport and community drivers of local transportation. The question themes explored local cultures, service behaviour and the need of transport information in respect of Song Thel local drivers and local passengers.

IOC Assessor: (1) Expert in education (an assessor in research tools); (2) expert in urban planning; (3) expert in transport engineering; (4) expert in local and Isan folk art cultural design; (5) expert in Thai linguistics

Commentary: None

Average IOC score: 1.00 point (the sum score from all experts)

- *The indicative question for an in-depth interview: Experts (see Appendix E)*

These indicative questions were used for an in-depth interview with three expert academics. Each indicative question was separately designed with a different theme that suited each field of expertise. Each indicative protocol was matched with each expert. These consisted of (1) transport engineering (indicative

question EA), (2) urban design (indicative question EB) and (3) Isan folk Art and Isan culture (indicative question EC). However, the local cultures perspective theme was shared as basic questions in each indicative question.

IOC Assessor (EA): (1) Expert in education (an assessor in research tools); (2) expert in transport engineering; (3) expert in Thai linguistics

IOC Assessor (EB): (1) Expert in education (an assessor in research tools); (2) expert in urban planning; (3) expert in Thai linguistics

IOC Assessor (EC): (1) Expert in education (an assessor in research tools); (2) expert in local and Isan folk art cultural design; (3) expert in Thai linguistics.

Commentary: The expert in Thai linguistics asked for the revision of unclear terminology and instructions on the indicative question. For example: from 'industry sectors' to 'society, economy and tourism sectors'

Average IOC scores of EA, EB and EC: 1.00 point (the sum score from all experts).

- The observation protocol (see Appendix F)

This protocol was designed to record field notes focusing on the theme of place, time, the behaviour of people who were observed, and reflections of the observer.

IOC Assessor: (1) Expert in education (an assessor in research tools); (2) expert in urban planning; (3) expert in transport engineering; (4) expert in local and Isan folk art cultural design; (5) expert in Thai linguistics

Commentary: Some experts suggested observation places at three main transit nodes in the Khon Kaen municipality. These consist of (1) North CBD at Khon Kaen central bus-station; (2) South CBD at Kanlayanawat School; and (3) Bang Lumphu market.

Average IOC score: 1.00 point (the sum score from all experts).

- The questionnaire protocol (see Appendix G)

The survey protocol was designed for collecting data from local people who live, work and travel in Khon Kaen municipality. The survey theme questions consisted of (1) demographic; (2) general information about UTSs; (3) transit

behaviour use in the city; (4) the quality and service needs of navigation systems in the city; (5) Isan background and local culture perspectives; (6) visual map perception.

IOC Assessor: (1) Expert in education (an assessor in research tools); (2) expert in urban planning; (3) expert in transport engineering; (4) expert in local and Isan folk art cultural design; (5) expert in Thai linguistics.

Commentary: The expert in education asked me to adapt some of the alternative choices from open-end to closed-end questions. This is because a lot of open questions may produce discomfort in a respondent when writing answers because time is limited at bus stops. However, he suggested that the results from the pilot survey may help to define a choice option if targeted respondents frequently answered the same way⁶⁷. Meanwhile, the expert in Thai linguistics asked for some improvement with terminology to remove more academic words in the information sheet, for example: from ‘integrative results’ to ‘mixed ideas’ of all participants, and from ‘local behaviour’ to ‘daily routine’.

Average IOC score: 1.00 point (the sum score from all experts).

- Indicative questions for focus group (see Appendix H)

Indicative questions were used to evaluate the (map) design prototype in the second stage of my data collection. As the modulator, I arranged the list of questions and themes, that were designed based on the usability test concept. The evaluative questions covered ten sections: (1) demographics (only people); (2) BRT logo; (3) graphic routes; (4) graphics for fare rate and timetable systems; (5) route-symbols information; (6) key legends; (7) service information table; (8) index symbols; (9) overall design materials on the map; and finally, (10) suggestions (open-end). Each section consisted of three criteria for the usability test; (1) usability (comprehension and communication efficiency with the graphic materials); (2) functionality (visible efficiency); (3) desirability (the attractiveness of design materials) (ISO9241-1, 1997; Jokela et al., 2003).

⁶⁷During the field work process, I tested the questionnaire by conducting a pilot study with 50 respondents, in order to re-check usability and participant comprehension. The descriptive statistics based on a percentage was applied to re-design some questions, i.e. change them from open-end to closed-end questions. The new closed end questions were arranged according to the frequency of answers from respondents in each open-ended question. After that, frequency of answers was indicated on the statistics software, and the top three answers were selected to be the choices. However, I still had the open-ended choice in these questions, for someone who wished to write a different answer.

IOC Assessor: (1) Expert in education (an assessor in research tools); (2) expert in (product) design; (3) expert in urban planning; (4) expert in Thai linguistics.

Commentary: The expert in education and product design fields informed me that the rating scales technique should replace the open-ended questions. This is because the rating scale has validity analysis when I report the sum scores of the design-agreement rate from each participant. The experts suggested that *“an approach using a deductive process in data collection could help me transform the subjective perceptions of people in to an empirical/objective data (statistic)”*. It also matched with a comparison by using the correlation between my usability test score and the level of public symbol communication success of ISO 7001 (at least 67%) (ISO7001, 2007b). Moreover, they suggested that I make a clear number of evaluated design themes on the indicative question. Meanwhile, the expert in Thai linguistics asked for the revision of some unclear terminology.

Average IOC score (first time): 0.50 point (the sum score from all experts).

Average IOC score (second time): 1.00 point (the sum score from all experts).

After I had finished the process of revising the research tools following this expert advice, I started to plan my field work timetable and organise the research team before we went to the site.

- **Step 2:** I started to collect qualitative data from ten people, using the in-depth interview technique. I spent two months (November – December 2011) making the appointments, conducting in-depth interviews, doing the transcription and analysing the data in this process. The first group consisted of five interviewees who were the heads of local offices in Khon Kaen city (key informants group A). These administrators were selected to be interviewees using purposive sampling (non-probability). This is because their administrative roles and organisations were directly involved with the local public transport project and policy. The second group was the community users/drivers of local transportation (representative 1 female/1 male). The third group was the experts

who have greater proficiency in academic fields of transport engineering, urban planning, and Isan folk art and Isan culture. This step gave me important perspectives about administrative and development concepts (from the key informants group A); the needs, wants, problems and behaviours in using public transport (from the key informants group B), and some knowledge about the transportation and Isan perception in the Khon Kaen community (from the experts). These variables provided the keynote ideas and observation sites (transit nodes in the city) for the next step in my research.

Research instruments: before conducting in-depth interviews with the local administrators and experts, I delivered the information sheet and consent form by letter, email or appointment. Meanwhile, for the key information group B, I used convenience sampling to select participants. I read the information sheet to participants and requested they sign the consent form, before I started the interview process. During the in-depth interview, I used a tape recorder for saving the dialogue, in order to transcribe the interview in preparation for data analysis.

- **Step 3:** The observation process lasted for two weeks.
 - In the *first phase*, I planned to inspect the main transit nodes of the public transport system in the case study area, in order to determine the key areas for data collection. The in-depth interviews with the experts provided the criteria for selecting the appropriate observation sites. They suggested the number of transit lines as significant criteria to identify which areas were the city nodes. After observation, I found the city had three big transit nodes⁶⁸ that provided the Song Thel service, each with at least four lines and up to six lines servicing each node (see Chapter 6, Figure 81, p.190). The main transit nodes were (1) the Khon Kaen transport centre 1, (2) Kalayanawat School and (3) Bang Lum Phu market.
 - In the *second phase*, following in-depth interviews with the local administrators (in step 2), I was advised that “*we do not have any official or correct map for our public transport system*”⁶⁹. I then used every Song Thel (20) line in the city, in order to confirm and recode service lines. Next, I linked

⁶⁸These nodes were also defined as the collecting site for the survey process (questionnaire) in the next step.

⁶⁹Translated from Thai.

this data by drawing the lines and routes on the GIS map (town planning) of the city (see details in Chapter 9, p.259).

- In the *third phase*, I spent one day per node (three days in total – December 2011) observing the transit behaviour including information needs, problems and problem solving (local and foreign passengers, who used public transport and the Song Thel systems in the city).

Research instruments: During the observation process, I used field notes to record data. I also used a digital camera to record pictures of what I observed in each transit node around the city.

- **Step 4:** Following the observation process, I built up the survey research team. This group was the researcher's fieldwork team and consisted of nine undergraduate students who had volunteered to be part of the data collection (survey) team. The field work team comprised local students who had a good relationship with the community, understood local culture, the Isan dialect and local perspectives. Before we went to the site, I conducted a meeting with the students to explain the aim of the research, how to use the research instruments, and the role of the volunteers, following key principles of AUT research ethics. The survey research was divided into two phases and took approximately 1.5 months (December 2011- January 2012) to conduct.

- *The first phase:* I tested the research instrument (questionnaire on paper) with 50 respondents around the main transit nodes as detailed above in step 3 (p. 151) and one big shopping mall in the city⁷⁰. The aim of this pilot study was to test and adapt the questionnaire with an experimental group before I used the final version of the questionnaire with real respondents. In the pilot, I used purposive sampling to classify the type of respondent⁷¹ who came from a cross section in the community, in order to receive an holistic response⁷² from people. This decision was because if we used just the correct statistical number, we would not collect the viewpoints of a cross-section of citizens in the city. In addition,

⁷⁰I selected the shopping mall because I needed to find high-income people who had not used public transport, and it was very hard to get them around the main transit nodes.

⁷¹Respondents were of equal gender, mixed ages, occupations and education. They were locals and strangers. Their incomes varied. This pilot survey also included disabled people.

⁷²The questionnaire aimed to invite people in the city to share their knowledge about transit behaviour, local and cultural perspectives, and Isan background and contribute to the public forum.

convenience sampling was also applied to select respondents around the nodes. Results from this stage were not included in the process of data analysis.

After collecting the pilot survey, I found most of the open-ended questions were inconvenient for respondents. They required more time to complete the process⁷³. Moreover, many respondents asked the collecting team to read the question, tick a choice and write answers for them. As a result, I removed some un-necessary open ended questions (see example in Table 3), and changed some of the open-ended questions to closed ones by using the multiple-choice option (see example in Table 4). These choices were defined following the frequency of answers from respondents themselves.

<p>Before: 9. Are you Khon Kaen People? 1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No (If 'No' please identify your province).....</p>
<p>After: 9. Are you Khon Kaen People? 1. <input type="checkbox"/> Yes 2. <input type="checkbox"/> No</p>

Table 3 Designer Adaptations following feedback from the pilot study

<p>Before: 4. The reasons and lists of your travel demands in Khon Kaen city? (Please identify, e.g.for working, studying, and shopping)</p> <p>No. 1 Are you travelling for..... No.4Are you travelling for.....</p> <p>No. 2 Are you travelling for..... No.5Are you travelling for.....</p> <p>No. 3 Are you travelling for.....No.6Are you travelling for.....</p>
<p>After: 4. The reasons and lists of your travel demands in Khon Kaen city?</p> <p>1. <input type="checkbox"/> Working 2. <input type="checkbox"/> Study 3. <input type="checkbox"/> Shopping 4. <input type="checkbox"/> Business 5. <input type="checkbox"/> Commercial 6. <input type="checkbox"/> Other.....</p>

Table 4 Process of Design and Changes

- *The second phase:* After reorganising the questionnaire, my research team and I went back to the sites (the same places as in the pilot study). I increased the size of the sample unit from 50 to 130 respondents. The criteria for classifying respondents were based on similar procedures (purposive and accidental

⁷³On the site (transit nodes) many respondents had limited time to complete the questionnaire. Hence, I had to change some open-ended questions to closed questions (multiple choice).

samplings based on non-probability) as used in the pilot study. However, my collection strategy had been changed from a questionnaire where respondents wrote their answers, to the questionnaire being read by an interviewer⁷⁴. In this phase, random selection was generated by the key transit nodes areas in Khon Kaen CBD. In each node, I defined a list of respondents (30 people) in order to ensure this sampling unit could meet the number required for statistical analysis⁷⁵. However, the primary data from this survey was triangulated with other primary sources from the observation and in-depth interview techniques, in order to ensure rigour in the analysis of end outcomes from of the first stage in data collection (more details in data analysis, p.158).

Research instruments: The instrument used in this survey consisted of the paper questionnaire and pen. The second phase of the survey used the paper questionnaire, pen, and interview techniques by the data collecting team.

- **Step 5:** This step was not included in the initial plan of the first stage of data collection. This step existed after I finished analysing all the data in the first stage of data collection. I found two key results which needed more input, the first was from other experts, and the second, more research by me. The *first* result concerned the Isan-textile issue. The snowball technique was applied in this step, using an in-depth interview process. I employed a semi-structured interview with the outline of my questions and open-ended questions to gather other perspectives or any missing issues. The interviewees consisted of one academic (expert) in Isan textiles (female) and two local specialists (male and female). The in-depth interview was conducted in the form of a group conversation. The outline of interview themes included (1) the Isan textile process, (2) the type of Isan textile patterns and (3) the concept and design of Isan textile perspectives.

The *second* result concerned a need for me to read the legend of Sin-Chai (see more details, p.90 and p.215). I had to read more on the geographical, historical and calendar sites, and observe the murals in two temples in Khon Kaen province. However this step was not included for analysis with any resources

⁷⁴From the pilot study I found that respondents had limited time and were thus inconvenienced when completing the questionnaire themselves. They asked the collecting team to read the questions and write an answer for them.

⁷⁵Creswell (2008, p. 156) suggested that approximately 15-30 participants in each group could provide the results of experimental research. The internal validity of dependent variables and the reliability of external validity can refer to the representative results of the target population by using this approximate number (Creswell, 2008).

from data collection in the first stage. It was an extra process to gather further detail related to the key results from the first stage, which could then be incorporated into the original ideas on the map design concept. (This issue will be discussed in Chapter 8)

Research instruments: In this step, I used the tape recorder, digital camera and paper notes during the interview and conversation process. I received permission from the interviewees to record their voices for transcription and to take photos.

4.2 The Second Stage of Data Collection

After I had finished the data analysis from the first stage, I used the key results to create the design prototype (Khon Kaen transit map). The second stage of data collection aimed to evaluate the prototype based on the usability test. This approach involved the feedback loop from target users (sampler), and I was able to revise the design steps in the general process of HCD (ISO 13407, 1999). I planned to collect data using focus group techniques to gather feedback from the community stakeholders, which included (1) the local administrators, (2) experts, (3) people (locals/strangers). However, this meeting could not happen because I could not arrange for these groups to join in a discussion at the same time. So I changed my plan, dividing the feedback into two phases/techniques. Figure 69 (p.155) outlines my collection strategy at this revised stage. Further details will be presented in the next paragraph.

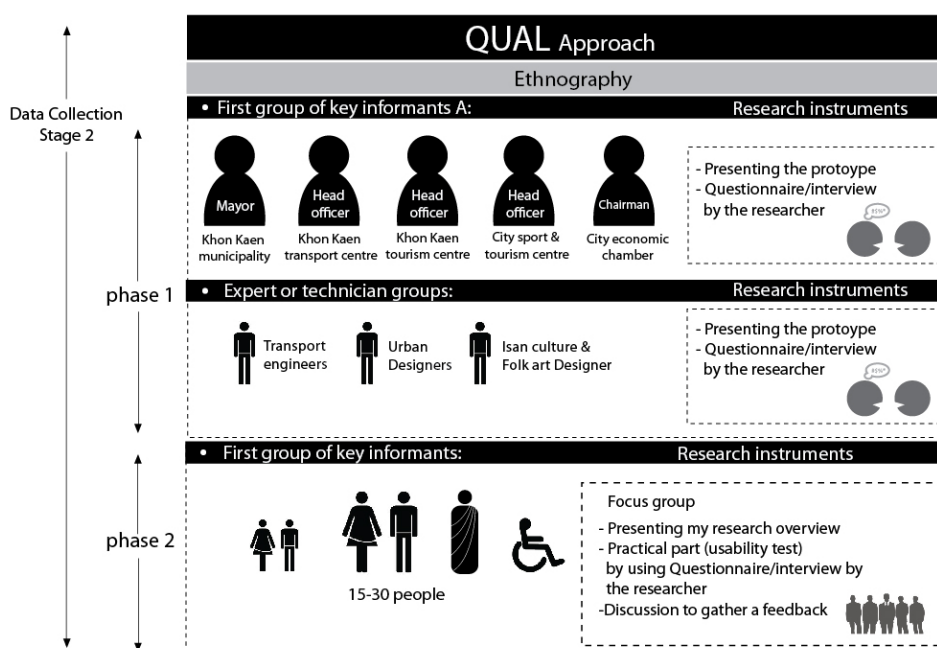


Figure 69 Collection strategy, stage two

- Phase 1:** I applied the interview technique using the questionnaire, where the themes were assessed via the usability test concept: (usable, factional, and desirable). (See more details in p.155 and Appendix H). This interview process was conducted in separate interviews with the same local administrators (key informants group A) and experts (urban planning, transport engineering, and Isan folk art/Isan culture). I started the interview by presenting the real map design prototype. Next, I asked a question following the list on the questionnaire⁷⁶ sections and ticked their answers.

In the interview process with the mayor of Khon Kaen city, the first time I presented my design prototype, the mayor said, “*Oh, oh! Look at this. It is amazing. How did you do that?*” He confessed “*Phai; do you know the first time you came to my office and asked me for an interview about this project, I had no idea about what you were doing. I thought you might design some normal road signage or city maps by using little lines to represent our city roads*”. He said to me that “*this is the design artefact that we need. It could make our city image something between a modernist and traditional city*”⁷⁷. The mayor and I discussed the possibility of Khon Kaen municipality being a hub of the Indo-China region in 2015. However, Khon Kaen municipality had not prepared transport information to communicate with people who live, work, and travel in the city.

⁷⁶This questionnaire was used to evaluate each group of research participants (administrators, experts and people (locals/strangers).

⁷⁷Translated from Thai.

During the interview process with the head of local transport, he said *“this is the great transport map for our city; Can we use this right now? Is that possible?”* I said *“this is for a future transport map of Khon Kaen city. However, when I finish my study; I will design a current public transport map for you”*. He said *“Do you know we really need it? I want to take your map to the next meeting and I want you to present it for us”*. I said *“Thank you very much for you response; but this design is just the prototype version. I have to test the usability with users to adapt that to the final version. When I finish my PhD, I will come back to make this for you as soon as possible”*⁷⁸. These conversations reflected the opinions of the local administrator group during the in-depth interview process.

Research instruments: These consisted of (1) the real printing of my design prototype (size A1 or 590 (H) x 840 (W) mm, one piece); (2) the separate printing of design sections of the prototype in order to create easy visibility for the participants for each section they were to evaluate (see details in Chapter 9); (3) the evaluation questionnaire in which the type of answer was adapted following the comments of the IOC assessors, and (4) the voice recorder.

- **Phase 2:** This phase can be described as the three simple steps of my focus group process.
 - *First step:* I started by finding a place to conduct the focus group with the participants. The art gallery at Khon Kaen University was the place that I used to conduct this activity. For the appointment process I called, and sent emails to invite people⁷⁹, and announced the meeting using a poster around the city areas.
 - *Second step:* I employed the data collection team to work with this focus group. Before we began the data collection I explained their roles during the process of focus group activity and gave them the plan and activity timetable (see Table 5). We organised the gallery, and prepared materials for the activity, by installing a big vinyl inkjet poster (5000 x 2000 mm) to describe the outline of this research. This was followed by (1) background and core ideas, (2) graphical material design processes, and (3) diagram map design processes (see in Chapter 9, section 2). We also installed the real design prototype (A1) and the

⁷⁸Translated from Thai.

⁷⁹These people had given their contact details at the first stage of data collection (of the survey process).

separate printing of seven design sections on the map prototype to the wall board.

Times	Activity
9.00-9.15 am	Registration and giving the group numbers (1 to 4) for a participant.
9.15-9.30 am	The moderator welcomes everybody and explains the information about protecting the right to privacy and confidentiality during the process of this focus group.
9.30-10.00 am	The moderator presents the background of research and key information about the BRT and transit map for Khon Kaen city, including the aim of this activity.
10.00-10.15 am	Coffee break 1.
10.15-11.15 am	The moderator starts by asking the participants to evaluate the map prototype (group by group, 15 minutes/ group). During the evaluation process, the moderator is the person who ticks the answer on the questionnaire for each participant.
11.15-11.30 am	Coffee break 2.
11.30-12.00 am	The groups discuss the questionnaire, together with the moderator, and share ideas. In the end, the moderator concludes, re-checks the feedback issues and thanks everybody.

Table 5 Timetable and outline of activities during the focus group process

- *Third step*: On the morning of the focus group, my team and I came to the gallery to set up the electronic devices which included the big screen LCD monitor for the presentation, and the speakers. The total number of interested participants was 24⁸⁰, which consisted of group 1 (elders and disabled people), group 2 (workers), group 3 (undergraduates), and group 4 (high school students). During the focus group process, I was the moderator. Meanwhile, my team of four were standing by to help participants register, give the group number, serve food, take photos and provide extra assistance. The crew was not involved with the role of moderation or data collection. In this step I conducted the activity following the plan as was indicated in Table 5.

During the focus group, most of the participants told me that they felt excited when they looked at my design (the transit map). They said to me; *“It was amazing. We have never seen Khon Kaen city like this before (diagram map). We never realised that this city has many Song Thel routes like this. Where is my house on the map? Which Song Thel number and new BRT route will pass my place? We look!; See the size of our city, it is*

⁸⁰This number consisted of mixed genders (13 males/11 females), low/high incomes (careers/education), and races (locals/rural people/strangers).

so large!”⁸¹. These words from the participants made me feel proud of my design artefact. I thought my map could be more valuable for the people and the community. At the end of the focus group, all participants said, “*Hey Phai, we want your design to be used in our community as soon as possible; the innovation and design is very useful for us and the city*”.

Research instruments: The research tool consisted of the evaluation questionnaire (similar to the one used for interviewing the local administrators and experts), my crew, LCD monitor screens, digital cameras, tape recorder, and paper notes. The real prototype and other presenting design materials were also included (as indicated in the second step of this process).

Section 5: Data Analysis

Quantitative and Qualitative approaches were used to analyse the data. Both approaches were employed sequentially and using parallel methods. Figure 70 (p.158) presents the outline structure of my analysis process between the analysis strategy (left) and analysis techniques (right). This process utilised the exploratory research concept, which emphasised qualitative more than quantitative analysis. In the *first stage*, I started by analysing qualitative data to explore a phenomenon, identify themes and related theory. In the *second stage*, I explained the relationship of data analysis using a mix of qualitative and quantitative techniques to triangulate data and variables. This combination of approaches enabled me to confirm, and consequently investigate, users’ perspectives before developing the map design prototype. The *third stage* applied the qualitative approach to analyse and describe feedback from the stakeholders, based on the usability test concept. Further details are described in the mixed data analysis strategies.

⁸¹Translated from Thai.

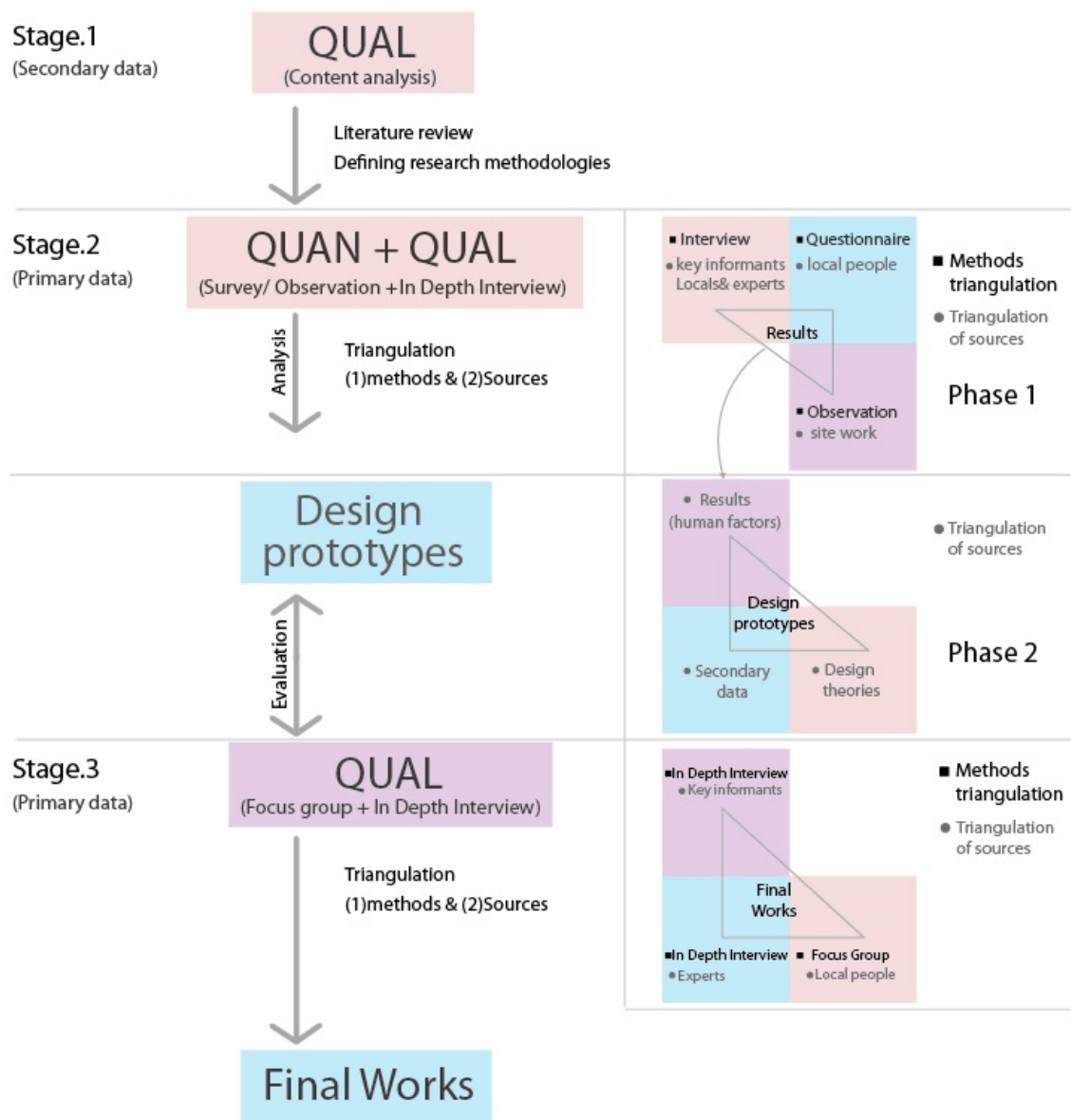


Figure 70 Designer Analysis, processes and techniques

5.1 The Mixed Data Analysis

This part presents the analysis strategy and technique, which involves the use of sequence and parallel methods between the quantitative and qualitative approaches, to analyse data.

- Stage 1:** I started by introducing qualitative analysis as the first sequence to analyse my secondary data. I used content analysis to classify the type of information based on inference techniques made by systematically and objectively identifying specified characteristics of my research framework (Holsti, 1969). In term of systematic analysis, I defined the information content

as two main categories: (1) documentary analysis and (2) theoretical study. In the documentary analysis, I classified the related units of key information, terminology and previous study before reviewing key literature (Leedy & Ormrod, 2001). My documentary sources included websites, newspapers, policy, textbooks, and journals. Much of the content analysis in this part was conducted using inductive rather than deductive (objective) processes. In the theoretical study, I applied the same criterion used in the documentary analysis. I analysed the context of my natural research framework in order to understand the key related theories. This secondary data was applied to confirm the investigation with different data sources and collecting techniques (in Figure 70: stage 2/phase 2, p.160); in order to strengthen reliability, as well as internal validity, for data interpretation (Merriam, 1991). Figure 71 presents a schematic draft of my content analysis process.

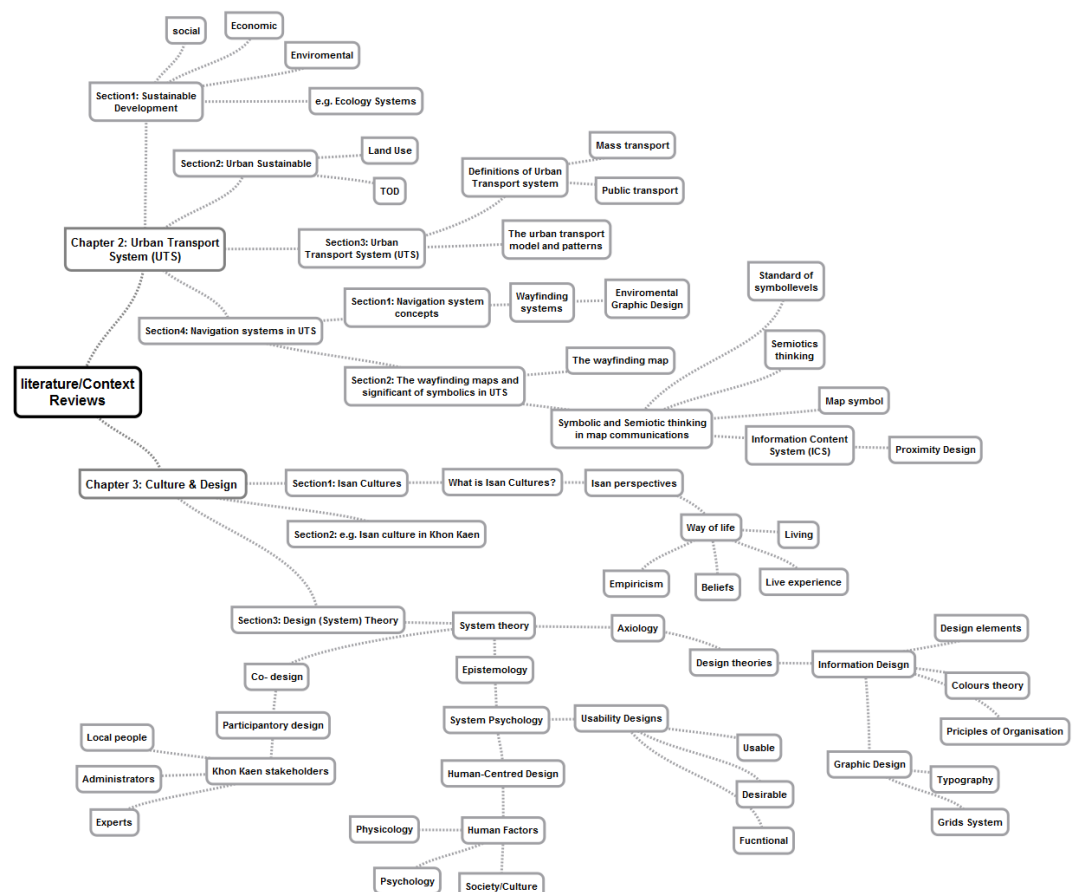


Figure 71 An example of the typological analysis process

- **Stage 2:** This stage was for analysing the field work data (from different types of methods and sources) to examine the human factors from the stakeholders in the Khon Kaen municipality. The triangulation technique was conducted to gain a richer understanding of the variables and their relationships (Tashakkori & Teddlie, 1998). In this stage, I divided the process of data analysis into two phases (diagram in Figure 70, p.158).

The first phase: I utilised two triangulation techniques: (1) methods triangulation and (2) triangulation of sources⁸²(Guion, 2002; Patton, 1990). This combination created a powerful way of demonstrating concurrent validity, especially in inductive research (Campbell & Fiske, 1959). In this phase, I applied a different collection method to gather the human factors from another group of stakeholders in this community (see Figure 70 stage2/phase1, p.158). Each collection instrument shared the common theme of questions⁸³. Both triangulation techniques attempted to consolidate a result from several aspects of the stakeholders in order to categorise a unit of key findings in each common theme. These dependent variables were the representative voices (human factors) of stakeholders in respect of (1) human psychology (cognitive learning), (2) social behaviour (transportation needs) and cultural perspectives (way of life). Details of the triangulation approaches in the first phase are detailed as follows:

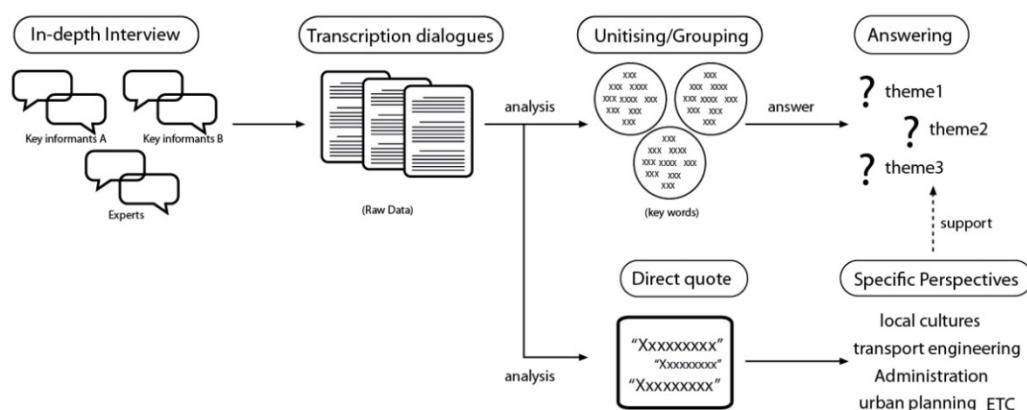


Figure 72 Analysis process of in-depth interviews

⁸²The first type uses a different method to investigate the similar aims of the study. Meanwhile, the second one engages more than one source of data collection (Cohen, Manion, & Morrison, 2011; Newby, 2010).

⁸³It consisted of (1) Local cultural perspectives, (2) transit behaviours, and (3) transportation needs.

- *The analysis strategy of in-depth interviews*: In this process, I triangulated sources from the different group of interviewees to confirm my investigation of the results, and created credibility from the sampling of variations. This process involved: *Step 1*, completing the interview process with each group (which consisted of the key informant groups A and B, and experts). *Step 2*, transcribing the recorded interviews (in Thai). *Step 3*, unitising (classifying) the raw data from the transcription process by matching patterns of interview questions. *Step 4*, categorising the groups of consistent answers (by coding a key word) which matched the common (and sub) theme of questions⁸⁴. Meanwhile, the direct quote technique was applied to analyse and express specific perspectives of interviewees⁸⁵. Figure 72 (p.161) presents the analysis process of my in-depth interviews. Figure 73 presents an example of the analytic diagram of the in-depth interview under the local perceptions theme with the local administration group.

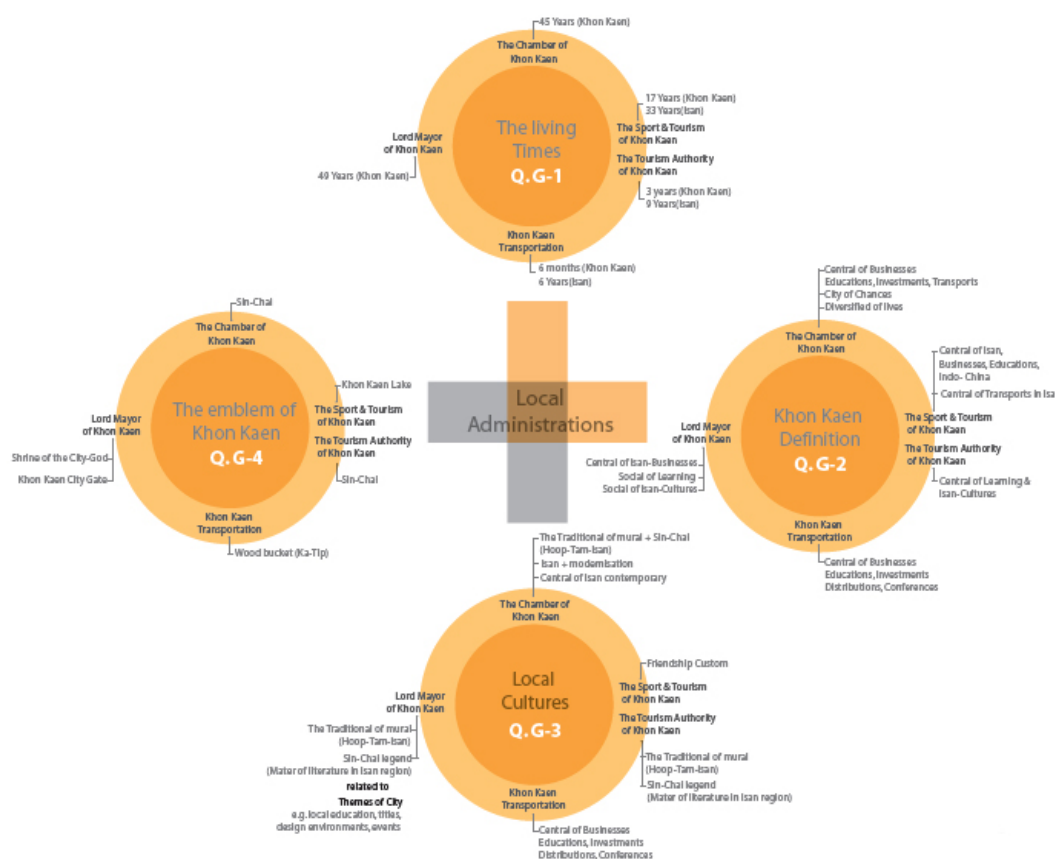


Figure 73 The process of matching patterns of interview questions

⁸⁴This is because in each common theme they had a sub-question, e.g. in the locals' perceptions, the theme consisted of three sub-questions; (1) Khon Kaen definition, (2) local culture and (3) emblem of Khon Kaen.

⁸⁵For each in-depth interview the format had some specific question themes, which depended on the characteristics of each group, e.g. transport engineering, urban planning or local administration, or passenger questions. I believed these intensive questions could generate substantial responses (reflections and suggestions) from key informants, beyond only answering my indicative questions.

- *The analytic strategy of the survey*: Loether and McTavish (1993) and Shavelson (1996) noted two efficient types of quantitative analysis, which reflect sources of behaviour and social science studies, and are descriptive and inferential statistics. Most results are indicated in the form of numerical data. My study applied descriptive statistics as the major approach to analyse the questionnaire. Univariate statistics were employed in my analysis to describe human factors (the knowledge base of people in the community) in respect of (1) psychology (e.g. the local culture's learning/experience/perspective), (2) physiology (e.g. the need for transport information/facility) and (3) socio-cultural aspects (e.g. urban transit behaviours/experiences/cultures). The frequency that was produced by using a number, percentage, mean (minimum/maximum), and standard deviation (SD), was employed to enumerate an average score and classify the hierarchy of results in each question (Cohen, Manion, & Morrison, 2001). The average scores were presented in tables and graphs.

The details of the analytic process are as follows: *Step 1* (data preparation): I started preliminary data checking by looking at the missing data in each code of questionnaires (case number identification), which were input before data collection. *Step 2* (codebook): I input the codebook construction on the analysis software to define a function (SPSS software) of variable view which was represented using a number. *Step 3* (coding data process): I keyed raw data into the software following the codebook function. I checked a missing point several times before starting to analyse the data. *Step 4* (data analysis): I applied descriptive statistics to describe the significance of (univariate) variables based on the frequency distribution, measures of central tendency and variability in each survey question.

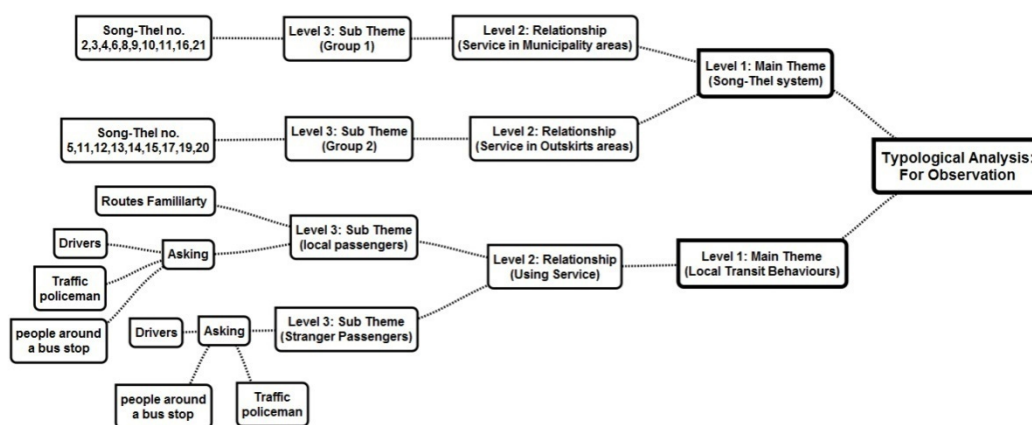


Figure 74 A typological analysis of my observation process

- *The analytic strategy of observation*: typological analysis was applied to organise the observation data. Typology is a method often used to differentiate among variables within a phenomenon (Creswell, 2008). Its strategy is applied to describe qualitative (or quantitative) data analysis, in order to categorise, match patterns and develop a set of related domains within the key theme (or terminology), which a researcher observes. The taxonomy is often used together with typologies for developing a hierarchy from a single domain (Spradley, 1980). The details of analysis are as follows: I distinguished the theme of observation analysis as three domains, i.e. (1) the urban transport structure (focused on Song Thel and BRT systems), (2) transit behaviours and (3) local cultures. In each analytical domain, I defined the three hierarchy levels starting from, level-1 (main theme), level-2 (relationship), and level-3 (sub-theme). Figure 74 presents my typological analytic process.

In respect of my reflection notes (auto-ethnography), during the observation process I applied the same method, as presented above, to distinguish the reflection themes. My reflections occurred when I noticed some interesting issues in the field or found an articulating point in my notes. Next, I defined a theme and applied typological analysis to assist me to think logically. This created an analytic induction based on the triangulation of variables (sources) (Patton, 1990); between the contextual validity (on the sites), my reflections⁸⁶ and the secondary data (documentary history and culture). For example; when I saw women wearing a sarong in the city, I noted this and re-examined the

⁸⁶These were concerned with the auto-ethnography of my local perspective, experience, cognitive learning, and knowledge.

relationship points with this phenomenon such as (1) the Isan way of life which I saw when I was young, (2) a sarong being a local product, and (3) the sarong pattern (or Isan textile) design concepts which were applied to the design of the architecture concept. Figure 75 shows one example of this analysis.

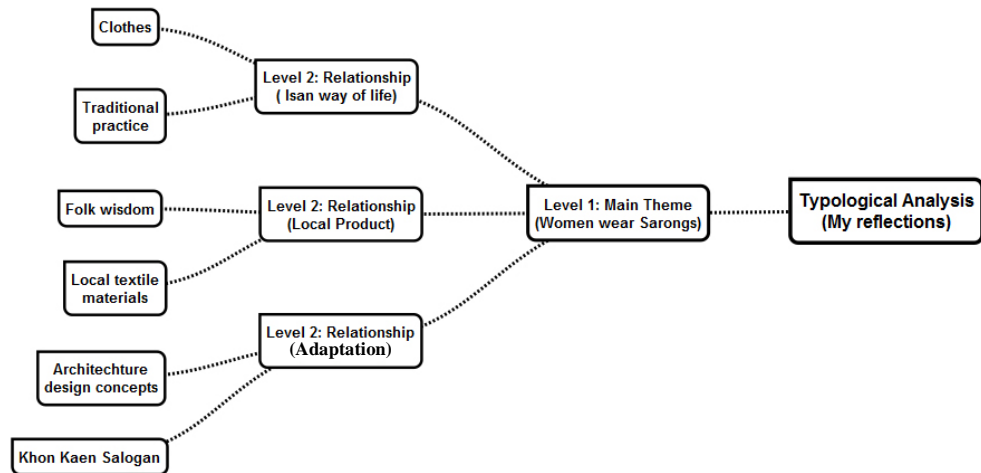


Figure 75 Typological reflective analysis of observation processes

At the end of data analysis stage 2 (phase 1), all of the key variables from the sampling of variations were triangulated to create the strength of credibility and internal validity. These key variables were classified to a different domain⁸⁷, which depended on the nature and relativity of each variable. Each domain was analysed and confirmed to ensure that the final inductive inferences (human factors) of this stage reflected the multiple realities of the community relationships. Finally, these human factors were brought to merge with the secondary data, this creating the key conceptual design for the second phase (see the outline diagram in Figure 76, p.166). The detail is described in the next paragraph.

⁸⁷ Consisted of (1) local cultural perspectives, (2) transit behaviours, and (3) transportation needs.

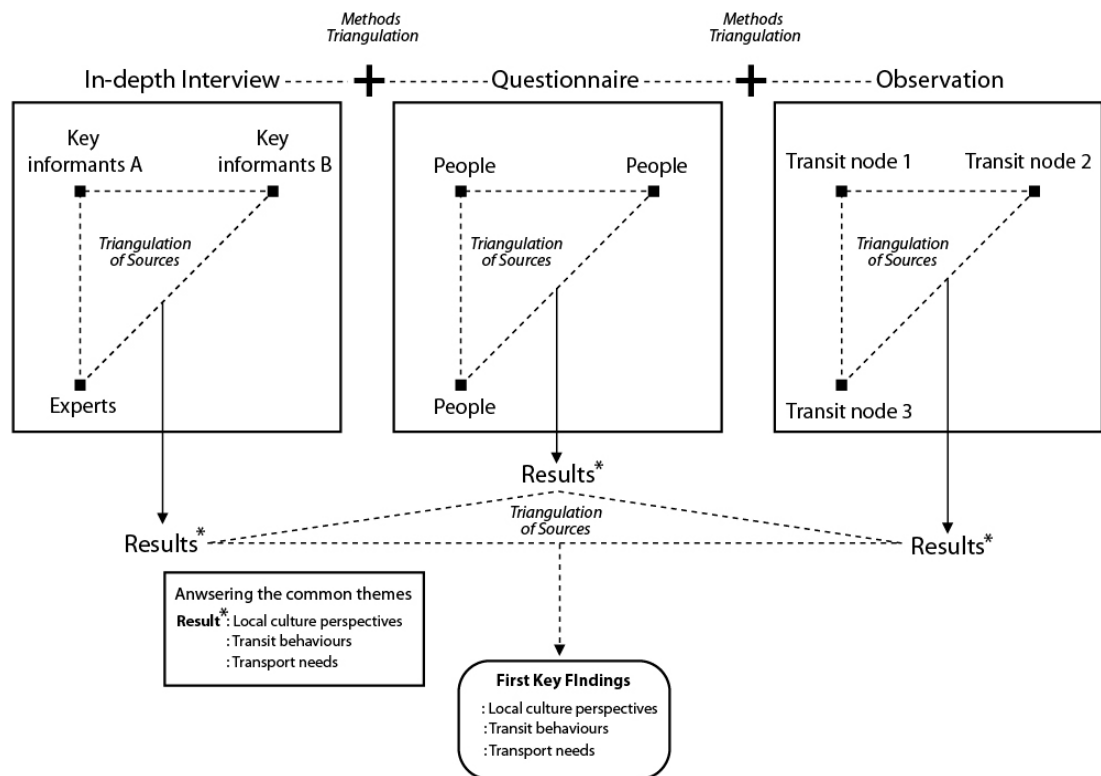


Figure 76 First Phase – Analysis to inform Design

The second phase: in this phase, I triangulated sources to merge the key human factors with my secondary data in order to create the (1) confirmatory investigation, (2) consistency and rigour, and (3) descriptive/interpretive validity (Krefting, 1991; Maxwell, 1992; Patton, 1990), before transforming the key factors to graphical materials. The key human factors (from phase one) were set up as the key design concepts to create the original graphic material for the Khon Kaen transit map. Secondary sources were employed to re-check the local history, culture and traditionalism to support the key findings. Meanwhile, the design theory bases of the information design principles⁸⁸ were applied to organise and transform raw data into graphic visualisations using the (design) software to create the prototype (map). The detail of the design processes and first key findings discussion, at this stage, are presented in Chapters 8 and 9.

After creating the prototype, the last stage of data analysis was the prototype assessment. One part of the HCD process, at the revision loop, was to gather and provide experiences and feedback from the target stakeholders. The usability test was

⁸⁸For example: design elements, principles of organisation design, typography and grid systems.

applied as the theme in this analytic stage (a detail of usability themes in p.148) to allow the stakeholders to contribute their ideas to my development design process (Holle & Zahlmann, 1999). The details of this stage are presented in the next paragraph.

- **Stage 3:** in the second stage of data collection (see details, p.154), I applied the same questionnaire protocols to evaluate the usability test of my prototype with the same target of community stakeholders (refer research participant details, p. 137). In this stage, I employed triangulation analysis with a different source of stakeholders and collection techniques (in-depth interview/questionnaire and focus group/questionnaire). The concurrent triangulation strategy between quantitative and qualitative methods was applied to analyse data from each group of participants; for example, the local administrator group. I used descriptive statistics to detect the frequency score values in each usability test variable within the ten sections of the questionnaire (as described, p.148, and appendix G) to identify the central tendency score. These scores were indicated in the form of numerical data which followed the typical value of number, percentage, mean (minimum/maximum) and standard deviation. The analysis strategy applied the same process as in the survey analysis (refer, p.163). Meanwhile, recorded interviews were transcribed before unitising and categorising the raw data. This analysis process revealed a key recommendation, confirmed and supported with a statistical result. Both methods were also applied to analyse data of the expert and local people groups.

Finally, the average scores in each section of each group, were analysed together in order to summarise the frequency scores in each questionnaire section. These averages were indicated in the form of the typical value of number, percentage, mean (minimum/maximum) and standard deviation⁸⁹. Meanwhile, the key recommendations from each group were combined and summarised as key suggestions⁹⁰. Both results from the concurrent triangulation indicated significant feedback (human factors) to adapt the graphic material of my design prototype and create the final design. Figure 77 (p.168) presents the analysis diagram of the last stage in my analytical process.

⁸⁹These averages were the indicators validating each design (material) section of the complete map design as meeting stakeholder requirements.

⁹⁰This was a comparison test to check alternative design solutions; ideas that came from the users' (and stakeholders') needs.

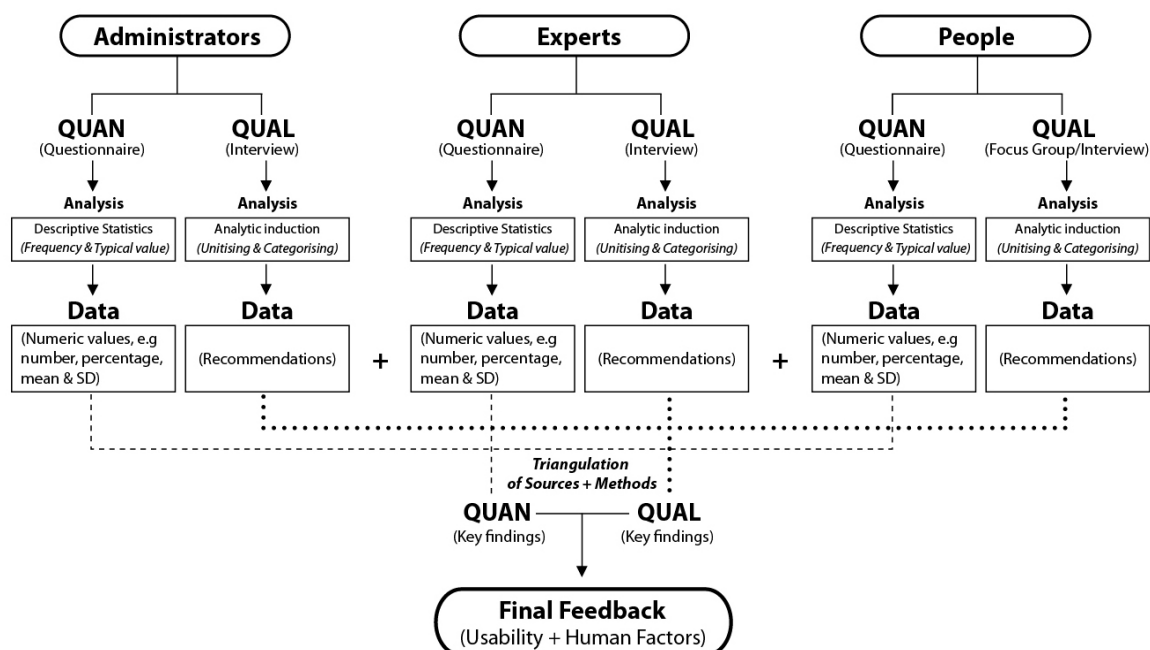


Figure 77 The outline of triangulation analysis in order to investigate usability and, test results and gather feedback from the stakeholders, before creating the final design

Ethical Considerations

Ethical approval was granted by the Auckland University of Technology Ethics Committee. (AUTEK) (see Appendix A) This approval guided my field work. Information sheets were provided to participants in the form of cover documents or verbally. Consent forms were also prepared in which permission from participants was requested. All transcribed material and data analysis was returned to participants involved with in-depth interviews. Participant names and contact details were made anonymous for protecting rights to privacy, with the exception of the Mayor and senior administrators, who wished to be described by their roles.

Summary

This chapter has demonstrated that my systematic holistic thinking could be an efficient guide to establishing mixed methodologies that contributed to the original public design concept and material which reflected the knowledge base of people in the community. The combination of methods (quantitative and qualitative) provided comprehensive insights into the variables (human factors) and stakeholder relationships within the case study (Tashakkori & Teddlie, 1998, p. 126). The HCD was the key principle that created the participatory design and interaction system with stakeholders in the community. Local culture, history, urban policy, traditional practices, environment, and

scholarly perspectives were integrated to investigate real human factor needs, which were represented in the form of popularity, symbology, language, cognition, problem-solving, and memory and perception variables. Triangulation was applied to collect and analyse data throughout the investigation. Methods also integrated the sampling of variables to create final results and key findings, which were the factors which guided the prototype design, described in the next chapter.

-Chapter 6-

Research Findings (Stage One)

Introduction

This chapter discusses the significance of my research findings from my field work and their influence on this study. The chapter is divided into three sections for reporting and summarising key results from my data collection in stage one. *Section one* presents key findings obtained from in-depth interviews, questionnaires and observation. *Section two* presents key results from the snowball techniques, after I had analysed the research data in section one. The *summary section* outlines the significance of the key findings from sections one and two. These findings became the key (human) factors which were applied to define the key design concepts that contributed to the original transit map prototype of Khon Kaen municipality. The details of how to define the conceptual designs are provided in Chapter 8 (discussion). The design processes of my transit map prototype are illustrated in Chapter 9.

Section One

This section presents the key findings that arose from the mixed research methods of data collection in stage one. The collection instruments were **part (A)** in-depth interviews, **part (B)** observations, **part (C)** survey using a questionnaire and **part (D)** purposive in-depth interviews and observations to fill gaps on analysis of A, B and C above. These tools were used for collecting data with the stakeholders involved within the urban transport system in the Khon Kaen community (local administrators, experts and people; see details Chapter 5, p.137). Key findings from the stakeholders were analysed based on the triangulation of methods and sources (see details in Chapter 5, p.159). These analytic techniques generated the key human factors which led to the original design concepts of the urban transit map. These concepts created the original design artefact (map prototype), which reflected the knowledge base of stakeholders in

Khon Kaen community (social, cultural, physical and physiological factors) (see more discussion, Chapter 8, p.229).

1.1 Part (A): In-depth Interviews

Part A presents the key findings from in-depth interviews with (1) the key informant group 'A' (local administrators), (2) the experts group and (3) key informant group 'B' (a passenger and a driver of local transportation). This data-collecting activity was conducted during November and December 2011.

1.1.1 Part A-1 (Local Administrators-Key Informant 'A')

The selection of research participants for in-depth face-to-face interviews focussed on the local administrators in the Khon Kaen municipality and used purposive sampling. Local administrators have high importance in regard to implementing the BRT project and Song Thel systems. They also have a lot of influence when developing urban (and transport system) policies. These interviews focussed on (1) local cultural perspectives, (2) local public transport situations and (3) urban transport development trends. The local administrators invited to be key informants were five top executives from the (1) Khon Kaen transport centre (Director), (2) tourism authority of Khon Kaen (Director), (3) Khon Kaen sport and local tourism (Director), (4) Khon Kaen city municipality (Mayor) and (5) Khon Kaen economic chamber (Chairman). Details of the key findings are provided below:

1). Khon Kaen Transport Centre Director: He has held this position for six months. He was not ethnically Isan, but he has lived in the Isan region for nine years.

His perspective regarding Khon Kaen local culture: He noted the position of this city, located in the centre of the Isan region. Many mega logistics -projects would be installed, for example a mega-cargo transit site, high speed trains and the BRT system. The role of the city was to be the centre of education, events, conferences, investment and distribution. These things would define 'Khon Kaen City' from his perspective.

The local textile (silk cloth) called '*Par-Mai*' in Thai 'ผ้าไหม' is the most favoured and prominent form of Khon Kaen culture (see reviews & discussions in Chapter 3 (p.93) & Chapter 6 (p.235)). The director said: 'When I thought about

the Khon Kaen local product, ‘Par-Mai’ was the first idea that came to mind’. However, from his perspective, the bamboo wood bucket was the representative logo of this city.

On local public transport situations: He said: ‘*I predict that Khon Kaen will be the hub of education and medicine and a conference centre. Many people from Laos and neighbouring countries will visit and use our facilities after we open the AEC community. The UTS should be ready at that time*’. Describing service quality in the current UTS in Khon Kaen municipality, he saw bus stops and transit information as being serious problems. This is because the Song Thel drivers, who were the car owners and held a service license, leased their cars to drivers who did not have a service license. The car lessees preferred to service passengers only in peak traffic periods to save their petrol. They competed amongst themselves to catch passengers at bus stops. This created traffic congestion around the big transit nodes. These nodes contained Bang Lumphu market, the city central bus station and Kanlayanawat School. There was a lack of service boards providing information to passengers.

The urgent problems of the UTS that Khon Kaen City needed to address were: (1) the traffic-discipline of Song Thel drivers at stop and pick-up points, (2) controlling Song Thel service times, (3) changing the behaviour of passengers (e.g. get in/out points) and (4) and providing service information. If strangers wanted to use the UTS system, how could they understand it? The director said: ‘I thought they might ask their friends to pick them up from the airport, train station or bus stations. So I had not thought the service information was necessary for this group’.

On urban transport development trends: The director agreed that the installation of the way-finding (transit) map system was very important. It should be installed at the main transit nodes first. He suggested that the main organiser should be the Khon Kaen municipality (city council), who might request funds from investors or sponsors. As part of short- term development (3-5 years), he suggested gathering the evidence to solve the issue of the overlapping routes of Song Thel system mode 1 (see details, p.189). His organisation would organise monthly meetings with the representatives of Song Thel entrepreneurs to discuss and exchange knowledge about the Song Thel service system. The long-term

development (10-20 years) should see the application of the BRT system into the major urban transit system, adapting the Song Thel system as feeders of the BRT system.

2). Director, Tourism Authority of Khon Kaen: The director had held this position for three years. He is not ethnically Isan but has lived in this region for 11 years.

On Khon Kaen local culture: He defined Khon Kaen city as ‘the learning centre of Isan culture’. He agreed with the director of the Khon Kaen Transport Centre that the city location⁹¹ makes Khon Kaen a centre of the Isan tourism industry. People can stay at Khon Kaen and travel around the adjacent provinces. Khon Kaen seems to be the capital city of this region, introducing Isan culture and perspectives to people. He thought that the legend of ‘*Sin Chai*’ was the favourite prominent form of the Khon Kaen local culture that he wanted promoted to visitors (see discussions, Chapter 8). Isan literature creates stories and local heroes, building the theme of city images. Tourism packages for the city would refer to the Sin-Chai game. With regard to the key symbol of the city, the director said that ‘*of course, it is a Khaen*’ (see discussions, Chapter 8, p.235).

On local public transport: He believed that the image of Khon Kaen would be ‘the city of local arts and culture which would combine ancient and contemporary forms’. The concepts would also be adapted to any public spaces that included the UTS. This, however, would depend on the consistency of urban development policy. He observed that ‘we do not have a master plan. When the new leader comes, he may prefer to **change** the plan rather than continue it’. Regarding the current service quality of the UTS, he noted that ‘*it was a nightmare; could I say it was not a public transport system?*’ He explained that Thailand had overlooked the development of public transport, way-finding, signage, bus stops and footpath systems. More attention was paid to car parks and lanes. Meanwhile, the urgent problem of urban transport information was lacking. He described visitors, both foreigners and Thais, coming to ask for a transit map every day, but it was not available.

⁹¹ Khon Kaen province has connecting areas with nine provinces in the Isan region. This is the highest number in Thailand (see reviews, Chapter 3).

On urban transport development trends: City life and local transportation would be much easier if a graphic way-finding system for the UTS of Khon Kaen city was available. The city municipality (council) should take responsibility to create a transit way - finding map. In the short-term plan, the city should define certain routes and time services (in the case of the Song Thel system) in order to respond to city life. The long-term plan should apply to the BRT system, thus creating sustainable development. He guessed that after reformatting the UTS system, industry would adapt to the city's new infrastructure.

3). Key findings of Khon Kaen Sport and Local Tourism Director: This director has lived in Khon Kaen for 17 years. He is of Isan ethnicity.

His perspective regarding the Khon Kaen local culture: The director described Khon Kaen city in the same way as local administrators numbers one and two. He said the city is the hub of the Isan and Indo-China regions. His most favoured prominent form of the local Khon Kaen culture is the local Isan silk cloth (*Par-Mai*). He also said that '*Kaen-Na-Kron Lake*' is a symbol of the city. He described knowing Khon Kaen because of this lake. In the future, he believed the city would be the centre of sport, the economy, transport, culture, and specifically a conference hub in order to support the AEC community.

On local public transport: In terms of the service quality of the UTS, he had the same opinions as the local administrators. He said, '*We do not have an urban transport city act which controls Song Thel drivers/passengers*'. Regarding the urgent problem of the UTS, he agreed with the local administrators. He said that '*the lack of information, and uncertain services, have made people like me lose confidence in using the local transport system*'. Visitors cannot use public transport in the city. He said, '*I am a local person. I could learn and use local transport myself. But to do this I have had to ask someone who often uses this Song Thel line*'.

On urban transport development trends: He noted that the graphic way-finding system in the UTS is very important. '*Firstly we have to organise the local transport act and enforce it. Then the way-finding system of the UTS will be affected.*' He said to make the UTS sustainable, the Khon Kaen municipality,

Khon Kaen transport centre and provincial organisations should work together to develop a public transport act and policy. Moreover, he thought the BRT system should be supported in order to improve transit behaviour in the city. Following these suggestions, he concurred with the basics of the local transportation concept. *‘Khon Kaen city will rapidly develop its economy and transport systems, so it can be the main hub of the Isan region’.*

4). Key findings of the Khon Kaen city mayor: The mayor is a local person, having lived in this city for 49 years. He has been mayor for seven years.

His perspective on Khon Kaen’s local culture: He defined Khon Kaen city as the centre of the Isan economy; a centre of learning, an accommodating city with sustainable development. He stated that Khon Kaen *‘does not have a strong character; thus the local flower called ‘Golden shower’ (in Thai, ‘ดอกกุหลาบ’), Par-Mai or Khaen are not enough’.* He believed that these things cannot create a selling point or city image. The mayor described Khon Kaen as a young city, compared with Chai-Mai, Nakhon-Ratchasima or Bangkok. Also, Khon Kaen is not scenic. He wants to develop Khon Kaen as a city of events as well as the economic centre of the Isan region. The mayor selected the *legend of Sin-Chai* and *‘Pang Jan City’* (see discussions, Chapter 8) as the keys to city development. He applied these key points to create the city’s development policies including those in local education, administration, city image and events. In respect to city symbols, he talked about the city gate. In the future, he believed the city will be administered using community decentralisation concepts; it would exist with community spirit and with a strong city identity.

On local public transport: The mayor described the service quality of the UTS, particularly the way-finding system, as a huge problem. He said this problem is reflected in traffic organisation and the administrative systems. He explained that *‘the administration system in Thailand comes from central government as a top-down policy. Central government wants the Khon Kaen municipality (sub-district) to develop following the plan of Khon Kaen province. The role of the Khon Kaen municipality is to follow and organise mega-projects of central government’.* Because of this, he believed our plan could not be implemented. Again, he stepped back from talking about the UTS. He said, referring to the

explanation above; *'we cannot control the number of Song Thel buses operating in Khon Kaen city under the current Ministry of Transport'*. Moreover, the relationships between the local state agencies in the city are not working well. We cannot interfere with their responsibilities (Khon Kaen transport centre) because each state agency is under a different ministry.

On urban transport development trends: In respect of short-term planning in the UTS, we conducted the local transport research project in order to solve the public transport problems in the city. The research project was named the *'Khon Kaen BRT'* (see reviews, Chapter 3, p.103). It is a community research investment. We expect the BRT system to solve traffic congestion in the CBD area and improve the quality of city life. This system will merge with the old system (Song Thel) or maybe replace it in the future. He said that the project also incorporated *Sin-Chai* and *Pang Jan* as major themes of the BRT design concept (see reviews and discussions, Chapter 3 & 8). In the long-term, he will develop a strategy to mobilise the funding from central government, local government (Khon Kaen municipality), investors, and local people. He said this mega-project is a long-term development that will require a huge budget. *'We need to invest in our community. Therefore, we have to be careful at every step.'* In the future, he hoped that *'Khon Kaen city would be the centre of the Isan region in terms of economics, transport, education, medical care, and investment. We will create a strong economy, from the inside, to diminish the effect of external factors such as economic recession and/or increasing energy prices'*. He stated that *'this is the way of sustainable development from my perspective'*.

5). Key findings of the Khon Kaen economic chamber (chairman): The chairman is not a local person, but has lived in this city for 45 years. During the in-depth interview, he said he had been in his position for three years. He had also had a place on the vice-mayorality team of Khon Kaen municipality for three years.

On the Khon Kaen local culture: The chairman defined Khon Kaen city as *'a city of chance that welcomes multiculturalism'*. Addressing his most favoured prominent forms of Khon Kaen local culture, he explained that *'Khon Kaen city*

should be represented by contemporary images. Not too old, and not too modern. We should develop the Isan local culture by using a mixture of art'. In terms of a city symbol, he had the same views as the mayor. He wanted to incorporate the legend of Sin Chai in a city symbol, images, thus creating an identity in order to make the city into a city of events. He believed the city's location would make Khon Kaen the hub of Isan and the centre of the East-West Economic Corridor in the Indo-China region.

On local public transport: He said that the service quality of the UTS was very weak. This includes service information (way-finding system maps). He had the same perspective as the mayor. *'The Khon Kaen municipality does not have the practical power to organise a local public transport system, within the Song Thel system.'* He noted that the lack of service information in the UTS was a nightmare for a fast-growing city such as Khon Kaen. Visitors, investors, new students and foreigners could not use public transport. He said that the Khon Kaen municipality does not have the authority to reorganise the Song Thel timetables, routes and the number of buses. He thought the Khon Kaen transport centre should take this responsibility. He suggested that we should have a middle man (leader) organising local state agencies involved with the UTS; this person should participate in a special meeting.

On urban transport development trends: In terms of the short- and long-term development plans for the UTS, he suggested the same strategies as the mayor. He recommended that the BRT be an alternative option for public transport users. Song Thel and BRT would be dual systems that compete for good service quality. He suggested that the mono system in the UTS should be cancelled.

To summarise the perspectives of the local administrators, it can be seen that all of them define Khon Kaen city in a similar way: it is the centre of the Isan region in regard to the economy, transport, education, investment, culture and medicine. Meanwhile, regarding the future of the city, they believe that it will become the hub of Indo-China and the Isan region in every sector, as above. The image of the city should develop in the form of a contemporary concept that combines local and modern designs.

Regarding local cultural viewpoints, three out of five of the local administrators (numbers 2, 4 & 5) supported the legend of *Sin-Chai* and '*Pang Jan City*' concepts as the most favoured prominent forms of the local (Khon Kaen) cultures. Meanwhile, the local administrators (numbers 1 & 3) stated that the Isan local textile or '*Par-Mai*' is the form of local (Khon Kaen) culture that they want presented to visitors. For the symbols of Khon Kaen city, three local administrators (numbers 2, 4 & 5) selected the three heroes from Sin-Chai. Their names are (1) Sin-Chai, (2) Hoi-Sung and (3) See-Ho (see reviews, Chapter 3). Administrator number 1 stated that '*Khaen*' was the city symbol; administrator number 2 said that '*Kaen-Nakhon Lake*' was the symbol of the city.

The quality of service information (i.e. the way-finding system) in the UTS is described in a similar way. The system is inefficient in every aspect: timetables, routes, fare rates and pick up/drop off information. The administrators believe that the short-term solution is (1) organising certain routes in the Song Thel system, (2) creating working relationships among relevant local state agencies, (3) defining the local transport act, and (4) studying and developing the BRT project. For a long-term solution, the administrators suggested that the city should operate the BRT system by merging, replacing or competing with the Song Thel system. He believed this would improve the service quality of the local transport system.

1.1.2 Part A-2 (Experts)

This study applied the same collection approach as above in part (A-1). The selection of research participants focussed on the experts using purposive sampling. These people have much academic expertise, covering the fields of (1) urban design, (2) Isan folk art/culture and design fields, and (3) transport engineering. The themes of this study mainly focussed on (1) local cultural perspectives, (2) a different theme that suited each field of expertise (3 fields as above). The experts involved with the in-depth interviews were three scholars from Khon Kaen University: (1) Associate Professor (PhD in urban design), (2) Assistant Professor (PhD in Isan folk art/culture and design), and (3) Associate Professor (PhD in transport engineering). The details of the key findings in this part are provided below.

- 1). **Key findings of the expert in urban design:** This expert is a local person who has lived in Khon Kaen city for more than 45 years.

His perspective on Khon Kaen's local culture: The expert defined Khon Kaen city as the centre of the Isan region in respect to business, education, medicine, investment and state agencies. Regarding the most favoured prominent forms of Khon Kaen local culture, he explained that *'it is hard to say what the prominent forms of Khon Kaen local culture are. This is because the local people in this city come from different backgrounds'*. He said that *'Khon Kaen is a young city: just 150-200 years old. Therefore, the city comprises mixed lineages. They consist of Isan local people, Chinese-born Isan people, and Vietnamese-born Isan people'*. The expert noted that the most favoured prominent forms of Khon Kaen local culture come from the slogan of Khon Kaen province itself (see details, Chapter 3). He stated that local people, Chinese and Vietnamese born-Isan people learn this slogan from an early age (primary school to high school). The slogan teaches them about local culture, products, traditions, and venerable people and places. *'Khaen'* and *'Par-Mai'* are the main local products of Khon Kaen city which are mentioned in the slogan. Therefore, both have become key symbols that reflect the way of life and culture in Khon Kaen city (Par-Mai is a textile and Khaen is a genre of Isan folk music). He said that *'as I am a Khon Kaen person, I choose Par-Mai as the most favoured prominent form of the Khon Kaen local culture'*. Meanwhile, as the symbol of this city, the expert selected *'Khaen'* and the *'Khon Kaen log (town entrance sign)'*. However, the expert recommended more detail about the Khon Kaen timber; *'this timber has a story: it is the log that has existed for around 1,000 years. When local (Khon Kaen) people found out about this, they made a pagoda to cover the logo and they have worshipped it ever since'*.

On the urban design of local public transport: The expert agreed with my suggestions about the three levels of transit nodes in Khon Kaen city (see details in indicative question (EB-3) in Appendix E). He suggested that the big transit nodes in this city consist of (1) Khon Kaen transport centre 1, (2) Kalayanawat School and (3) Bang Lum Phu market. In the future, the *'Central Plaza'* shopping mall and *'Sam-lium'* intersection should be included as two more nodes. Moreover, he suggested that the bus stop system in the future should apply eco-information technology concepts as a development strategy. Finally, the expert recommended that Khon Kaen city should implement a compacting concept for the city's land use. This concept would develop using a horizontal

explanation of the urban landscape. The UTS will be designed by creating the TOD in each community node. These concepts will decrease the population density in the CBD areas of Khon Kaen city, and also create sustainable development for the UTS and quality of (city) life.

2). Key findings of the expert in Isan folk art/culture and design: This expert is not a Khon Kaen person, but he is Isan and he has lived in Khon Kaen and the Isan region for more than 55 years. He teaches in higher education, in the field of graphic design and Isan art culture. Furthermore he is an artist and belongs to the Mekong River Artists Association.

His perspective regarding Khon Kaen local culture: The expert described Khon Kaen as the centre and hub of the Isan region. In terms of the most favoured prominent forms of Khon Kaen local culture, he explained that in fact the Isan region shares the same patterns of the Isan way of life based on the concept of ‘12 mouths and 14 ethical behaviours’. In the Isan dialect this is called ‘*Heat Sim Song- Krog Sim See*’ (see details, Chapter 3). He concluded that Khon Kaen is a young city with a young history, but has competency with its location. Given this point, central and local governments should contribute and develop the cultural city identity/image. He criticised the Khon Kaen cultural development plan, dividing it into two concepts. The *first concept* had developed design ideas which reflected the slogan of Khon Kaen province, i.e. Par-Mai, Khaen, local flower and dinosaur. The *second concept* was created based on the selling points of event and tourism commerce with which we can look at Sin-Chai ideas. He thought that Khon Kaen and Sin-Chai were not related in terms of history and geography, sites and monuments. Two of the temples (Wat Sanuan-Wari-Phatthanaram and Wat Chaisi) in Khon Kaen province have mural art related to the legend of Sin Chai. This point made the local administrators want to promote the Sin Chai idea as the key development policy regarding city image and identity. This is because other provinces also have similar Sin Chai mural paintings in their cities (see discussions, Chapter 8). In terms of Khon Kaen symbols, he selected Khaen. Meanwhile, he chose Isan local textiles as the most favoured prominent forms of Khon Kaen local culture.

On local art/cultural issues: He suggested that the most favoured prominent forms of Isan culture had parallels in local ways of life. These can be shared in the ideas of cuisine, dress and accessories. This is because Isan has strong characteristics and different traditions from other regions in Thailand⁹². In terms of relationships between Isan and local (Khon Kaen) cultures, he explained that the Isan and Khon Kaen cultures have the same traditional practices based on the concepts of *Heat Sim Song-Krog Sim See*. However, what makes Khon Kaen special from Isan culture is the 'Friendship Custom' or 'Puk-Sio' (in Thai 'ผูกเสี่ยว') as it is called in the Isan dialect. He noted that the *Friendship Custom* is traditional practice only in Khon Kaen province. It is a custom performed to welcome guests and friends using silk threads bound on the wrist. These represent trust of spirit; the custom invites the protecting spirit to return the body of foreigners who come to Khon Kaen. He said it can be seen that silk has strong relationships with the local ways of life such as spirit, etiquette, folk wisdom, local materials and products, and decorations. The silk textile concept can also be applied to decorations, the tiled roads, building design and events such as the Silk Festival (only in Khon Kaen).

On local art/culture in contemporary issues: In terms of cross-cultural issues between western and local customs, the expert provided critical details in three dimensions: (1) living, (2) learning and (3) art and design. In respect to *living*, he explained that many Westerners came to Thailand and the Isan region during World War Two. During that time, Thai people looked at Westerners as their model (for example, night life). The Thai people learned how to communicate and work with Westerners, slowly absorbing their languages, perspectives and culture. In *learning*, Thai people started to learn how to communicate and live with Westerners who stayed on; for example, road signs were also in English; Western fast food outlets were established, i.e. McDonalds and KFC. In terms of *art and design*, he explained that he had read many books which criticised mixing Thai designs with another culture's designs. He noted that throughout history, Western people were colony hunters. They competed with one another, presenting their power by occupying many countries. One region is South-East

⁹²He illustrated that the central region of Thailand was influenced by the 'Ayothaya Empire'. The northern and southern regions of Thailand obtained their influence from the 'Lan-Na and Java Empires'. Meanwhile, the Isan culture was influenced by the 'Lan-Chang Empire' (see reviews, Chapter 3).

Asia. He concluded that *‘colonial attitudes underestimate and discount the local cultures and civilisations of their dependencies. Colonial powers bring their own regulations and practices into their dependent countries. These affect the local practices, customs and culture. For example, why must the great sculptures of human figures be the works of Michelangelo; or imperial paintings be the works of Leonardo Da Vinci?’* Indeed, the values of art and culture are created based on their suitability in the context of life, nature, materials and beliefs. The values of different cultures cannot be compared to each other.

On human factors reflecting local art/culture in the globalisation era: There are three human factors which make the Isan perspective different from Western perspectives. In (1) *psychology*, he explained that the aspect that makes Isan and Western perspectives totally different is belief. Religious Westerners tend to be Christians while Isan (and Thai) people are Buddhists. These beliefs show contrasts in learning experiences within both cultures; they are interpreted and developed through symbolic units (i.e. icons, pictography, language and letter systems). These (2) *physical* systems (factors) have create contrasting practical behaviours in the context of living, eating, and dress. He criticised these complex systems which brought local traditions and customs into their (3) *own culture*. Hence, these three human factors directly affected design concepts and diversity in the world of design artefacts. However, he said that *‘in the era of globalisation, no culture can stand alone. We should integrate the appropriate concepts which make our design artefacts meet the aims of communication, usability and satisfaction’*. Moreover, he suggested the important thing is to *‘represent the spirit of our cultures in order to (1) create valuable and characteristic designs, and (2) celebrate the strong identity of our culture in the world’*; before our culture disappears and is absorbed by other cultures forever.

3). Key findings of the transport engineering expert: This expert is not a Khon Kaen native, but has lived in the city for more than 30 years. He teaches in the tertiary education system, focussing on the urban transport engineering field. He is a member of the research team who collected, analysed and designed the BRT Khon Kaen system within the Khon Kaen municipality.

His perspective of the Khon Kaen local culture: The expert described Khon Kaen as the hub of the Isan region. The city is the centre of transportation,

investment, education and business. In terms of the most favoured prominent forms of Khon Kaen local culture, he gave the same perspective as local administrators (numbers 2, 4 and 5): the legend of Sin Chai. He believed that this would create a selling point for the city. Meanwhile, the symbols of Khon Kaen city, in his opinion, are Sin Chai heroes: (1) Sin-Chai, (2) Hoi-Sung and (3) See-Ho.

Onlocal public transport: He said that the current system (Song Thel) should be deconstructed and reformed, as the system is inefficient. Although the local transport system is the heart of the city's infrastructure, the timetable and route systems are unclear. In addition, the urban elements of Khon Kaen city are unrelated to city land use. However we could not actually monitor that. The expert mentioned that to improve Khon Kaen TOD, the city should have a sustainable UTS with land use planning. He agreed with my suggestion about having three levels of transit nodes in Khon Kaen city (see details in Appendix E, Q. EA-3). He concluded that in the case of the transit node level 3 (interchange stations), we should prepare a space for park-and-ride passengers. The significance of the way-finding system with a UTS, the expert said, '*was very important*'. He noted that '*it was the major instrument that is created for guiding people to understand the service system and information. Without a good way-finding system, the new transport system will fail because the passengers will not start to use the services*'. In the future, he hoped that when the BRT system is finished, the number of passengers who use the public transportation will increase 30-40 per cent.

In summarising the perspectives of the experts, it can be seen that in terms of the symbols of the city, two of the experts in urban design and Isan folk art/culture and design, have selected Khaen as the representative symbol of the city. Meanwhile, the transport engineering expert selected three heroes in Sin Chai literature. In respect to the most favoured prominent form of Khon Kaen local culture, expert numbers 1 and 2 chose Par-Mai. This traditional textile could represent the relationship between silk and the local knowledge of this community in respect to folk wisdom, addressing faith, worship (friendship custom), and activity (silk festival). Expert number 3 supported the Sin Chai legends as the most favoured prominent form of Khon Kaen local culture that should be presented to create a selling point for the city. Meanwhile, experts 1 and 2

noted that the significance of local symbols and cultural contributions which were articulated from (1) the *'provincial slogan'* and (2) *'the concept of '12 mouths and 14 ethical behaviours'*.

All the experts had a similar definition of Khon Kaen city. They said that Khon Kaen is the centre of education, business, transportation, culture and medicine in the region. In respect to transportation, experts 1 and 3 agreed with the dividing of the three transit node levels. Both said that the service quality of the Song Thel system in respect to service times, stop points and routes are critical. They pointed out that the way-finding system was the key instrument to connect people to the UTS. Meanwhile, expert number 2 suggested that to create a well-designed concept, we should understand the aim of our communications and usability. This will produce satisfaction. Moreover, he recommended that we should create our design character based on our background experience.

1.1.3 Part A-3 (Community of Song Thel Users/Drivers-Key Informant 'B')

This study applied the same collection approach as in parts A-1 and A-B. The selection of research participants focussed on representatives of the local community - Song Thel passengers/drivers - using purposive sampling. These people used and delivered services within the Khon Kaen municipality area. There were two participants in this collection activity: (1) a Song Thel passenger (female) and (2) a Song Thel driver (male). The themes of this study were (1) local cultural perspectives, (2) service behaviour and (3) the need for transport information with respect to Song Thel local drivers and local passengers. The details of the key findings in this part are provided below.

1). Key findings of the Song Thel representative passenger: This woman has lived in the Khon Kaen city for more than 50 years. She is a local villager who has used local transport (including the Song Thel system) for most of her life.

Her perspective regarding the Khon Kaen local culture: The woman defined Khon Kaen city as the centre of business, education, transport, work and medical services. In terms of her most favoured prominent form of the Khon Kaen local culture, she selected the traditional textile (Par Mai). Regarding the city symbols, she chose 'Khaen'; because she likes 'Mor-Lum', and the Isan folk-

song band (see reviews, Chapter 3). In the future she would like to see Khon Kaen as a modern and contemporary city.

On the need of transport information for local passengers: I asked her about how many Song Thel systems (mode 1) operate the service in the CBD (Q.KB1-1, see Appendix C). She was not sure. She stated that she had not seen the official transit map of the Song Thel system before. Moreover, she said that she never knew about the actual time service and stops of the Song Thel system in the CBD. I asked her, how she used it. She answered, ‘*I just ask the drivers*’. She expressed a need to see some information about route services, stops, and actual time services. However, when I asked her about the Khon Kaen BRT project, her response was to ask more questions: ‘*What is the BRT? What does it look like? How can we use it? Which places they will pass? How does it work? When will the system start operating?*’

2). Key findings of the Song Thel representative driver: This man is has lived in Khon Kaen city for more than 40 years. He is a local entrepreneur who has delivered services for local passengers in the Khon Kaen CBD for over 20 years.

His perspective regarding Khon Kaen local culture: He defined Khon Kaen city as the major city of investment, transportation and education in the Isan region. He selected the traditional textile (Par-Mai) as the most favoured prominent form of Khon Kaen’s local culture. Meanwhile, in his opinion, Khaen is the symbol of the city. This is because Khon Kaen is the city of the ‘Mor-Lum’ band in this region. In the future, he believes that the city will be a modern city.

On the need for public transport information in respect to Song Thel drivers: In his response to service times, he said that actually there is no service time regulation being controlled from the Khon Kaen transport centre. He said that he ran his service only in the rush hour, because there are more passengers then. If he ran his car all day, he would not profit. He explained that he knew about stop points that were identified from the Khon Kaen municipality and transport centre; but drivers tended to respond to where the passengers got on and off the bus. The most frequent questions asked by passengers were ‘*Are you passing this place? Which Song Thel number goes past my destination? How can I get there?*’ When I asked him how he answers these questions, he said he liked to

say *'I don't know'* or *'we don't go past that place'*. I asked him about the service quality of the Song Thel system in the CBD areas; he said that *'it's okay!'* In the case of the BRT project, he said that this system did not function well for the city and the needs of local people.

In summarising the perspectives of the community users/derivars of local transport, it can be seen that both the representative user and driver in the city had similar ideas. They defined Khon Kaen as the centre of business, education, transportation and medical services. However, regarding the need for local transportation, they had contrasting perspectives. The user needed route information and service times. She also required official transit information about the UTS. The representative of community (Song Thel) drivers thought that their services were fair, considering their profits and degree of service quality.

1.2 Part (B): Participant Observation

This part presents the key findings from the participant observation section of my field work. The process of this collection activity was divided into three phases: (1) inspection of the field work areas, (2) observation of the urban transport structure and (3) urban transit behaviour. However, the relative issues were also combined at each phase of data collection. Auto-ethnography was applied in order to integrate my reflective investigations during the observation process; this is because I have been part of this community for more than 30 years. In terms of data analysis, the typology technique was applied to describe the relationship between the set of key findings in each phase (Creswell, 2008). This analysis technique categorises and matches patterns, and develops a set of related domains within the key themes (or terminologies), which I observed (Spradley, 1980) (see more details, Chapter 5, p.164). The details of the key research findings in each phase are provided in the following paragraphs. Note: (1) *This collection activity occurred during December 2011.* (2) *The devices included a digital camera and field notes.*

1.2.1 Phase 1: Inspection of the Field Work Areas

This phase focussed on inspecting the Khon Kaen municipality areas which were selected as the key points for my next observations in phase 3. The suggestions from the experts were considered when developing my observation plans (see details, pp.179-184). The purpose of this inspection was to define the collecting points for my pilot and

survey processes in part C. During the observations, I used a car and drove around the four sub-district areas within the municipality in order to inspect and recheck transit nodes.

Phase 1, key findings: The results revealed that the main transit nodes which met the criterion⁹³ of the experts had around six nodes. These included (1) Khon Kaen Transport Centre 1, (2) Kalayanawat School, (3) Bang Lum Phu market, (4) Khon Kaen hospital centre, (5) Lotus shopping centre and (6) Khon Kaen Transport Centre 2 (or ‘Air-Conditioned Bus Terminal’). Careful consideration revealed that two of the six transit nodes (numbers 1 and 6) had alternative options. A passenger could change their transportation from urban (Song Thel) to inter-provincial (bus) modes. Transit node number 1 had the biggest area and number of passengers (see Figure 78).

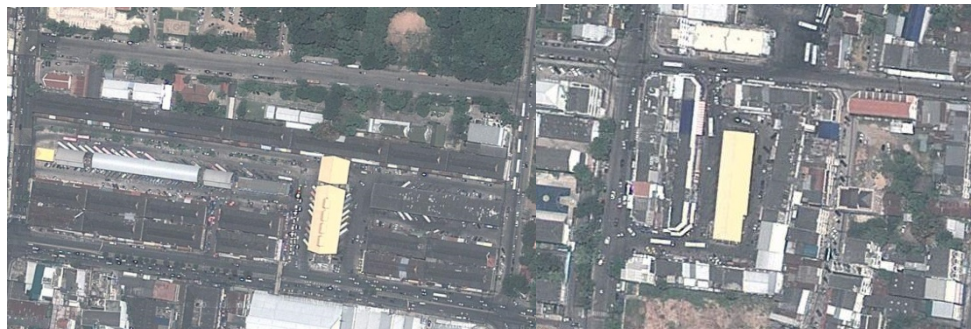


Figure 78 Size comparison between transport centres 1 (left) and 2 (right).

Meanwhile, node numbers 2 and 3 had the highest number of passengers who waited for a Song Thel bus. Both nodes were high demand areas.

My reflective findings: During the observations, I made a note regarding the UTS transit information issues. I found that key guidance information regarding transit data was not provided, was incorrect and/or not up to date. Such problems were widespread and were present at each transit level such as stops, and main transit nodes. Figure 79 (p.187) illustrates the lack of quality in the way-finding system for passengers learning to use urban transport information.

⁹³The experts suggested that the numbers of (Song Thel) transit lines are significant when identifying which areas were the city nodes. They noted that at least four lines and up to six lines could form a main transit.



Figure 79 Bus stops in Khon Kaen city

The pictures above present challenges in the transit information within Khon Kaen city. For example: Top left is an old information board concealed by advertising in the city transport centre. Meanwhile, the picture at top centre shows an out-of-date information board at a bus stop. The top-right picture illustrates the absence of service information at another bus stop. The bottom pictures show the worn-out and dirty environment around bus stops. The only things that give information to people are the old and small information boards. These include some information in Thai about the place names on the outside of and inside the Song Thel buses, which is only useful for local people. In addition, some advertising boards obscure the service information. The examples are presented in Figure 80.



Figure 80 Examples of service information provided on the Song Thels

1.2.2 Phase 2: Observation of the Urban Transport Structure

In this phase I aimed to observe and analyse the Song Thel system structure. The analysis included the inspection of the Song Thel system modes and service lines which provide a commuting service in the municipality areas. The key results from this phase could help with identifying the correct service routes of the Song Thel system. Additionally, this data could be integrated with the observation results from phase 1 in order to help me select the transit nodes which were to be used as the collection point of my survey process. During this observation, I used a Song Thel to record the service routes information. Next, I drew the data on a GIS map of the city.

Phase 2, key findings: Observations revealed that the Song Thel system consists of two operating modes. The first group is Song Thel mode 1 which provides a commuting service. This includes Song Thel numbers 2, 3, 4, 6, 8, 9, 10, 11, 16 and 21. The second group was Song Thel mode 2 which brings passengers from the outskirts into the city centre. This group consists of Song Thel numbers 5, 12, 13, 14, 15, 17, 19 and 20⁹⁴.

After I had used every service line of the Song Thel system, the trip patterns were analysed as a 'polycentric model'⁹⁵(Frey, 1999). This model also applies to the urban village version of trip patterns. The node systems within the city, relating to the physical environment and public transport of the Song Thel structure, need to be organised accordingly. Figure 81 (p.189) shows that both CBDs of Khon Kaen city have three large transit nodes. They are divided into one large node in the Northern CBD and two large nodes in the Southern CBD. The picture on the left illustrates an overview of Song-Thel's model 1 and 2 service lines. The three cycle dots represent the areas of the main transit nodes. The right-hand picture shows the trip pattern of the transit nodes model in Khon Kaen city, applying the polycentric concept (Donald et al., 2003).

⁹⁴This information was rechecked with a staff member at the Khon Kaen transport centre.

⁹⁵The polycentric model uses the standpoint of the sub-centre, with some 'urban villages' heading a cluster to organise the urban transport system into sub-villages (Lynch, 1960).

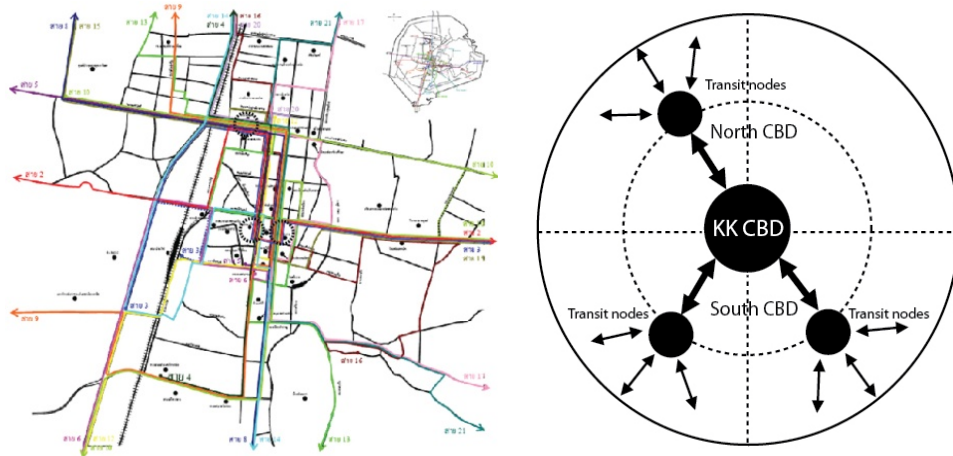


Figure 81 UTS service lines in Khon Kaen city and trip pattern transit nodes model

Taking into account the suggestions of the experts and trip pattern analysis, I selected transit node number 1 Khon Kaen Transport Centre 1 (left), 2 Karayanawat School (centre) and 3 Bang Lum Phu Market (right) as the main targets of my collection points (see Figure 82).



Figure 82 The three main transit nodes in Khon Kaen city

My reflective findings: During my observations, I found a lot of design artefacts in architecture models which relate to the traditional way of life in this community. Most of these architecture models applied the two main concepts of (1) local textile (or ‘Par-Mai with Khid patterns’) in Thai ‘ผ้าไหมลายขิด’ and (2) Khaen; both were employed as the main construction design concepts that are expanding around the city. For example, part of the Khid silk pattern designs were used as decoration on road surfaces, the gateway of Khon Kaen’s main stadium, walls of buildings, and a sculpture in the shopping mall. (See Figure 83, p.191). It can be noted that the main design of the Khid pattern is the flower symbol which the designer used for representing the local flower. This is called the golden shower or ‘Koon flower’ in Thai.



Figure 83 Influence of Isan textiles impacting on architecture, signs and logos

Meanwhile, Khaen is a key concept for landmark buildings in the city, such as the city's clock tower, a road sign and other symbols (see Figure 84).



Figure 84 Influence of Khaen on design artefacts

The legend of Sin Chai was applied as the newest concept for city decorations. The three heroes in the Sin Chai story were installed as sculptures on power poles (lamp posts) in the downtown areas of the city (see Figure 85, p.192). Meanwhile, the bamboo wood bucket was applied as an idea of traditional cuisine. The wood bucket concept was applied as the architecture model of the biggest shopping mall of the Isan region. (See Figure 86, p.192).



Figure 85 The three heroes in Sin Chai literature and the decoration of power poles



Figure 86 The adaptation of the bamboo bucket to one of the landmark buildings in the city

1.2.3 Phase 3: Urban Transit Behaviour

In this phase I aimed to observe the transit behaviour of passengers in the key transit nodes as mentioned above. These include transit node number (1) Khon Kaen Transport Centre 1, (2) Karayanawat School and (3) Bang Lum Phu market. I spent three days inspecting community transit behaviour in each node. A digital camera and paper notes were used to collect the data in the field.

Phase 3, key findings: After inspecting my setting areas I found that I could group passengers into two major types. The first type was those who regularly used the common Song Thel service line; their behaviour indicated familiarity with the system. The second type comprised non-regular passengers who were unfamiliar with the Song Thel system. Most of this group were generally found at the Khon Kaen Transport Centre (transit node number 1). They often asked a Song Thel driver when they had no idea how to use the service (see Figure 87, p.193).



Figure 87 Behaviour of passengers who were unfamiliar with the Song Thel system

My reflective findings: During the observations, I noticed the traditional dress style of people as the 'Isan Sarong' (ผ้าถุงอีสาน). The sarong is a marquisette of Isan textile product (cotton) which Isan women make after their harvest (Monthien, 1994). I found many rural women wearing a sarong in the transit nodes. Even when the style changed to more modern dress, I still found this traditional style of dress around the city and outlying areas (see Figure 88).



Figure 88 Women wear traditional dress in the city and outlying areas

In summary, the key findings of observation **phase 1** were that the six main transit nodes in the city met the criterion (see details, p.187) of the experts. The major problem of the urban transport system was the poor quality of information for users (communication). The city did not have a functional transit way-finding system with up-to-date correct information for passengers. The UTS was simply unprofessional.

The key results in **phase 2** found the Song Thel system consists of 18 service lines divided into two modes. The first mode provides a commuting service within the Khon Kaen municipality. The second mode provides a service for commuters from the city outskirts into the city centre. The trip pattern of the Song Thel system was the ‘polycentric model’ used by applying the urban village model (Frey, 1999). The CBD could be divided into two parts: Northern CBD and Southern CBD. The main transit nodes that had high demand consisted of one transit node in the Northern CBD (City transport centre 1). Meanwhile, the other two nodes were Karayanawat School and Bang Lum Phu market in the Southern CBD. Observations further revealed that a lot of design artefacts such as architecture and city environmental design models were integrated into the Isan textile and Khaen concepts as the key design ideas.

The key findings in **phase 3** pertained to the transit behaviour of passengers who were unfamiliar with the Song Thel system. These passengers preferred to ask a Song Thel driver around the transit nodes. On reflection, I found that in the modernist era; an Isan sarong was still worn by the local women. This Isan textile remains the traditional dress style of Khon Kaen and Isan women today.

1.3 Part (C): Developing Survey Questions

This part presents key findings from the people (locals and non-locals) who reside in the Khon Kaen municipality. A paper questionnaire, using the interview technique, was employed to collect data (see details, Chapter 5). The number of sample units stayed at 131 people (see reasons in Chapter 5, p.138). Random selection, with purposive sampling techniques, was used to select potential participants (the reasons were provided in Chapter 5, pp.138-139); this technique provided the ability to acquire an holistic response from a cross- section of people in the community. The respondents (locals and non-locals) were of equal gender, mixed ages, occupations and education, and included disabled people. The three question formats: (1) rating scales, (2) open and

closed ends, and (3) semi-closed questions were utilised in this questionnaire (Creswell, 2008; Neuman, 1997) (see details of the questionnaire in Appendix G).

The questions were grouped in six sections: (A) demographics, (B) general information about the use of vehicles and UTS in the city, (C) the use of transit behaviours in the city, (D) the quality and service needs, (E) Isan background and local perspectives, and (F) transit map interpretation. These sections sought to describe human factors in respect of (1) psychology (e.g. the local culture's learning/experience/perspective), (2) physiology (e.g. for useful transport information), and (3) socio-cultural aspects (e.g. urban transit behaviour).

The data analysis utilised descriptive statistics. Univariate statistics were employed to describe the findings. The key outcomes were represented in the shape of frequency distributions which were produced using a number, percentage and mean (see details, Chapter 5, p.163). SPSS software was used to analyse the raw data and present the average scores in the form of tables and graphs. The details of the key findings in each section are provided in the following paragraphs.

1.3.1 Section A: Demographic Questions – Participant Cohort

This section investigated the general demographics of people residing in the Khon Kaen community. The key results identified the demographic trends of my research participants. These included questions about gender, age, disability, education, occupation, income, local residence and time lived in Khon Kaen city. The questions assisted me with categorising and understanding the basic background of people from a cross section of the community (my case study).

Analysis of raw data in this section revealed that 51.9% of respondents were female and 48.1% male (total 131 participants) (see Table 6, p.196). This total included four disabled people (or 3.1%) (see Table 7, p.196). Meanwhile, 105 respondents (or 80.2%) were local people (female 51 and male 54) and 26 respondents (or 19.8%) were non-local (see Table 8, p.196). Regarding their residential area, 71.8% (or 94 out of 131 people) of the respondents were living within Khon Kaen city. (see Table 9, p.196).

Gender			
		Frequency*	Valid per cent (%)
Valid	Male	63	48.1%
	Female	68	51.9%
Total		131	100.%

Table 6 Gender of respondents

* (N = number of respondent)

Disability			
		Frequency*	Valid per cent (%)
Valid	Yes	127	96.9%
	No	4	3.1%
Total		131	100.0

Table 7 Respondents with disabilities

* (N = number of respondent)

Khon Kaen local			
		Frequency*	Valid per cent (%)
Valid	Yes	105	80.2%
	No	26	19.8%
Total		131	100%

Table 8 The origin of respondents

* (N = number of respondents)

Live in Khon Kaen			
		Frequency*	Valid per cent (%)
Valid	Yes	94	71.8%
	No	37	28.2%
Total		131	100%

Table 9 Residents of Khon Kaen city

* (N = number of respondents)

From the total number of respondents, people aged 20-29 years had the highest representation (at 34.4%). Meanwhile, the people aged more than 60 and between 15 and 19 years of age ranked second (at 21.4%) and third (at 20.6%) respectively, in this question (see Figure 90, p.197). Regarding education, the results showed that the undergraduate degree was the highest study level of participants at 41.2% or 54 out of 131 respondents. Meantime, the senior and junior high schools and primary schools

ranked second (21.4%), third (16%) and fourth (15.3%) respectively in this question (see Figure 89). In terms of occupation, the results indicated that students (high school) and university students were the first and second career categories in this section (see details of other classes in Figure 91). The group with a salary showed that most income levels stayed lower than 5,000 (37.8%) between 5,000 and 10,000 (37%) baht per month (see details in Figure 92, p.198). Four respondents chose not to answer this question as they were monks⁹⁶.

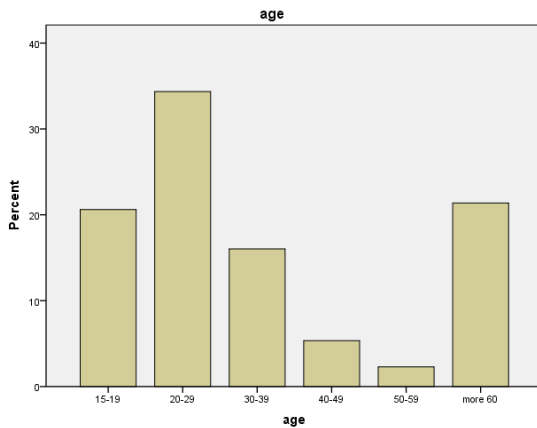


Figure 90 Ages of respondents

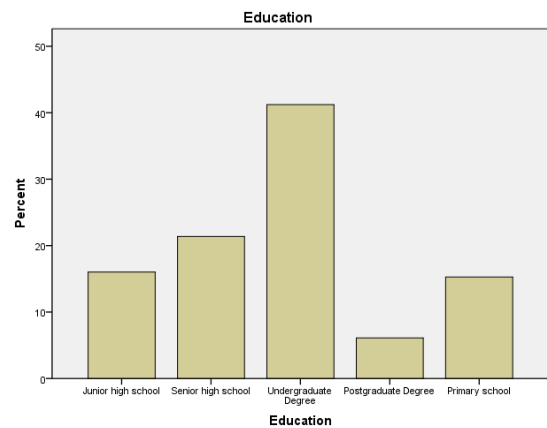


Figure 89 Education of respondents

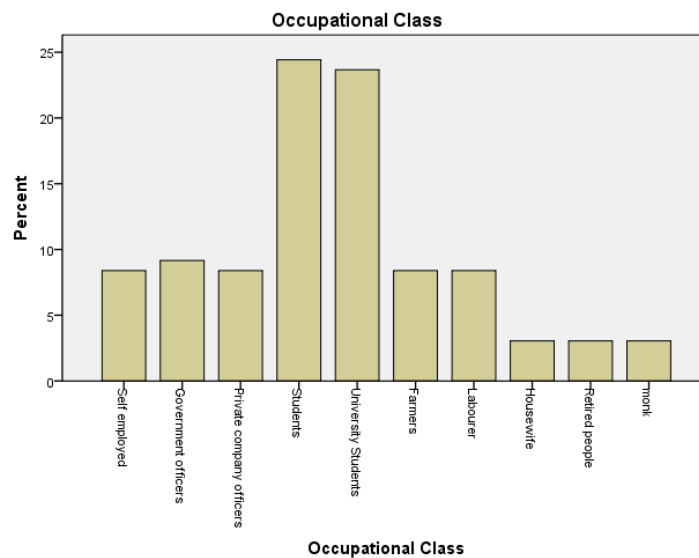


Figure 91 Occupations of respondents

⁹⁶Buddhist monks cannot receive any salary.

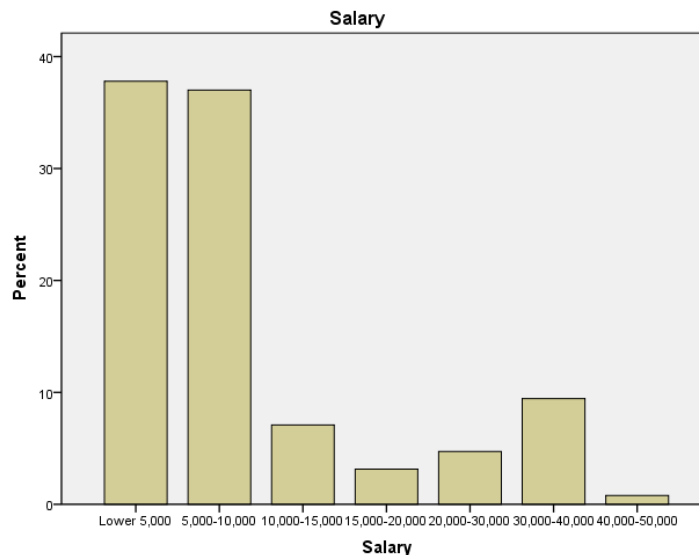


Figure 92 Salaries of respondents

1.3.2 Section B: General Information about the Use of Vehicles and the UTS in Khon Kaen City

This section inquired about the use of vehicles and the Song Thel system in Khon Kaen. These results were generated by respondents who regularly used the Song Thel system. The outcomes will create understanding about the local passengers' background, and experience in using the UTS.

The key results in this section were that 87 of 131 respondents (or 66.4%) regularly used the Song Thel system in the municipality areas (see Table 10, p.199). Of these respondents, 72 came from the low-income group (less than 5,000 Baht and 5,001-10,000 Baht). However, 82 of the 87 respondents (or 94.3%) could not tell how many service lines of the Song Thel system (mode1) served the municipality areas (see Table 11, p.199). In addition, 70.1% (61 of 87 respondents) were unsure about the information regarding the initial and destination points of the Song Thel service lines that they regularly used. Meanwhile, 23% (or 20 of 87 respondents) did not know anything about service information (see Table 12, p.199). Regarding the Song Thel service times, 33.3% did not know about the timetable; while 65.5% were unsure about the service times of the Song Thel system (see Table 13, p.199). With respect to fare information, 43.7% (or 38 from 87 respondents) were unsure about the rate in each passenger class (see Table 14, p.200).

Do you use the Song Thel system?			
		Frequency*	Valid per cent (%)
Valid	Yes	87	66.4%
	No	44	33.6%
	Total	131	100.0%

Table 10 Respondents who were using the Song Thel system

* (N = number of respondents)

Do you know how many service lines there are?			
		Frequency*	Valid Percent (%)
Valid	No	82	94.3%
	Yes	5	5.7%
	Total	87	100%

Table 11 Participants who knew how many Song Thel lines there were

* (N = number of respondent)

Do you know your service line information?			
		Frequency*	Valid Percent (%)
Valid	Yes	6	6.9%
	Not sure	61	70.1%
	No	20	23%
	Total	87	100%

Table 12 Participants who knew about their Song Thel service

* (N = number of respondent)

Do you know the service timetable?			
		Frequency*	Valid Percent (%)
Valid	Yes	1	1.1%
	Not sure	57	65.5%
	No	29	33.3%
	Total	87	100%

Table 13 Participants who knew about their Song Thel services line timetable

* (N = number of respondent)

Do you know the fare rate in each passenger class?			
		Frequency*	Valid per cent (%)
Valid	Yes	47	54%
	Not sure	38	43.7%
	No	2	2.3%
	Total	87	100%

Table 14 Participants who knew about the fare rates in each passenger class of the Song Thel system

1.3.3 Section C: Transit Use Behaviours in the City

This section identified the local transit use behaviour of respondents who regularly used the Song Thel system in the city areas (a total of 87 respondents). This section was divided into four subsections⁹⁷. These included (C1) the use of local transit behaviours (Song Thel system), (C2) experiences with the Bus Rapid Transit (BRT) and Graphical Navigation Systems, (C3) the direction of new urban transport and graphical navigation systems in Khon Kaen city and (C4) use of a private vehicle.

Section C1 (local transit use behaviours): Key results in this section revealed four basic reasons as to why respondents were using the Song Thel system. These included (1) to save money (56 of 87 respondents selected this choice), (2) they did not have any private vehicle (49 of 87 respondents), (3) comfort (20 of 87 respondents), and (4) could not find a car park (18 of 87 respondents). On weekdays, the peak usage period of the Song Thel service in the city areas was 6.01-8.00 am; the second busiest period was 4.00-6.00 pm. The off-peak service times when respondents did not need the service were 12.01 am-2.00 pm and 8.01-10.00 pm. During the weekend, the peak usage periods were 6.01-8.00 pm and 10.01 am-12.00 noon. Off-peak service times were 8.01-10.00 pm and 2.01-4.00 pm. Regarding reasons to travel in the municipality areas, the participants' main one was study (40 of 87 respondents). The next most common reasons were business, work, shopping, and commerce; another was exercise.

Regarding transit use behaviours, 88.5% of respondents regularly used the Song Thel system. They would ask a Song Thel driver when they were confused about

⁹⁷ In this section, the respondents who selected the choice 'uses the Song Thel system' (in question B1, Section B) continued to answer questions in subsections C1, C2 and C3. Respondents (44 people) who chose 'do not use' the Song Thel system' (in question B1, Section B) were directed straight to subsection C4.

the route. Calling a friend ranked as the next most common option (see Table 15).

What do you do when you get confused about Song Thel's services?			
		Frequency*	Valid per cent (%)
Valid	- Call a friend	7	8%
	- Ask a Song Thel driver	77	88.5%
	- Ask another passenger or shopkeeper near that (bus) stop	3	3.4%
Total		87	100%

Table 15 Transit use behaviour of sample passengers; when they got confused about Song Thel services

* (N = number of respondent)

Section C2 (experiences with Bus Rapid Transit (BRT) and Graphical Navigation Systems): The key results found that 90.8% of respondents who regularly used the Song Thel system did not know what the 'Bus Rapid Transit (BRT) system was. Moreover, 95.4% of the participants had never used a BRT system before. Regarding the experience of using the graphic way-finding system,⁹⁸ 86.2% had never previously used this graphic material (see Table 16). In addition, none of the respondents had ever seen any information about the graphic way-finding system for urban transportation at any (bus) stop in the city areas (see Table 17, p.202).

Have you ever used a graphic way-finding system for travelling?			
		Frequency*	Valid per cent (%)
Valid	Yes	12	13.8%
	No	75	86.2%
Total		87	100%

Table 16 Use of any way-finding system in the city areas

* (N = number of respondent)

⁹⁸This system includes the route maps, service timetables, and fare rates.

Have you ever seen any information about the way-finding system at any (bus) stop in the city areas?			
		Frequency*	Valid per cent (%)
Valid	Never seen	87	100%
Total		87	

Table 17 Participants who had never seen any way-finding material about the UTS in Khon Kaen city areas

* (N = number of respondent)

Section C3 (direction of new urban transport and graphical navigation systems):

The key results were that 67.8% of respondents who regularly used the Song Thel system wanted to see the BRT system replace the Song Thel system; 28% of the respondents preferred to use both systems. In addition, 100% of the respondents wanted to see the BRT system's service information. They also fully agreed that Khon Kaen city should install a graphic way-finding system for the UTS *Note: in this subsection, I provided a definition of the BRT system in the questionnaire in order to ensure that participants understood what the BRT was (see details Appendix G).*

Section C4 (use of private vehicle): This part was designed for the 44 respondents who answered 'do not use' the Song Thel system (in question B1, Section B). The key reasons why they did not use the UTS were: (1) unclear service information, (2) uncertain service times, (3) unconvinced about the service and (4) the long time on board. All respondents in this group agreed to use public transport if the system provided high quality service. The respondents (97.7%) also wanted to see the BRT system replace the Song Thel system. All respondents would also like to see BRT Khon Kaen's service information. They also agreed with the installation of the graphic way-finding system idea for urban transportation.

1.3.4 Section D: The Quality and Service Needs of any 'Way-finding Systems' at Bus Stops in Khon Kaen City

This section was aimed at identifying the quality (subsection D1) and service needs (subsection D2) of way-finding systems at bus stops in the city areas. The group of respondents who were allowed to answer this section were 87 people who regularly used the Song Thel system. In section D1, the choices were as follows: 1=very poor

quality,2=low quality,3=average quality,4=good quality,5 =premium quality. Section D2 divided the need levels as follows: 1=do not need,2=not sure and 3=need.

Section D1 (the service quality of urban transport way-finding systems): Question (Q) D1.1 asked about the quality of transit information for passengers (e.g. map of routes, service timetables, and fares) at any bus stop. The key findings illustrated that 74.4% and 25.6% of respondents selected choice numbers 1 and 2. Meanwhile, Q. D1.2 asked about the accessibility of route service information on a Song Thel and any bus stop. The outcomes were 82.6% of participants selected choice number 2; while 25.6% answered choice number 1. In Q.D1.3, the provision of fare information, the result showed 50% chose number 3 and 41.9% selected number 2. In the case of timetable information, most respondents chose number 2 (68.6%) and number 1 (29.1%). However, the overall view of service quality of the Song Thel way-finding system was low quality: number 2 at 94.2% (see Table 18).

The overall view of service quality of Song Thel navigation systems in Khon Kaen city

		Frequency*	Valid per cent (%)
Valid	1	5	5.8%
	2	82	94.2%
	Total	87	100%

Table 18 Overall view of service quality of the Song Thel way-finding system in the city areas

* (N = number of respondent)

Section D2 (the service needs of the way-finding system in urban transportation): The key result in this subsection was that 94.3% of respondents needed the service information about the graphic way-finding system for the UTS (see Table 19, p.204). Another result was 93.1% of respondents needed Khan Kaen city to install a graphic way-finding system for the UTS. In addition, 53.9% of respondents needed the information about government agencies, sightseeing destinations, parks, and other important places to be on the UTS map.

Do you need a graphical navigation system for local transport (and the BRT system)?			
		Frequency*	Valid per cent (%)
Valid	2	5	5.7%
	3	82	94.3%
Total		87	100%

Table 19 Participats' need for a graphical navigation system for the UTS

* (N = number of respondent)

1.3.5 Section E: Isan Background and Local Perspectives

This section sought to inquire about Isan local perspectives; it consisted of two subsections: E1 (local background and perspective) and E2 (local perspective with signage system). There were closed and open-ended questions for participants who wished to comment or had ideas beyond those that could be chosen.

Section E1 (local background and perspective): from 107 respondents: 52 female and 55 male. While 105 people were locals, two people were non-locals. The majority of local people who answered this section living in Khon Kaen over 31 years (44.3%). The second rank was between 21 and 30 years (29.2%) (see details, Table 20).

How many years have you lived in Khon Kaen province?			
		Frequency*	Valid per cent (%)
Valid	3-5 Years	1	0.9%
	6-10 Years	1	0.9%
	11-20 Years	26	24.5%
	21-30 Years	32	29.2%
	Over 31 Years	47	44.3%
Total		107	100%

Table 20 Participants who answered the questions in section E

* (N = number of respondent)

Regarding the character of Khon Kaen city, the local people wanted the city image to look like: (1) a city of folk art and Isan cultures (62.6%), and (2) a modern city which is the business centre of the Isan region (33.6%). A prominent point of local culture that the city should represent was the traditional Isan textile, Par-Mai, (70.1 %). (See Table 21, p.205). In terms of city symbols, the

respondents selected 'Khaen' (70.1%) (see details, Table 22). Meanwhile, 95.3% of respondents chose yellow as the key colour that represented the city image.

What is a prominent feature of local (Khon Kaen) culture that should be presented?			
		Frequency*	Valid per cent (%)
Valid	Traditional Isan textile	75	70.1%
	Friendship custom	7	6.5%
	Silk festival	7	6.5%
	Folk singer	14	13.1%
	Song kran festival	4	3.7%
	Total	107	100%

Table 21 Prominent points of local culture that local people would like to present to visitors

* (N = number of respondents)

What is the key symbol of Khon Kaen city, in your opinion?			
		Frequency*	Valid per cent (%)
Valid	-Cassia fistula	14	13.1%
	-Isan Mouth Organ ('Khaen')	75	70.1%
	-Silk	5	4.7%
	-Khon Kaen Log's	6	5.6%
	-Khon Kaen buddha's relics	5	4.7%
	-Dinosaur	1	0.9%
	-Khon Kaen city gate	1	0.9%
	Total	107	100%

Table 22 Key symbols of Khon Kaen city in the mind of participants

* (N = number of respondent)

Section E2 (local perspective regarding signage): this subsection indicates the key visual perceptions about symbols and signage systems. These images show the relationship between the background and interpretive aspects which reflect the traditional ways of life, customs, culture, and practices in people's minds. The key results are presented in this section; they are the key visuals which were applied to create the design concept of visual symbols and graphic contents in my map prototype (see discussions, Chapter 8). The design themes were generated and categorised based on the information needs of people in this community⁹⁹ (the key results of information needs were provided in the section

⁹⁹Some information needs to be related to commercial activity. I decided to not provide a business logo or symbol in the maps, i.e. the names and logos of shopping malls, private companies etc. Meanwhile, some information needs to be extended beyond the sub-

C1, p.200). Some parts of the key (visual) findings are provided in the next paragraph.

According to the key visual findings regarding city places, the phrase 'government agency' conjured up the following in the respondents' minds: (1) Garuda, (2) City Hall and (3) Thai Flag (see Table 23-a, p.206). The words 'fresh market', evoked the images of (1) woman vendor, (2) wicker basket, (3) fish, (4) vegetable. Other images included fruit (1.9%), meat (0.9%) and garlands (0.9%) (see Table 23-b, p.206). For the word 'park', key visuals consisted of (1) bench, (2) tree, and (3) lawn (see Table 23-c, p.207). The word 'hospital' produced images such as (1) the Red Cross, (2) physician, (3) nurse and (4) hypodermic syringe (see Table 23-d, p.207). The key visual of 'hotel' consisted of (1) bed, (2) pillow and (3) building (see Table 23-e, p.207).

(a) With the words 'government agency', what is the first image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	City Hall	10	9.3%
	Garuda	95	88.8%
	Thai Flag	2	1.9%
	Total	107	100%

(b) Regarding the words 'fresh market', what is the first image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	Woman seller	63	58.9%
	Basket	27	25.2%
	Fish	8	7.5%
	Vegetable	5	4.7%
	Others	4	3.7%
	Total	107	100%

categories. For example, regarding the issue of 'business' information in the transit map, I divided and extended this issue into four sub-categories. These were (1) state agency, (2) restaurant, (3) accommodation and (4) shopping.

(c) With the word 'park', what is the first image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	Tree	24	22.4%
	Bench	75	70.1%
	Lawn	4	3.7%
	People working out	4	3.7%
	Total	107	100%

(d) Regarding the word 'hospital', what is the first image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	Physician	16	15%
	Nurse	1	0.9%
	Red Cross	88	82.2%
	Hypodermic syringe	2	1.9%
	Total	107	100%

(e) With the word 'hotel', what is the first image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	Bed	71	66.4%
	Pillow	33	30.8%
	Building	3	2.8%
	Total	107	100%

Table 23 Key images with respect to the examples for each word or phrase

* (N = number of respondent)

In terms of persons and things, the key visuals produced by the phrase '*disabled people*' were (1) wheelchair, (2) amputee and (3) blind man (see Table 24-a, p.208). The key visual of the word '*elder*' consisted of (1) man with cane, (2) man with hunchback and (3) man with waistcloth (see Table 24-b, p.208). Regarding the key visual for the '*boy*' the following were cited: (1) a boy with topknot, (2) a little boy and (3) short pants (see Table 24-c, p.208). Meanwhile, the word '*girl*' evoked images such as (1) a girl with two topknots, (2) a girl with braided hair and (3) a skirt (see Table 24-d, p.208). In terms of the word '*Isan male*' the key visuals were (1) man with loincloth, (2) moustache and (3) man wearing a western suit (see Table 24-e, p.208); while the key visuals of the phrase '*Isan female*' consisted of (1) a woman wearing a sarong, (2) a skirt and (3) a woman with her hair up (see Table 24-f, p.209).

(a) With the words 'disabled people', what is the first image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	Wheelchair	81	75.7%
	Amputee	16	15%
	Blind man	10	9.3%
	Total	107	100%

(b) Regarding the word 'elder', what is the first image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	Man with cane	65	60.7%
	Man with a hunched back	27	25.2%
	Man with waistcloth	15	14.1%
	Total	107	100%

(c) The word 'boy', what is the first image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	Short pants	8	7.5%
	little boy	12	11.2%
	Boy with topknot	87	81.3%
	Total	107	100%

(d) Regarding the word 'girl', what is the image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	Skirt	18	16.8%
	Girl with braided hair	26	24.3%
	Girl with two topknots	63	58.9%
	Total	107	100%

(e) The word 'Isan male', what is the first image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	Man with Loincloth	96	89.7%
	Moustache	6	5.6%
	Man wearing suit	5	4.7%
	Total	107	100%

(f) The word 'Isan female', what is the first image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	Woman wearing sarong	96	89.7%
	Lady with her hair put up	2	1.9%
	Skirt	9	8.4%
	Total	107	100%

Table 24 An overview of key visuals with respect to particular words

* (N = number of respondent)

Regarding activity sets, the key visual of the word 'shopping' consisted of a (1) woman carrying paper bags, (2) trolley and (3) carry basket (see Table 25-a, p.209). The key visual of the word 'eating' contained (1) Ka-Tip Khao (bamboo wood bucket), (2) spoon and fork, and (3) plate (see Table 25-b, p.209).

(a) The word 'shopping', what is the first image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	Carry basket	5	4.7%
	Trolley	49	45.8%
	Woman with paper bag	53	49.5%
	Total	107	100%

(b) the word 'eating', what is the first image that comes to mind?

		Frequency*	Valid per cent (%)
Valid	Bamboo wood basket	80	74.8%
	Plate	10	9.3%
	Spoon and fork	17	15.9%
	Total	107	100%

Table 25 An overview of key visuals in respect to activity sets

* (N = number of respondent)

1.3.6 Section F: Transit Map Perceptions

This section investigated the map-reading skills of participants who lived and stayed in the city. The investigation revealed their basic experience of reading maps. Three types of transit maps were used: (1) diagram style, (2) combination style and (3) geographical

style (see Appendix G). The key findings were used to define a map style consistent with the cognitive skills of the people in the community. The key findings in this section were that 113 of 127 respondents selected the diagram style of map reading. The combination and geographical map styles ranked second and third respectively. (See Table 26). Four people did not participate because they were illiterate.

Transit map perception			
		Frequency*	Valid per cent (%)
Valid	Diagram style	113	89%
	Combination style	11	8.7%
	Geographical style	3	2.4%
	Total	127	100%
Missing		4	
Total		131	

Table 26 Results of transit map recognition from 127 participants

* (N = number of respondent)

In summary, the total number of respondents in this activity was 131 people, consisting of 63 males and 68 females. Of the 131 people, 105 were locals. More than 70% of respondents lived in the Khon Kaen municipality. Most respondents came from a group of undergraduate degree (41.2%) and senior high school students (21.4%). The average income of participants stayed between less than 5,000 Baht (37.8%) and 5,000-10,000 (37%) Baht.

In terms of urban transport contexts, 87 respondents (or 66.4%) regularly used the Song Thel system. More than 94% did not know how many service lines there were in the Song Thel system. In addition, over 70% of Song Thel passengers were not sure about the exact route of the Song Thel service they regularly used. The main reasons why they used this system were to save money and they did not have a private vehicle. Regarding needs, the first reason was study (40 from 87 respondents). The second, third, fourth and fifth reasons were business, working, shopping and commerce respectively; another was exercise. Regarding the new urban transport system 'BRT', the key findings indicated more than 90% of Song Thel passengers did not know what the BRT system was. Moreover, 95.4% had never used a BRT system before. Meanwhile, 86.2% had never used a graphical way-finding system for travelling on a public transport system. Further, 100% of respondents who regularly used local transport had never seen any information about graphical way finding for the UTS at any bus stop in the city areas.

In terms of service and information needs of the UTS, the survey of service quality of the Song Thel way-finding system stayed at a low level (94.2%). Meanwhile, more than 94.3% of respondent (from a total of 87 people) needed the graphic way-finding system for the Song Thel and BRT system. They (93.1%) wanted the Khon Kaen municipality to install this navigation system.

The survey of Isan background and local perspectives found that most of the respondents had resided in Khon Kaen province for more than 11 years: 31 years (44.3%), 21-30 years (29.2%) and 11-20 years (24.5%). They would like to see the character of the city being a (1) city of folk art and Isan culture (62.6%), and a (2) modern city and business centre of the Isan region (33.6%). The traditional Isan textile was the most favoured prominent aspect of the local (Khon Kaen) culture (70.1%) that they would like to present to non-locals. In addition, 'Khaen' was the strongest symbol selected by the respondents (70.1%) as the representative sign of Khon Kaen city.

Section Two

This part presents the key findings from the snowball technique which consisted of two collection approaches: (1) in-depth interview and (2) observation. Both investigating approaches were conducted after obtaining the significant key findings which came from the triangulation analysis results of parts A, B and C. The details of the key findings in both data collections are provided in the following paragraphs. *Note: this data collection was conducted after I had analysed the core key findings from in-depth interviews (part A), observations (part B) and surveys by questionnaire (part C), as detailed above.*

2.1 In-depth Interview (Isan Textile)

Regarding the in-depth interviews, the key findings indicated that the Isan textile is the most favoured prominent form of Khon Kaen local culture¹⁰⁰. I planned and started to collect more intensive data from specialists in the Isan textile field in order to learn about the background and pattern design concepts which informed my ideas about the Khon Kaen transit map prototype (see discussions in Chapter 8). The collection activity used semi-structured interviews with guidelines regarding my question theme and open-ended questions. The interviewees were an expert (academic) in Isan textiles (female)

¹⁰⁰This key finding was the result of the final analysis of triangulation results from the group of stakeholders in this community (the perspectives of (1) local administrators, (2) experts and (3) locals as above). The reports of key findings are in parts A, B and C.

and two local specialists (male and female). The in-depth interviews were conducted as group conversations. The key details are provided in the next paragraph.

Key findings: the material which the Isan textile uses to make the traditional cloth consists of (1) silk (ไหม) and (2) cotton (ฝ้าย). Both are plants which grow in this local (and Isan) area. However, the interviewees mentioned that the famous type of Isan textile which is more original and valuable is the ‘Khid’ (pattern) cloth (ผ้าลายขิด). This is because Khid makers have to create the original pattern and/or weave their traditional design into the cloth. The natural material with which the Khid makers prefer to weave is silk. This product is ‘Khid silk cloth’ or in Thai, Par-Khid-Mai (ผ้าขิดไหม). They prefer to make the Par-Khid-Mai because it has more product value than cotton. They said that Khon Kaen is a famous place in Thailand for the Isan textile industry.

Regarding the key design principles of the Khid pattern, the expert and specialists explained that a Khid pattern uses a basic grid system. A craftsperson will sketch the pattern from their imagination onto grid paper before weaving the Khid cloth. Each larger box of Khid patterns contains the arrangement of pixels or block images on the cloth (see Figure 93).

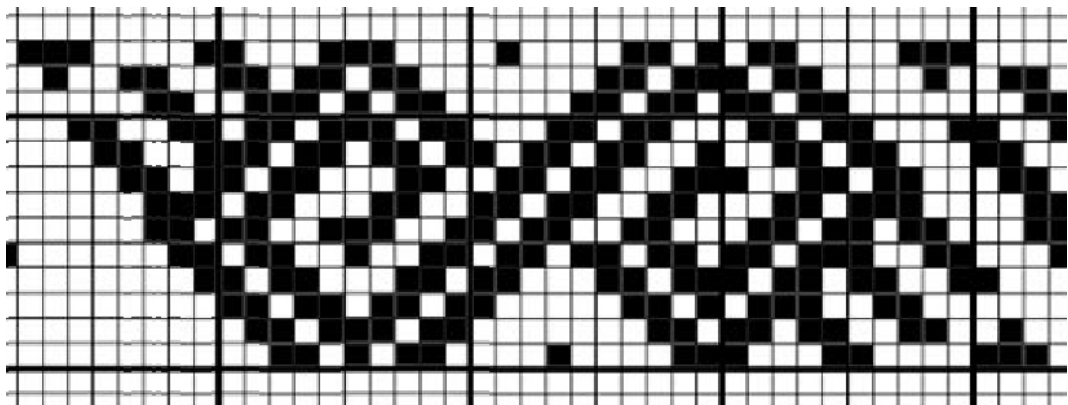


Figure 93 Example of a Khid pattern on the grid system

They illustrated that the designing of a Khid pattern is based on an odd number in each line. The traditional Khid pattern stays in a geometric shape. A Khid craftsperson weaves by repeating the same pattern in the vertical lines (called the stand line in Thai ‘เส้นยืน’). Meanwhile, the horizontal line (called the direct line in Thai ‘เส้นพุ่ง’) is a contrasting colour to the stand line. In Figure 94 (p.212), the left picture shows that the

yellow and blue silk lines are the stand lines. Meanwhile, the pink line is the direct line which is woven by using a wooden shuttle (see picture on the right).



Figure 94 The weaving principles of Isan textile processes

The interviewees noted that the key compositions of Khid cloth are two patterns. One is the major pattern (ลายหลัก) and the other is the sub-pattern (ลายประกอบ) which supports the major pattern (see Figure 95).



Figure 95 Example of a Khid pattern on the grid system

In terms of creating a Khid pattern, they explained that the pattern is an adaptation of the ideas from local appliances, animals (in Isan literature) and flora. Khid makers are able to create original patterns by themselves. However, most of them prefer to use their traditional design patterns which are based on local styles in the Isan region (see Figure 96, p.214).



Figure 96 Different Isan Khid patterns where a craftsperson has used divergent ideas to represent flowers

In addition, the expert mentioned that the form of Khid sub-pattern which makers prefer to apply on their cloths is the ‘Unit’ pattern (ลายหน่วย); sometimes called ‘Cobweb’ (ลายขี้ม) or ‘Base’ (ลายฐาน) pattern. The choice depends on which part of the Isan region they belong to. Figure 97 shows the Cobweb pattern. The craftsperson designed the Cobweb as the major and sub-patterns in the cloth.

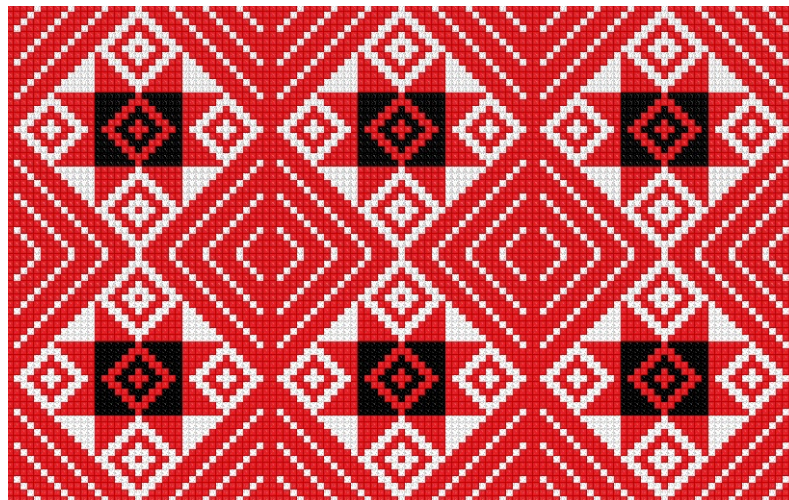


Figure 97 The Cobweb pattern represents a native flower from some parts of the Isan region

The Cobweb is one of the major patterns that Isan villagers like to make as a garland to show respect and to decorate temples (see Figure 98, p.215). This rite is an Isan custom called ‘Chadok religious ceremony’ in Thai ‘งานบุญพระเทวด’. Isan people will go to their local temple to hear a sermon by a monk; he talks about Lord Buddha’s world (where ‘world’ means the cycle of birth and death).



Figure 98 The Cobweb pattern is used to make decorations for a temple

The Cobweb pattern is a famous design that Isan textile makers like to weave into silk cloth. The female expert said that the most popular pattern which Isan textile makers prefer to use is the flower pattern. She gave an example of a Khon Kaen textile maker who prefers to apply the flower pattern representing the ‘Koon flower’. I learned how to weave the patterns and then I integrated them into the design concept for my transit map prototype (see details Chapter 8).

2.2 Participant Observation (Sin-Chai Mural Painting)

After analysing the data collection from stage one, I found another key finding was the legend of Sin Chai. This key finding came from some of the local administrators who are one part of this community and have more power in respect of the BRT project. Moreover, the Sin Chai legend concept was also supported by the local government as a key part of promoting and defining city development policies (see details, Chapter 8, p.249). I used this collection technique, along with a critical review of related documents, and suggestions from the experts; I was given the details in the above section pp.178-184, and Chapter 4 and 8. I found that Khon Kaen province has two major temples where their complete Sin Chai mural paintings were restored by the Fine Arts Department of Thailand. I started to go to the temples to take photos and to learn about the real contexts. The names of the temples are Wat Sanuan-Wari-Phatthanaram and Wat Chaisi. The details of the key findings are provided in the next paragraph.

Key finding: The Sin Chai mural paintings in both temples are more than 100 years old¹⁰¹. They were painted by local artists¹⁰². Their style is different from the South Isan group which was influenced by a royal artist. This is because provinces in South Isan were close to the central region of Thailand (Bangkok or Ratanakosin Era at that time). The North Isan group, and a province that sits alongside the Mekong River, obtained the influence of its mural painting style from the Lan Chang Empire (currently Laos) (Udon, 1997). Khon Kaen province is in the centre of the Isan region; therefore the artists' painting style was not greatly influenced by the royal artist and Lan Chang style.

Most walls of both temples talked about the 'Chadok' stories (see details, Chapter 3, p.87) which relate to Buddhism, a belief in hell and heaven, folk tales (Sin Chai), and the Dharma puzzle (see Figure 99). Sin Chai is depicted in Isan mural paintings. The original style of mural paintings in the two temples illustrates the sample forms using the technique of contour drawing (with free form).



Figure 99 The two top pictures present a belief in hell and heaven in Buddhism.

The bottom pictures illustrate the Sin Chai folk tale

The artists used colour inside the contours without painting a shadow, muscle, or human figures. Most of their characters expressed emotions. Most of their

¹⁰¹The signboard in front of both temples included this information.

¹⁰²The information was provided on the same signboards.

murals do not have the figures posing. However, it can be noted that the murals in the Sanuan-Wari-Phatthanaram temple use more realistic forms than those in the Chaisi temple (see Figure 100).



Figure 100 Drawing and painting styles in the Sanuan-Wari-Phatthanaram temple (left) and the Chaisi temple

My reflective findings: During the observation period, I learned about and saw the relationship between the stories of the Isan people and the local ways of life in the Khon Kaen community. The murals told me about traditional practices, e.g. dress (Isan sarong), folk wisdom, local amusements and beliefs. I could see how the Isan people and locals have a relationship with basketwork, local textiles, Khaen, and Isan folk songs (see Figure 101). These reflected the history of the knowledge base of this community; not just the legend of Sin Chai.



Figure 101 The traditional ways of life in this community including customs, dress and amusements

In summary, Khid cloth is the one technique which is famous in the Isan textile industry. The key composition of Isan textile design consists of a major pattern and sub-pattern. A (local) flower is the famous major pattern that Khid makers like to weave into silk cloth. The Cobweb is one of the patterns that Isan villagers like to make in garlands

to show respect and to decorate temples; this is where Khid makers prefer to use the Cobweb as a sub-pattern to support a major line on the Isan textile cloths.

Regarding observations of the Sin Chai mural paintings, Isan mural art in Khon Kaen was originally drawn by local artists rather than those from the northern and eastern Isan regions. The artworks in two temples utilised the contour technique with a free-form shape. Simple colours were painted inside the contours without shadow and muscle elements. The theme of mural art in both temples was the Chadok tale (Sin-Chai) and Buddhism stories. These traditional artefacts reflect Isan ways of life, thus expressing culture in this community, e.g. folk wisdom, dress, musical instruments, trust, and customs.

Summary

This chapter presents the key findings from my field work in order to investigate the knowledge base of stakeholders in Khon Kaen city. The key results are outlined as follows:

Key findings set 1: The stakeholders were in agreement regarding the definition of Khon Kaen city. They mentioned that Khon Kaen is the centre of the Isan region in respect to the economy, transportation, education, investment, culture and medical care.

Key findings set 2: More than 70% of people groups, 67% of the experts group, and 100% of the key informants group B (drivers and passengers) selected 'Khaen' as the symbol of Khon Kaen city. Meanwhile, 60% of the key informants group A (local administrators) chose the Sin Chai hero as the symbol of Khon Kaen city.

Key findings set 3: In terms of the most favoured prominent forms of local (Khon Kaen) culture that the stakeholders wanted to present to visitors, results indicated that 40% of the local administrators, 100% of community drivers/passengers, 67% of the experts, and 75% of people groups chose the traditional Isan textile. Meanwhile, another 60% of the local administrators supported Sin Chai as the most favoured prominent forms of Khon Kaen culture.

Key findings set 4: From my reflective findings (observations) the design artefacts in city areas such as buildings, Khid patterns on the road, design sculptures, road signs and some street furniture were related to Khaen, Isan

textiles, and the Koon (local) flower. These express the traditional ways of life in this community, which is consistent with the key suggestions from the experts regarding the Khon Kaen slogan¹⁰³. The evidence also corresponds with the murals on the walls of both temples, as presented above.

These key findings were integrated and defined as the key conceptual design framework. Khaen, Isan textiles, Sin-Chai, and other results were applied as the key experimental design ideas. These results transformed the information into graphical material to create the Khon Kaen transit map design prototype. The details of how to integrate these findings, in order to contribute to the original sets of graphic materials, are discussed and presented in Chapter 8 and Chapter 9. The next chapter indicates the key results from data collection stage two, where I applied the in-depth interviews and focus group technique to evaluate the transit map prototype.

¹⁰³In the Khon Kaen slogan, the key statement talks about Khaen and Isan textile (Par-Mai).

-Chapter 7-

Research Findings (Stage Two)

Introduction

This chapter overviews the key results from the second stage of my data collection obtained from in-depth interviews and focus groups. The results came from the evaluative design processes of my transit map prototype. The groups of participants involved with these processes were the stakeholders from a cross section in the community, as detailed in the data collection, stage one. The key findings in this second stage resulted from significant feedback from the participants. This assisted me to realise and improve the missing points in my design artefact. The feedback led to the revision phase of my design materials. The process also facilitated and enhanced communication with participants, and allowed me to create and recognise the usability requirements of the stakeholders, before I could design the final version of the transit map prototype.

This chapter is divided into three sections: *Section one* presents the key evaluative results from the local administrators and experts groups. *Section two* indicates the key evaluative findings from groups of people from a cross section of the Khon Kaen community. *Section three* summarises the significance of the key feedback from sections one and two.

Section One

This section presents the key results which came from the mixed methods of data collection, stage two. The research tool consisted of a paper questionnaire, using the in-depth interview technique. This tool was used to evaluate **my design prototype** (Khon Kaen transit map) with the two groups of stakeholders which included (1) local administrators and (2) experts, i.e. the same participant groups as in the first stage of data collection. The themes of evaluative questions covered 10 sections: (1)

demographics (this section was only used for groups of local people); (2) BRT logo; (3) graphic routes; (4) graphics for fare rates and timetable systems; (5) route symbol information; (6) key legends; (7) service information table; (8) index symbols; (9) overall design material; and finally, (10) suggestions. The details of the chosen options in the evaluative questionnaire contained: (1) the closed question in section 1; (2) the rating scales from sections 2 to 9 (4=excellent, 3=good, 2=average and 1=poor); and (3) open-ended questions for section 10. Each section from 2 to 9 contained three criteria for the usability test: (1) usability (comprehension and communication efficiency with the graphic materials); (2) functionality (visible efficiency); (3) desirability (the attractiveness of the design materials) (ISO9241-1, 1997; Jokela et al., 2003).

The results were analysed using descriptive statistics with the SPSS software. The frequency distributions of the key findings were described and represented in the form of numbers plus mean, maximum and minimum. *Note: (1) For the data collection, I created the real design prototype (A1 size), and separately printed seven design sections of my map prototype¹⁰⁴ (see Appendix I).* The details of the key findings in section one are presented in the following paragraphs.

1.1 Key Findings from Local Administrators (Key Informants ‘A’)

The participants were the same group of local administrators as in data collection, stage one. The key evaluative results¹⁰⁵ from this group were that the average of the sum design scores of the BRT logo (**section 2**) stayed at 3.86 points. Meanwhile, the sum design scores of graphic routes (**section 3**) were 3.88 points. The sum design scores of graphics for fare rates and timetable systems (**section 4**) were 3.77 points. The sum design scores of route symbol information (**section 5**) remained at 3.81 points. Regarding key legends (**section 6**), the sum design scores were 3.84 points.

The total design scores of service information tables (**section 7**) stayed at 3.8 points. The average design scores of index symbols (**section 8**) were 3.7 points. The sum design scores of overall design materials (**section 9**) in the map prototype stayed at 3.86 points. Finally, the average of the sum design scores from sections 2 to 9 stayed at 3.81

¹⁰⁴The separate printing of seven design sections included: (1) BRT logo in section 2; (2) graphic routes in section 3; (3) graphics for fare rates and timetable system in section 4; (4) route symbol information in section 5; (5) key legends in section 6; (6) service information table in section 7; and finally, (7) index symbols in section 8.

¹⁰⁵These evaluative results also included the three criteria of the usability test; (1) usability (comprehension and communication efficiency with the graphic materials); (2) functionality (visible efficiency); (3) desirability (the attractiveness of the design materials).

points (see Table 27). Note: the points in tables 1 and 2 came from the rating scales where 4=excellent, 3=good, 2=average and 1=poor.

Descriptions of sum design scores (map prototype)				
Sections	Numbers (N)	Min	Max	Mean
(Sec. 2) BRT logo	5	3.66	4	3.86
(Sec. 3) Graphic routes	5	3.8	4	3.88
(Sec. 4) Fare rates & timetables	5	3.66	3.88	3.77
(Sec. 5) Route symbol information	5	3.23	4	3.81
(Sec. 6) Key legends	5	3.77	3.91	3.84
(Sec. 7) Service information tables	5	3.66	4	3.8
(Sec. 8) Index symbol designs	5	3.33	3.92	3.7
(Sec. 9) Overall design materials	5	3.55	4	3.86
Sum design scores	5	3.61	3.89	3.81
Valid N (list-wise)	5			

Table 27 Key results of design evaluation by the local administrators group

In terms of key feedback, this group requested that the credibility of Khon Kaen University be noted by putting the university banner in the design prototype. They agreed with the Isan textile concepts, Khaen and the mural design that I experimented with and applied to the design prototype.

1.2 Key Findings from Isan Experts

The key findings in this group came from the same group of experts in: (1) urban transport engineering; (2) urban planning; and (3) Isan folk art/culture and design fields. The key evaluative results from this group indicated that the sum design scores of the BRT logo (**section 2**) and graphic routes (**section 3**) were 3.83 and 3.86 points respectively. Meanwhile, the sum design scores of graphics for fare rates/timetable systems (**section 4**) and route symbol information (**section 5**) stayed at 3.85 and 3.82 points respectively. The sum design scores of the key legend (**section 6**) and service information tables (**section 7**) stayed at 3.65 and 3.77 points respectively. Meanwhile, the sum design scores of the index symbol designs (**section 8**) and overall design materials (**section 9**) stayed at 3.60 and 3.85 points. Finally, the average of all the sum design scores, from sections 2 to 9, stayed at 3.71 points (see Table 28, p.223).

The description of sum design scores (map prototype)				
Sections	Numbers (N)	Min	Max	Mean
(Sec. 2) BRT logo	3	3.83	3.83	3.83
(Sec. 3) Graphic routes	3	3.7	4	3.86
(Sec. 4) Fare rates & timetables	3	3.77	4	3.85
(Sec. 5) Route symbol information	3	3.76	3.84	3.82
(Sec. 6) Key legends	3	3.15	3.91	3.65
(Sec. 7) Service information tables	3	3.66	3.83	3.77
(Sec. 8) Index symbol designs	3	3.07	3.88	3.6
(Sec. 9) Overall design materials	3	3.66	4	3.85
Sum design scores	3	3.38	3.88	3.71
Valid N (list-wise)	3			

Table 28 Key results of design evaluation by the experts group

The key feedback has been divided into three parts covering the different perspectives of each expert. These suggested topics are discussed in the following paragraphs. However, the detail and adapting processes are presented in chapter 9 (design process).

Urban planner: This expert suggested four adaptations. **Point 1:** change the Thai alphabet (๓) to numbers (๑) in the fare rates system. **Point 2:** provide a map legend to explain to readers the RRT red and yellow lines which will service out-of-city areas. **Point 3:** design signs to guide readers to identify the direction of the maps. **Point 4:** adapt the grid composition of the map legend sections which include (1) route information, (2) key legends and (3) index symbols going to the same grid line.

Isan artist/graphic designer: This expert suggested four points. **Point 1:** add graphical material which reflects a strong sense of Isan sentiment which would have greater impact on viewers. **Point 2:** extend the proportion scale of the graphic routes section up to 70% from 100% of the total design area. **Point 3:** swap the position of '(A)๓' to '๓(A)' in the grid system on the left-hand side of the map. **Point 4:** add a key icon about timing in both service timetables and index symbols in order to create more clear communication to viewers.

Transport engineer: The expert suggested swapping the position of route services between the BRT's green and pink lines to create simple visual perception.

After I had finished collecting the evaluative data from the local administrators and the experts group, I started conducting the focus group activity to evaluate my design prototype with people from the community. The details of the key findings are provided in section two.

Section Two

This section presents the key results which came from the mixed methods of data collection, stage two. The research tool consisted of a paper questionnaire using focus groups (discussion) with interview techniques (see details, Chapter 5, p.156). This tool had the same questionnaire protocol that was used to evaluate **my design prototype**, with the local administrators' and experts' groups. The total number of participants was 24; they were a cross section of the Khon Kaen community. Participants were of both genders, with low/high incomes (careers/education), and different classes (local/rural people/strangers). The results were analysed using descriptive statistics with SPSS software. The frequency distributions of key findings were described and represented in the form of a number, mean, maximum, minimum and percentage. *Note: the participants had provided their contact details at the first stage of data collection (from the survey process).* The details of the key findings in section two are presented below.

2.1 Findings from the People's Group

The total number of participants was 24: 13 males and 11 females. Two thirds of them were local people. In terms of age, 37.5% of participants were between 40 and 49 years, and 25% were between 15 and 19. More than 33% of the participants had a bachelor's degree. The majority, 58.4%, had an educational level between junior and senior high schools. High school and university student numbers stayed at 20.8% and 16.7%; the retired people and government staff stayed at 16.7% and 12.5% respectively. The workers and farmers were 12.5% and 8.3%. With regard to income, 37.5% of people had a salary less than 5,000 Baht per month while 16.7% earned between 30,001 and 40,000 Baht per month. Table 29, p.226 presents demographic details of participants.

Gender

		Frequency*	Valid Per cent (%)
Valid	Male	13	54.2%
	Female	11	45.8%
	Total	24	100%

Are You Local?

		Frequency*	Valid Per cent (%)
Valid	Local	13	75%
	Stranger	11	25%
	Total	24	100%

Age

		Frequency*	Valid Per cent (%)
Valid	15-19 years	6	25%
	20-29 years	4	16.7%
	30-39 years	1	4.2%
	40-49 years	9	37.5%
	50-60 years	4*	16.7%
	Total	24	100%

*one of these people was disabled

Education

		Frequency*	Valid Per cent (%)
Valid	Junior High School	7	29.2%
	Senior High School	7	29.2%
	Bachelor degree	8	33.3%
	Master degree	2	8.3%
	Total	24	100%

Occupation

		Frequency*	Valid Per cent (%)
Valid	Self-employed	1	4.2%
	Government staff	3	12.5%
	Private company officer	2	8.3%
	Student	5	20.8%
	Uni student	4	16.7%
	Famer	2	8.3%
	Worker/labourer	3	12.5%
	Retiled people	4	16.7%
	Total	24	100%

Income (Baht/month)			
		Frequency*	Valid Per cent (%)
Valid	Lower-5,000	9	37.5%
	5,001-10,000	5	20.8%
	10,001-15,000	3	12.5%
	15,001-20,000	1	4.2%
	20,001-30,000	1	4.2%
	30,001-40,000	4	16.7%
	40,001-50,000	1	4.2%
	Total	24	100

Table 29 Demographic details of participants who joined the focus group activity

* (N = number of respondents)

The key results were that the sum design scores of the BRT logo (**section 2**) and graphic routes (**section 3**) were 3.58 and 3.68 points respectively. Meanwhile, the sum design scores of graphics for fare rates/timetable systems (**section 4**) and route symbol information (**section 5**) stayed at 3.6 and 3.64 points respectively. The sum design scores of the key legend (**section 6**) and service information tables (**section 7**) stayed at 3.78 and 3.65 points. The sum design scores of the index symbols/designs (**section 8**) and overall design materials (**section 9**) stayed at 3.70 and 3.82 points. Finally, the average of the total of sum design scores from sections 2 to 9 stayed at 3.72 points (see Table 30).

The description of sum design scores (map prototype)				
Sections	Numbers (N)	Min	Max	Mean
(Sec. 2) BRT logo	24	2.66	4	3.58
(Sec. 3) Graphic routes	24	3.1	4	3.68
(Sec. 4) Fare rates & timetables	24	2.88	3.88	3.60
(Sec. 5) Route-symbol information	24	3.15	4	3.64
(Sec. 6) Key legends	24	3.28	3.96	3.78
(Sec. 7) Service information tables	24	3.16	4	3.65
(Sec. 8) Index symbols designs	24	2.85	3.96	3.7
(Sec. 9) Overall design materials	24	3.33	4	3.82
Sum design scores	24	3.22	3.91	3.72
Valid N (list-wise)	24			

Table 30 Key results of design evaluation from the focus group

After finishing the evaluative design process with every group (see details, Chapter 5, p.157), I started the group discussion (brainstorming) activity. Key findings were that most of the participants asked if they could add some key visual elements to some icons of the index symbols. These consisted of: (1) restaurant, (2) park and (3) university icons. Another one was the BRT logo. The elder group asked to adapt the typeface of 'BRT' on the logo because it was difficult for them to read. Most of the workers needed another word to replace the word 'concession'. These suggested adaptations related to the low scores in table 4 section 2 (2.66), 4 (2.88) and 8 (2.85). The details of changes are provided in chapter 9, p.278.

Summary

Key findings in this collecting stage (evaluative design) found that the total of the sum design scores from all groups of participants¹⁰⁶ stayed at 3.73 from 4 points, or 93.25% from 100% (see Table 31).

The description of sum design scores (map prototype)				
Sections	Numbers (N)	Min	Max	Mean
(Sec. 2) BRT logo	32	2.66	4	3.65
(Sec. 3) Graphic routes	32	3.1	4	3.73
(Sec. 4) Fare rates & timetables	32	2.88	4	3.65
(Sec. 5) Route-symbol information	32	3.15	4	3.68
(Sec. 6) Key legends	32	3.15	3.96	3.78
(Sec. 7) Service information tables	32	3.16	4	3.68
(Sec. 8) Index symbols designs	32	2.85	3.96	3.7
(Sec. 9) Overall design materials	32	3.33	4	3.83
Sum design scores	32	3.22	3.91	3.73
Valid N (list-wise)	32			

Table 31 Focus groups recognition of Isan in the design prototype

This number represented the level of usability test standard of the ISO9241-1 (see details, p.123). This standard consists of three criteria: (1) efficiency (usability), (2) effectiveness (functionality), and (3) satisfaction (desirability) (ISO9241-1, 1997; Jokela et al., 2003). The total of 93.25% from this test gained the public communication achievement of ISO7001; which the code defines as 'developing comprehension in

¹⁰⁶These include the local administrators (5 people), experts (3 people) and people (24 people).

public information design symbols'. The ISO suggested the level of public communication success should reach a figure of 67% comprehension of the control group using the symbol system (ISO7001, 2007a). Hence it can be stated that the sum design scores of this transit map have been achieved as suggested, before it can be used in the public space.

However, this evaluative design process is just one part of the HCD principle that I applied to produce a design solution that was revised by the target users. These key results were applied to create the revision of materials on my map in order to respond to the needs of end users as provided in the details above. These findings are the key human factors that were influential in the development of the urban transit map of Khon Kaen city. The next chapter provides details which relate to fulfilling the aims of my research questions. The discussion also includes interesting issues that reflect the previous trends of participatory design within the public spaces in this community.

-Chapter 8- Discussion of Results

Introduction

This chapter discusses the significant findings from the fieldwork described in chapters 6 and 7. There are four main sections in this chapter, which are discussed in the order in which they were encountered in the field work.

Section 1: Cultural Key Findings and Design Concepts

This section discusses influence on the (unseen) reasons why each key finding relates to the background of stakeholders and the Khon Kaen community. The material presents the significant evidence from the fieldwork that culture directly/indirectly influenced stakeholders' perspectives in their participation and responses. The local culture was the key theme that I investigated with the stakeholders in the Khon Kaen community. The key findings were developed into the main design concepts of the transit map prototype. Longman's dictionary (1995) defines 'culture' as "*the ideas, beliefs, and customs that are shared and accepted by people in a society*" (p. 330). Cowan (2001) argued that common cultural contexts in human society are influenced by the thinking processes of an individual's cognitive learning. In the preparation for fieldwork, I found that the graphic materials of most existing transit maps¹⁰⁷ were developed from and based on Western perspectives (see details in reviews, Chapter 2).

These perspectives, for example: philosophy, cultures, lifestyles, beliefs, languages, folk wisdom, and public transport experiences¹⁰⁸ (Thienmongkol & Waring, 2012), are very different from Khon Kaen (Isan) cultures. Figure 102 (p.230) reveals comparisons of eating styles between Isan and Western cultures, e.g. (top-left) woven basket in which

¹⁰⁷For example: the transit map of London underground (Tube map), the New York City subway, BART map of San Francisco, the public transport map in Zurich, MRT map of Singapore, Seoul transit map, Kuala Lumpur transit map and etc. (Allard, 2009).

¹⁰⁸The key result in the field work found that more than 90% of respondents who regularly used the Song Thel system did not know what the 'Bus Rapid Transit (BRT) system was. In addition, more than 95% of respondents did not have prior use experiences with this urban transit system. Meanwhile, 86.2% of the participants lacked experience in using the transit map system for travelling in any urban area (see details in chapter 6, p.200).

Isan people put sticky rice and have food (top-right); (bottom-left) western style table setting of; (bottom-right) the eating style of western people. Further, the standard of a dining symbols are represented in Western ways. In figure 103 (top), the male and female figures represent the symbol for facilities toilet, but these are not recognised as dress styles in the Isan culture, in the photo. On the bottom of figure 103 is a shopping trolley, the western shopping symbol, which again is not recognised in the context of shopping in Isan cultures.



Figure 102 Different ways of life from Isan and Western perspectives



Figure 103 Western symbols are different from those of traditional Isan cultures

These points were noted in developing graphic materials for the Khon Kaen transit map. I needed to understand the cultural background, learning experiences, and hear locals' voices before I developed sustainable design concepts.

1.1 The Relationship between Culture and Key Findings

The findings regarding the local cultures theme were collected in the first stage of data collection. The key findings consisted of: (1) Khaen, (2) Isan textile (Par-Mai) and (3) the legend of Sin-Chai.

1.1.1 Key Finding and Design Concept 1(Khaen)

The symbol of Khon Kaen city is a bamboo mouth organ (called 'Khaen'). More than 74% of the stakeholders selected Khaen as the strongest symbol of the city (see chapter 6, p.205). Khaen is a musical instrument of Isan country-folk music (Mor-Lum) which is made from bamboo that reflects Isan folk wisdom and their way of life. In folk wisdom, a Khaen is one of Isan's wisdom (handcraft) products. Bamboo is the most common material for almost every form of Isan handicraft. These handicrafts fully serve the lifestyle of the Isan people, e.g. eating, fishing, farming and uses such as containers (Pongsburus, 2008). With regard to the way of life, Khaen has distinctive features. This local music instrument has been with Isans and Laotians for over 3,000 years (Pongsburus, 2008). Mor-Lum is a kind of Isan rap song that usually attacks a rival Mor-Lum band. If it is a good line, Mor-Khaen (a Khaen player) will blow his Khaen louder to create a frenzied performance. This has been the most entertaining type of performance by and for Isan people for more than 140 years (Miller, 1985). The Khaen is an essential component of the Mor-Lum show that has been an integral part of the Isan way of life.

In Khon Kaen history, I found that the 100 years old mural art in the Sanuan-Wari-Phatthanaram temple has pictures that represent a relationship between Khaen, Mor-Lum and Khon Kaen (see chapter 6 in Figure 101, p.217). Khon Kaen is the one major city in the Isan region where the Thai government has set up a television station. Most television programmes present Mor-Lum shows. Hence, the city became the hub of Mor-Lum performances. In 1957, Khon Kaen was named as 'the city of Khaen players' (Library of Treasury Department, 2000). Khaen subsequently became the most popular music instrument in Khon Kaen province. In the field, I found Khaen had become a model of design, with a local logo, symbol, signage, and architecture designs in the city

(see chapter 6 in Figure 7). Moreover, Khaen has been identified in the province by the Khon Kaen slogan¹⁰⁹ as a valuable item.

The majority of stakeholders' (74%) recognised that Khaen is the strongest symbol of the city in their cognitive learning and their long-term memory. Although the participants came from different ages, educations, occupations and social classes, the direction of this cognition did not differ much among the participants. This psychological point was also mentioned by the experts in urban design and Isan folk art/culture and design (see details chapter 6, p.179 and 180). They supported the understanding that an individual develops from the environment of the community which surrounds him or her. For example, the Khon Kaen slogan has reminded people about Khaen since they were young. The embedding of Khaen concepts in design, building, symbols and logos in the city lodges Khaen in people's subconscious. Consequently, Khaen represents the folk wisdom which is the natural material of customs, and amusement in particular (Mor-Lum). This folk custom shows that Khaen resonates with the local way of life and the customs of Khon Kaen and the Isan people. Khaen surrounds the people in daily life. Khaen is also embedded in the spirit of community.

1.1.2 Key Finding and Design Concept 2 (Isan textiles)

The most favoured forms of the local Khon Kaen culture are the Isan textiles. Key results indicated 70% of all stakeholders chose Isan textiles, as the most prominent form of local culture that they wanted to present to visitors. Siri (2001) noted that for thousands of years the weaving of textiles has been the traditional practice of Isan women after the farming season (summer). They wove cloth for clothes and to run household businesses. The weaving method was passed down from one generation to the next. The techniques of Isan weaving are based on the knowledge base in each Isan location.

The developing pattern of Isan textiles occurs from basic beliefs and the natural world (Janmoon & Srivienya, 2006). A weaver will interweave the local way of life including natural plants and animals. Trust, culture, and emotions are also woven into patterns (Sumphaw, 2000). Therefore, it can be said that Isan weaving applies natural materials

¹⁰⁹In Thailand, all 77 provinces have formed their slogans from a local perspective: sightseeing points, valuable people, sacred objects/places, fruit, plants, and/or culture in order to promote their selling points.

(silk and cotton), folk wisdom, ways of life, handcrafts, beliefs, traditions and rites into cloth.

Jantajon (2004) and Pongsburus (2008) state that Khon Kaen is the hub of Isan silk cloth in Thailand. Much of this silk cloth has the highest market share and value in the country. Khon Kaen has become a well-known city¹¹⁰ in relation to the silk cloth industry. In my fieldwork, I found the Isan cloth and the Khon Kaen community have had a strong relationship for a long time. The mural art in Sanuan-Wari-Phatthanaram temple is evidence of this relationship (see chapter 6 in Figure 101). The pictures show the local women 100 years ago wearing traditional sarongs that were woven from silks and cottons. Nowadays, this traditional dress is still worn by older women (see chapter 6 in Figure 88). Isan textile concepts have been incorporated into decorations on buildings, road signs, street furniture and in parks (see chapter 6 in Figure 83 & 84). From this perspective, Isan textile is like the media which represents the story of Khon Kaen; societies, folk wisdoms, ways of life, cultures and communities.

1.1.3 Key Finding and Design Concept 3 (Sin-Chai)

This design concept was developed after working out the findings from the local administrators group (key informants A). Sixty per cent of this group chose the legend of ‘Sin-Chai’ as the most favoured prominent form of Khon Kaen local culture. The three heroes in this legend were selected as the symbols of the city. Since 2007 “*Nakhon Pang-Jan*” (Pang-Jan City) was the key aspect/identity that some of the local administrators believed should be the central city image (see in-depth interview in chapter 6, pp.171-178). This city has the same name as one in the ‘Chadok Tales’¹¹¹. The legend of Sin-Chai is one part of the Chadok Tales which is concerned with Pang-Jan city¹¹². The legend is a famous and valuable piece of literature in the Isan region. Two of the temples in Khon Kaen province have mural art related to the legend (Udom, 2004). This association made the Khon Kaen municipality use Sin-Chai as the key strategy in developing their urban policy (Tawanchai et al., 2006). For example, in terms of the urban development policy (2010-12), Sin-Chai acted as the mascot of identity concepts of the city around the municipality areas. The Sin-Chai heroes also featured on power poles installed in Khon Kaen downtown (see figure 85 in chapter 6) (Khon Kaen Municipal, 2010b).

¹¹⁰The Khon Kaen slogan also refers to silk cloth as the key local product.

¹¹¹‘Chadok’ tales tell the stories of Lord Buddha’s former births. Most of the Chadok tales in Thailand present just the last 10 worlds from 1,000 of Buddha’s world (‘world’ means the cycle of birth and death).

¹¹²In Thai, the Chadok tale explains that Sin-Chai is the King of Pang-Jan city (NKPCO, 2008).

In fact, Pang-Jan city and the Sin-Chai story are directly related to the historical geography, sites and monuments in the Nong-Khai province. Around 1200BC, Pang-Jan city was established by local people in the 'Ratanawape district' (Nong-Khai province); most people believed that Sin-Chai used to be the king of this ancient city (NKPCO, 2008). However, Khon Kaen province has no relationship with either story. These mural art works were painted by local artists around the Isan region in provinces such as Mahasarakham, Karasin and Roi-Et (Udom, 2004).

Given these inconsistencies of history, I believe that the legend of Sin-Chai has not been strong enough to be the key identity of the city's image. None of the stakeholders in the (local) people's group or key informants group B gave answers about Sin-Chai to any closed or open-ended questions (see details in chapter 6, pp.184-186). Sin-Chai was not integrated into the locals' minds as a key symbolic and cultural representation of the city. This difference between the local administrators and local people about the symbol and the favourite prominent forms of Khon Kaen city will be discussed in section 2 below.

The Khaen, and Isan textiles are the key cultural variables that come from a background in the local community. These variables reflect the consistency of local values which are hidden in the community spirit and people's minds. Khaen and Par-Mai represent the human factors that were kept alive in the stakeholders' subconscious; they learned these from slogans in the provinces (psychological factor). But the application of local materials to create local products (Khaen and Isan textiles) represented physical factors of the strong sense of folk wisdom in the social and culture community. Folk wisdom created common activities. These traditional practices of Khon Kaen and the Isan communities have continued. All these factors influenced and supported the recognition and interpretation process of stakeholders. The variables also created the original design materials which reflect the local culture, consistent with existing designs in the Khon Kaen community.

Section 2: Influence of Culture onmy Experimental Perspectives

This section discusses the application of ideas to transform the key design concepts into graphic material in my transit map. It focusses on demonstrating the key experimental aspects, in which I merged the design concepts and the city transport information. The details of the design processes are provided in chapter 9.

2.1 Experimental Idea 1

The distinctive feature of Khaen was applied as the design concept of the Khon Kaen transit map (BRT) logo. The numbers of five BRT routes were used to present the key message; the use of colours reflects the arrangement of route construction, beginning with the red route and ending with the yellow route. I abridged the detail of Khaen, using line elements to create the unique form of logo, based on contemporary (traditional and modern) concepts¹¹³. In respect to connotations, the significant meanings which combine the key messages of the BRT system and signage of Khon Kaen city, are embedded in the logo (see Figure 104). The developing details of the BRT logo are provided in chapter 9 design process on page 263.



Figure 104 The comparison between the original Khaen feature and the final logo on the Khon Kaen BRT map

2.2 Experimental Idea 2

Although the pattern of Isan textiles consists of several weaving method techniques e.g. 'Jok', 'Khid', 'Yok', 'Puen' and 'Mud-Mee' (Siri, 2001), Khid is the most common pattern woven in the Isan region (Hattanut, 2010). The experts in Isan textiles (see detail, p.180) and Hattanut (2010) stated that the Khid pattern is one of Isan's textiles which most often expresses the distinctive Isan character. Pongsburus (2008) mentioned that the Khid pattern uses a more complex method than other Isan weaving techniques. Therefore, Khid cloth is made and worn only for special occasions, such as an auspicious ceremony or religious event (Hattanut, 2010; Pongsburus, 2008) (see details in chapter 6, p.215). Hence, it can be said that the Khid pattern is the auspicious form that reflects the wisdom of the Isan region.

¹¹³This concept incorporated the needs of all stakeholders to see the image of Khon Kaen city as a modern and cultural city (see details in chapter 6, p.219).

In the field work, the Khid pattern was used as the key design concept for decorating the city environment (see chapter 6 in Figure 83 & 84). The evidence (from review and observation) reveals that Khon Kaen people realise the value of local textiles (Khid), and prefer to celebrate this wisdom in public spaces. This consistent evidence supported me to apply the Isan textile (Khid) concept as the key theme to develop my graphic route design concept. I hypothesised that this graphical (Khid) theme would support the existing designs in the city environment, and maintain the city identity, in order to create a sustainable design image for the public spaces in the Khon Kaen community.

In the practical design, I used the Khid concept to transform the transit information of the Song Thel and BRT systems. I started studying the special character of each service line of the Song Thel (mode-1). The unique point which showed a different character for each Song Thel number is the doors. The ‘Cobweb’ pattern was applied to represent the Khid design idea (see the reasons in chapter 6, p.213). Figure 105 demonstrates the four processes of my experimental design ideas. Meanwhile, figure 106 (p.237) presents the outcome of this experimental process.

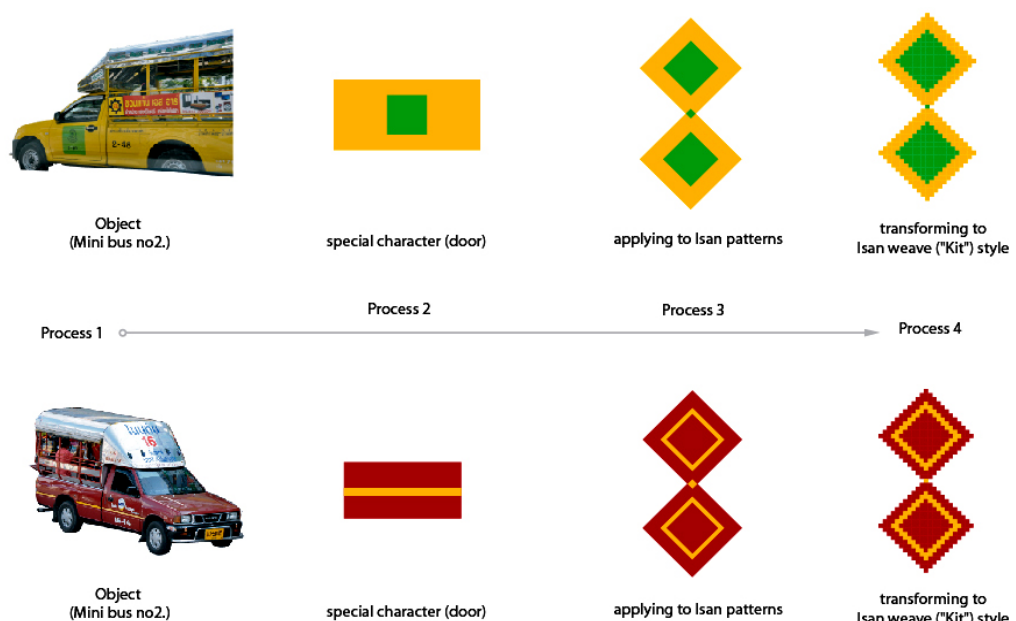


Figure 105 The developmental ideas from real objects utilised in the special characters of the Khid pattern

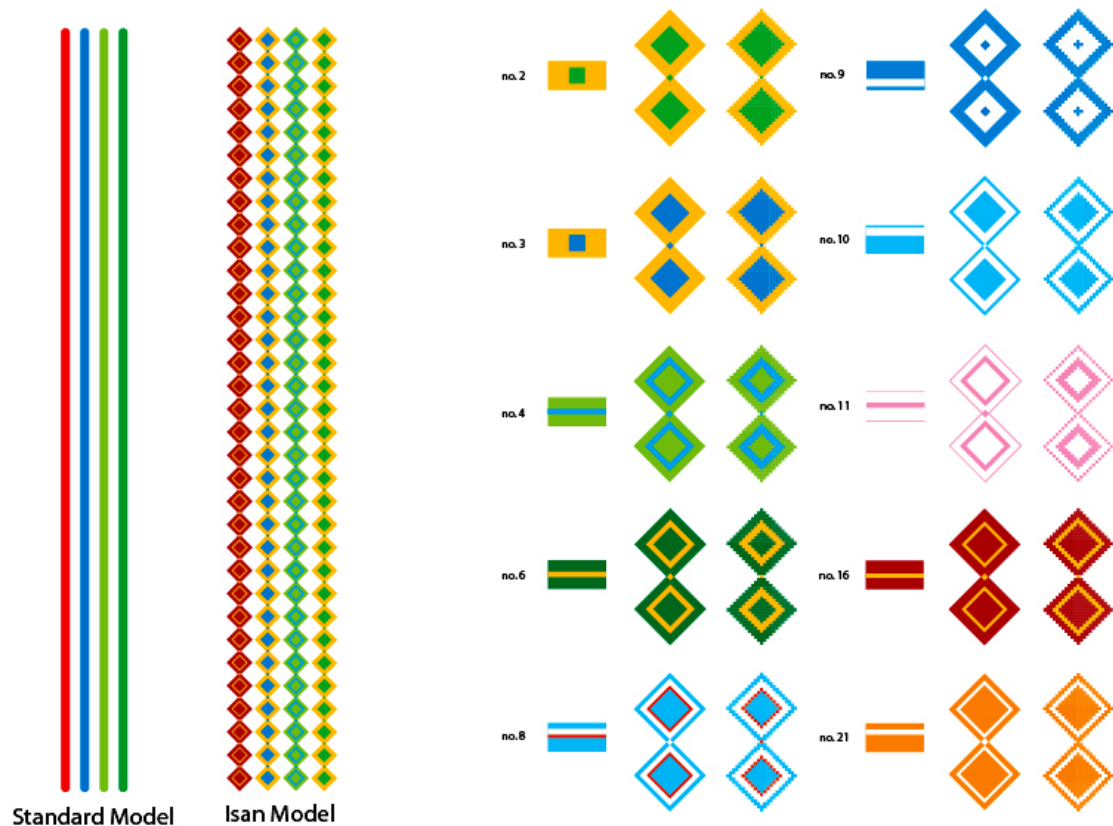


Figure 106 The outcome of the design process for each Song Thel route

In terms of the special character of the BRT system, I used the ‘Golden Shower’¹¹⁴ as the graphic symbol¹¹⁵ because this flower was selected by the local people¹¹⁶ as the second symbol (see detail in chapter 6, p.205). Meanwhile, the key composition of ‘major and sub lines’ concepts in the Khid pattern was employed to demonstrate the ‘priority’ (major and sub) of both transit systems visually. This approach could improve the taxonomy of the complex routes in this map (Thienmongkol & Waring, 2012). Figure 107 (p.238) shows the application of the ‘major’ and ‘sub’ lines concept to create the original graphic style for the map. The BRT had the major pattern because it will be the major transit system of the city. The Song Thel system was represented by the sub-patterns, as this mode will support the BRT system.

¹¹⁴In Thai this local flower is called ‘Koon flower’ (คูน). It is one of the key findings regarding the symbols of Khon Kaen city. In my fieldwork, I saw the Koon flower was transformed into the Khid pattern form. It was also used to decorate city environments such as the gates to the Khon Kaen stadium and crosswalk graphics in the city (see figure 6, chapter 83).

¹¹⁵This is because most of the Khid pattern has a flower as the major pattern (see example in chapter 6, p.214).

¹¹⁶I did not select this flower to be the symbol of the city for two reasons. First, it is the local flower of other provinces such as Nakhonsithammarat. Second, fewer local people selected this flower as the symbol for this city (see result in chapter 6, table 22).

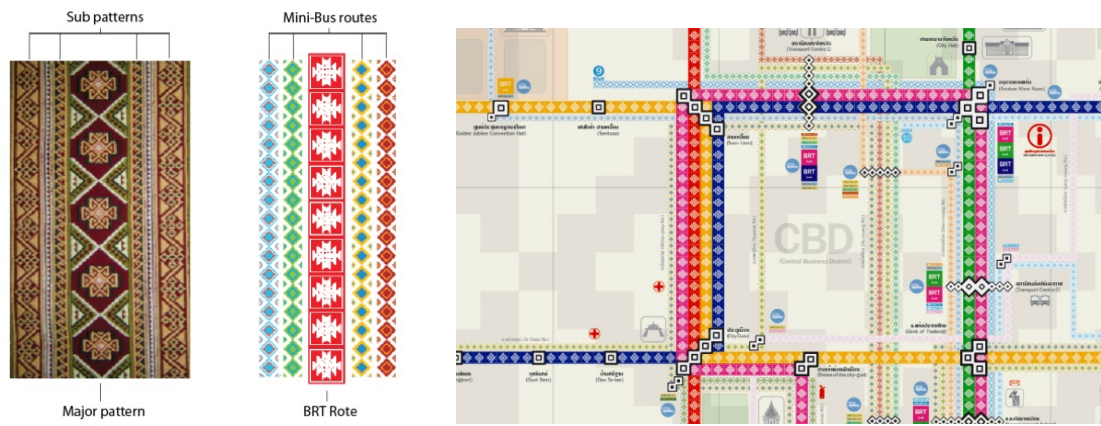


Figure 107 Experimental design concepts from local textile patterns

The Khid concept was also applied to develop the design concept of ‘interchange point’ symbols. One of the Khid patterns, called ‘Line-Kor’ (ลายตะขอ), was applied to represent this set of symbols. ‘Line-Kor’ is one of the Khid patterns which represent the shape of a hook. It is a tool that Isan people use with cooking appliances in their kitchens. By understanding the meaning of connectors (in this case a hook), I applied Line-Kor to represent the symbol for the interchange points between the BRT and Song Thel systems. The symbols allowed quick recognition by users, based on the sense and meaning of the hook or Line-Kor figure (see Figure 108).



Figure 108 Ideas transformed from hooks and Line-Kor in Isan cloth toward the symbol set of interchange points on the transit map prototype

2.2.1 Conceptual Similarities between Khid and Diagram Map Styles

The application of the Isan textile concepts could make the Khon Kaen public transport map look modern, with a strong cultural identity¹¹⁷. This is because the core concept of the Khid design uses a pixel base to create a pattern (see details, Chapter 6, p.213). This concept has a logical link with the basic design of diagram maps applying the geometric and degree forms to develop a transit map structure that looks modern (Forty, 1995; Garland, 1994). This contingent similarity between the Khid pattern and the geometric form made my map prototype clearly recognisable to the stakeholders¹¹⁸ based on the usability test in respect to efficiency (legibility/visibility), effectiveness (communication/comprehension) and satisfaction (cultural value/desirability/attraction) (Jokela et al., 2003).

This result came from the experimental integration of two core factors. The first factor was cultural backgrounds¹¹⁹ which were included in Isan ways of life¹²⁰. The second was a psychological perception where I applied diagram concepts¹²¹ to enable a logical and easy read by my audiences. This integration allowed the development of the sets of graphics on the map and accessed individual/community backgrounds (mental map), while also creating a simple understanding for each of my research participants¹²²; despite the fact that most of them (my participants) had no experience¹²³ of using a public transport map (see results of evaluative scores, Chapter 7 in table 31).

Although Lynch's map elements (1960)¹²⁴ were combined as essential parts of my map prototype, the key different point of my study is the application of cultural perceptions

¹¹⁷This design feature also supports the stakeholders' needs in respect to the city image. This is because the stakeholders in the Khon Kaen community wanted to see that their city image had a cultural and modern character in the future (see details in chapter 6, p.219).

¹¹⁸The sum design scores from the evaluative map design prototype stayed at 3.73 from 4 points, or 93.25% from 100%. The testing score gained a public communication achievement of ISO7001 which the code defines as 'developing comprehension in public information design symbols' (at least 67%) (ISO7001, 2007a).

¹¹⁹Lynch (1960) claimed that the consideration of individuals' and audiences' sensation and memory of past experience before developing a visual way-finding image is the strategic link between the exterior of the city environment and individual minds. The images have wide practical and emotional importance to the individual interpretation that guides and enables users to move quickly and easily from A to B. In term of cognitive learning, the use of visual images/symbols, which relate to cultural background, can support long-term memory (subconscious) in the process of individual interpretation (Cowan, 2001; F.D. Saussure, 1983).

¹²⁰For example: customs (Khaen and Mor-Lum), folk wisdom (Isan textile), behaviour (Isan dress/food) and environment (city geography/natural world/transport systems).

¹²¹Wolff (2007) claimed that a diagram map feature attracted the reader's attention He focussed on the overview of transit track services, rather than reading a complex shape of geographic lines. Garland (1994) concluded that a diagram form could support people's mental idea of maps, and helped them decipher complex details in the real geography of transport and urban systems. The study of Roberts (2005) supported the idea that logical forms of diagram maps can guide a map reader to access graphical materials sequentially.

¹²²In the survey (section F), a diagram style was selected by 89% of participants or 113 from 127. These respondents were from multiple age groups (15 ≤ 60), both genders and various education levels.

¹²³In the survey I found that more than 86% of participants had never previously used public transport maps. More than 88% would ask a Song Thel driver when they were confused about the route.

¹²⁴Lynch (1960) identified five types of map elements: (1) paths, (2) edges, (3) districts, (4) nodes and (5) landmarks (See reviews, Chapter 2, p.50).

to develop the map identity and these elements¹²⁵. I considered that Lynch's study (1960) focussed on the application of his map elements to develop the schematic of city maps based on the living experiences of the inhabitants in order to create a real image of the city¹²⁶ close to the mental picture in the inhabitants' minds. I analysed that his study did not focus on creating a city identity but he tried to create a pictorial map of cities. On the other hand, my study tried to find cultural and community experiences in order to combine these experiences with the graphical map elements. This combination could then create an original set of graphical materials which better connected with the social background of stakeholders I served. The original designs also represent the identity of the city image which was developed based on the knowledge base of stakeholders in the community.

My graphical materials had the original features from graphic representations of other public transport maps (routes, interchanges etc.) but with new designs. Appendices A and B are a summary of graphical types which other public transport maps have utilised to present their transit information¹²⁷.

2.3 Experimental Idea 3

The legend of Sin-Chai was applied as the key character design in the fare rate section. The characters are used to represent the four types of passengers: children, adults, elders and disabled people (see Figure 109, p.241). This experimental design integrated the ideas between (1) the mural art concept and (2) key visual perceptions¹²⁸. With respect to the practical design, I studied the characters of the Khon Kaen murals (style) using photos. Then I drafted interesting poses by using cut-off collage techniques, and mixing the components. These were combined with the key visuals, e.g. two topknots with the girl figure, or the cane with the elder figure. This combination created new human figures based on (1) the concept of Khon Kaen's mural style, (2) the local cognitive learning styles of visualisation and the signage system (see key visual results and design processes in chapter 6, p.204-210; and chapter 8 in figure 113, p.245).

¹²⁵For example: (1) the Isan textile (Khid) concept with routes (paths/edges, see Figure 105 & 106, pp. 236-237), (2) the Kor pattern with interchange points (nodes, see Figure 108, p.238), (3) Sin-Chai mural art with symbols of passenger types (signage, see Figure 109, p.241) and (4) Isan ways of life with a set of index symbols (signage, see Figure 113, p.245).

¹²⁶For example: street view, land use, landmarks, local geography and urban forms.

¹²⁷Allard's (2009) PhD analysed the principles of map making in the context of public transport. He studied, compared and summarised suitable types of graphics used to represent complex transit information from more than 80 transit map systems around the world. In the end, he found that it was difficult to standardise graphics in printed maps. This is because each city has a different structure in the fields of geography, transit networks and cultural backgrounds (Cain, 2007). Allard suggested that the development of public transport maps must incorporate cultural background by considering social, behavioural and cognitive factors. This is the key variable to consider when developing the graphic elements and the principle of design operation on transit maps.

¹²⁸These visual perceptions were investigated from the perspectives and background of the local people, using the signage system (see details of key visuals in chapter 6, pp.204-210).

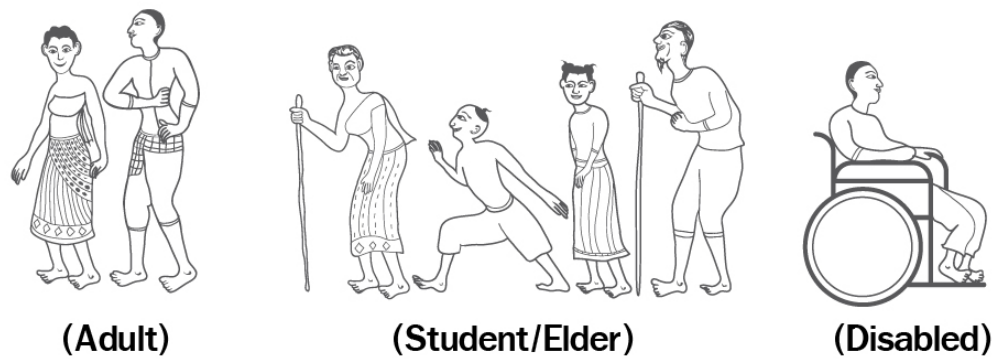


Figure 109 Three types of passengers: The design concepts were adapted from the Sin-Chai mural art style

2.3.1 Local and International Perceptions

The icons in Figure 109 symbolise the types of passengers using my prototype map. This set of pictographs indicates the cultural backgrounds of the respondents. The key findings in the survey (section E2, Chapter 6, p.205) indicated and reflected the local people's social, behavioral and cognitive perceptions. The experts in Isan folk art/culture and design stated that, in the Isan region, the concept of '12 mouths and 14 ethical behaviors' is the basis of Isan with respect to beliefs, rules, practices and ways of life (Duk et al., 1993). Most rural Isan people live and practice this concept which produces strong characters who follow traditional Isan practices. These cultures are embedded in people's minds; even when they are city dwellers, young or old (see the demographics of respondents, Chapter 6, p.195). The children with topknots, the man wearing the Isan loincloth or the woman wearing an Isan sarong are the key visual elements which reflect the strongest of cultural perceptions by the inhabitants¹²⁹.



Figure 110 Common symbols which are used to represent elders and disabled people

¹²⁹The topknot hair style is a religious practice of Thai/Isan people. When a boy or girl becomes a teenager they need to shave to receive good luck (Duk et al., 1993). Isan weaving is the activity and custom of Isan people after the framing season (summer) (Janmoon & Srivienya, 2006). They weave sarongs and loincloths to wear and to sell. Furthermore, the Isan textile is made for rites. It is called the 'Chadok Religious Ceremony' in Thai 'งานบุญพระเวศ' which is one part of the '12 mouths and 14 ethical behaviors' concept (see details, Chapter 3, p.86). These beliefs are embedded in the Isan people and their ways of life.

However, some parts of the key findings in section E2 (the questionnaire) reflect the sharing of perceptions between local and international perceptions. The key visuals of elders with the cane, a hunched person and the man in a wheelchair are common symbols which represent a group of older and disabled people (see Figure 110, p.241). Although there are many forms of disability¹³⁰, most people recognise that a wheelchair symbol represents the disabled. These indicate that there are similarities between the interior and exterior world in the symbolic system of intercultural communication.

Unity symbols are based on amenities such as hospitals, airports and post offices. Some symbols have a shape that relates to their actual object e.g. the airport symbol with an aeroplane or post office with a letter. The Red Cross symbol is an arbitrary icon, which does not resemble the action or object of emergency first aid, safety and hospitals, but people learn and understand this representative icon (Bliss, 1965; Modley, 1976). However, cross-cultural communication was indicated by my respondents in some answers in section E2 (p.205). For example: when asked to identify what they thought were visual representative symbols the participants' voted as follows: a girl with braided hair (24.3%), a man wearing a suit (4.7%) and a trolley (45.8%), representing the visual symbols of 'girl', 'Isan male' and 'shopping'. Some of the visual feedback from the evaluative design focus group with the local people¹³¹ included a request to add the university graduates' trencher to the 'institute symbol', even though this headgear has never been part of the original style of Thai and Khon Kaen graduates' dress (see Figure 111).



Figure 111 Institute symbols At left is the first design.
The design on the right is the adapted design.

This transition presents the cross-cultural adaptation of inhabitants coming from the dynamic socialisation process in which individuals interact with a new environment (Kim, 2001). The new environment does not only include new language, policies, geography, weather and socio-cultural adaptations, but also communication technologies

¹³⁰For example: the blind, deaf and mute; amputee, or intellectually disabled person

¹³¹They included local people at 75% and non-local people at 25% (see detail, Chapter 7, p.224).

which are key factors that influence the creation of new knowledge in inter-cultural communication (Engels-Schwarzpaul & Fitchett, 2010; Kim, 2005); e.g. the internet, social media, Facebook, Skype, Twitter or Google. Global flows of information and inter-cultural interaction have thus been formed (Engels-Schwarzpaul & Fitchett, 2010).

In the era of globalisation, we cannot stop this transition process. The expert in Isan folk art/culture and design stated that *'no culture can stand alone'*; a good design will be concerned with appropriate concepts which make any product meet the aims of communication, usability and satisfaction. In the future, however, technologies will influence the organisation and shaping of communities, e.g. the environment, economy, education, policy, communication, transport and other aspects of life. Sets of symbols or visual language automatically follow the formation of technology and new perspectives into next generation. When this happens, the spirit of local culture may be absorbed by another, more dominant culture so that it is difficult to distinguish one from the other.

Section 3: Symbols and Cognitive Learning

This section focuses on two major issues. The first discusses a visual language of people in the Khon Kaen community perceptions which reflects the original design outputs. The second issue is the different cognitive of Isan and Western peoples. The considerations of both these design issues were important in the processes to gauge evaluative outcomes of my map symbols.

3.1 Visual Languages

With respect to visual language, the interesting visual results regarding Isan local perspectives were in section E2 of my questionnaire (see p.205). These results reflected the sensory experiences of the local participants in the phrase¹³² groups, (i.e. those concerning city places, people, objects, and activities) when selecting a key visual choice (see details in my questionnaire, Appendix G in section E2). These key visuals answers were transformed into a set of symbols in my map prototype in conjunction with the key visual feedback from the participants. Figure 112 (p.244) illustrates the integration of ideas between the key visuals from the respondents and their social backgrounds, before the data was transformed into symbols.

¹³²These phrases were selected when designing the key symbols and were based on the most common reasons of transit use by the respondents (see details, chapter 6, p. 204-211).

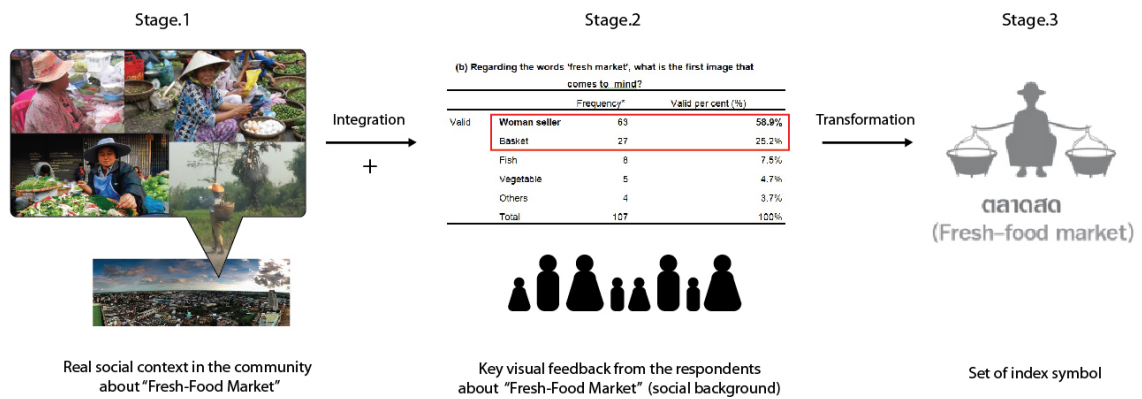


Figure 112 Sample design process applied to develop the set of index symbols

This design process contributed to the original form of symbols that came from the real situation within the context of 'fresh-food markets' in the community. Its contexts¹³³ were embedded in the individuals' life experience (stage 1). A local fresh-food market experience was rechecked using the survey method in order to investigate the key visuals which related to the long-term memory of the individuals concerned (stage 2). Different answers¹³⁴ (key visuals) were combined¹³⁵ for the single form of the 'fresh-food market' symbol (stage 3). From this design process, the denotation for the 'fresh-food market' symbol was generated, based on as holistic view of each individual's perspective (picture). This design model was also applied to create the other icons within the index symbols section (see figure 113, p.245).

¹³³ E.g. dress (sarong and hat), equipment (basket), place (market and space) and people (female vendor)

¹³⁴ These different answers (images) uncovered the related (connotative) imagery about the words 'fresh-food market' from each individual's experience; e.g. hat, woman and basket. However, when these images were combined as a single symbol, it was seen that this combination design enhanced the individuals' interpretation to a high level.

¹³⁵ The key criterion for selecting a key (answer) to a combined visual was based on the ranking of frequent answers which came from the local participants chosen.

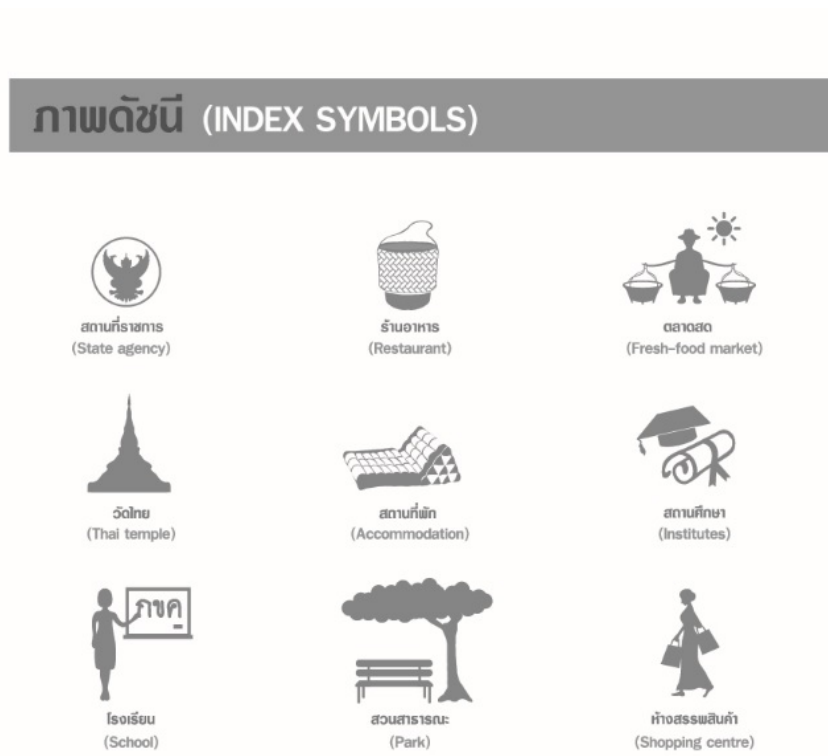


Figure 113 Set of index symbols in the final map prototype
(Re-designed version after receiving feedback from the usability test)

The efficiency of this design process can be assured by the audit results, based on the usability test concepts, in which 92.5% of the sample group recognised the usability of the index symbol section, with regard to communication, visibility and attractiveness (see details in chapter 6). The result indicates that social contexts in different cultures can create a diverse set of visual language systems. Indications are that the system of design patterns of public symbols may not necessarily follow international system standards, but can be created by communication with targeted audiences in a specific setting. Dewar (2004) moved that even when a broadly used uniform traffic sign system exists in Europe, each country has a few unique symbols. The European symbols are certainly not used world-wide. Dreyfuss (1972) and Modley (1976) remarked four decades ago that the world was filled with a variety of symbol designs and this great variety of symbols were used for specific messages. The variability of symbol design is not only found in different continents, but also within the same countries and cities across different applications (Dewar, 2004). Allard (2009) illustrated his view that traditional public transport maps cannot always convey obvious meanings with large audiences because ‘strangers still have to learn a whole set of graphic keys every time they get to a new city’ (p.138).

With respect to individual interpretation, Hsueh and Peng (2010) commented that although our mental abilities can handle multiple thoughts, individuals prefer to compare things based on their personal experiences in order to discover the value of those things. Meanwhile, Banks (2001) supported the notion that all visual forms are embedded in society, and these forms automatically influence a person's mind when analysing a form in order to find the answer. Therefore, it can be said that the understandings of cognitive mechanisms in which people make inferences from symbols require study. This is because symbol design is not only a glossary of pictures, but knowledge of visual grammars in a symbol is useful when conveying pictures in order to make it simple for people to use them (Kolers, 1969). However, I found that some international symbol systems cannot be avoided because these systems are part of the locals' subconscious thinking processes; e.g. airports, hospitals, post offices, and train station symbols.

3.2 Cognitive Levels

The cognitive level of the participants needed to be considered. From the results of the evaluative design process, I uncovered the key significant aspects of local people when interpreting symbolic systems: they needed to be extended in more detail. For example, design section 8 (index symbol) showed that the minimum score of the usability test remained at 2.85 from 4 points (see table 31 in chapter 7). This was the lowest of all the evaluative design scores in any design section. The participants asked me to improve some of the problematic symbols. They wanted me to add a new key visual in order to make the meaning clearer¹³⁶.

A new key visual occurred during the focus group activity. Figure 13 illustrates the comparisons between the original and revised designs. It can be seen that details were added following the participants' comments. The revision process ensured the form of the symbols remained close to the actual object each symbol represented.

¹³⁶See more detail about the re-design process in chapter 9, p.278

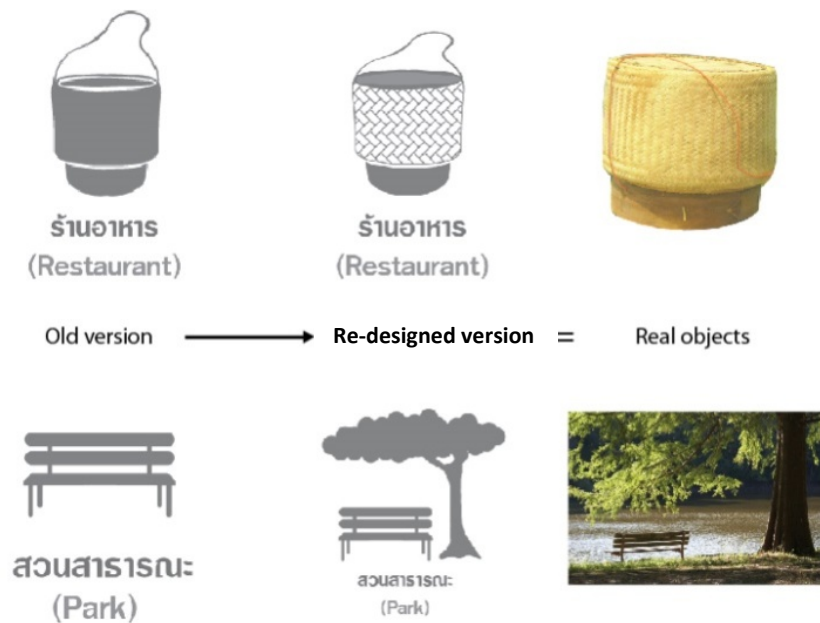


Figure 114 The revision process

With this revision, it can be noticed that the cognitive level of participants was close to the semantics stage. Clarke (1987) and Daniel (2007) stated that semantics is one of the three semiotic levels which is placed at the first stage of human cognition. Semantics is the relationship between signs and things; it refers to denotation (see more reviews in chapter 2, p.59). Simply, the level of semantics was 'image-related'. Many scholars define this level of semantics to be a highly pictorial representation of the object or action considered; it is also direct comprehension of the symbol itself (Beardon, 1992; Modley, 1976; Y. Rogers, 1989) (see more reviews in chapter 2, p.62). I found that the real contexts of texture, form, environment and symbol learning background were the key psychological variables which the participants used to decode the symbols. Background symbol design in Thailand, especially, provides a lot more detail in a symbol or logo, I thought this significant point was one of the factors which made Thai and Isan people familiar with this symbol style (see Figure 115, p.248).



Figure 115 Existing symbols in Thai and Isan contexts

from left, (1) Provincial Waterworks Authority, (2) Khon Kaen university, (3) Bank of Thailand, (4) Khon Kaen city municipality and (5) Kanlayanawat-Khon Kaen School

By comparison, my set of index symbols indicates a different view of the Western and Isan perspectives in respect to visual perception. Figure 116 compares the different views of visual symbols, with respect to dining, accommodation and shopping, in their cognitive images.



Figure 116 The set of Public Information Symbols of ISO7001
(top line) and the final symbol designs (bottom line)

These cognitive images of symbols were shown from different views of local life: i.e. geographical, environmental, cultural, and belief factors. For example, the symbol for dining in the Public Information System of ISO7001 has the knife and fork representing eating in a restaurant. The Isan dining style uses a bamboo container in which sticky rice is kept. Rice is the main food and the bamboo container is the equipment for Isan

people (Pongsburus, 2008). With respect to accommodation, the ISO7001 symbol uses a bed to represent resting places, i.e. a motel or hotel. Meanwhile, a traditional Isan resting place is symbolised by the Isan mat and pillow. However, a change of virtual images in the symbol system will vary over time (Dewar, 2004). This is because the changes in new technological and social trends will influence the development of products, fashion, communication, transport and so on. The old trend may become a distinctive visual because it is out of date or is not recognised in people's minds. Nevertheless, although most of my key visuals are associated with traditional views, these indicate the power of Isan cultural property in the local minds. Finally this natural learning helped me develop suitable map symbols that related to the cognitive level of my target audiences. This discovery may be useful for any stakeholder who wants to study and develop public design in this community.

Section 4: Differences of Opinion in the Khon Kaen Community

This section discusses a conflict of opinion between the local administrators and local people, with respect to the symbols and local culture of the Khon Kaen community. It was an unexpected issue that I found arising from the key findings in stage one. At the end of this section, I propose a collaborative model that I applied to resolve this conflict, in order to develop a suitable way of creating the participatory design for all stakeholders in this community.

4.1 Perspectives of Local Administrators

In practice, Khon Kaen has many symbols which represent the characteristic of the city: (1) dinosaurs, (2) Khaen, (3) the Koon flower, (4) Khon Kaen timber (log), (5) the Kham Kaen pagoda, and Par-Mai (Isan textile) (Library of Treasury Department, 2000). These items are contained in the province's slogan, rotated to represent the symbol, logo and mascot of the Khon Kaen community. Between 1940 and 2012, Khon Kaen's city character changed, based on the perspectives of local administrators in each generation. Figure 117 (p.250) presents several characters of Khon Kaen city which defined the city character in a number of events. The designs used different items (as above), and some designs combined every item in the same design piece (a), (d), (f) and (g).



Figure 117 The changing forms of the Khon Kaen logo

(d), mascot (a) (b) (g) and symbol (c) (e) (f)

In 2006, the city had a radical change in the in urban-policy system when the Khon Kaen municipality applied the legend of Sin-Chai as the key concept to develop urban policy¹³⁷ (see interview details in chapter 6, pp.171-178). The administrators believed that city development should be based on the Sin-Chai concepts¹³⁸ in order to make Khon Kaen into a city of sustainable living (Tawanchai et al., 2006). They implemented and promoted these policies by conducting the Sin-Chai events e.g. sports, educational fairs, performing arts, learning centres etc. (Tawanchai et al., 2006). In addition, the legend of Sin-Chai was put into the local curriculum. In the meantime, the heroes in the legend of Sin-Chai were incorporated in designs as power poles were installed around the city. This was done in order to celebrate the city's new character.

Everything seemed perfect but I noticed that the stand point of the local administrators was inconsistent with regards to the development of the city's character. Since 2006, although the administrators have defined Sin-Chai as the development policy for the

¹³⁷The strategic development of Khon Kaen urban policies, based on the Sin-Chai concept, consists of three main sections. The first article is **organisational development**, e.g. learning, training, exchanging knowledge and discussion. The second is **urban development**, e.g. decorating the city environment based on Sin-Chai themes such as on power poles. The third is **education**: internal (curriculum), external (extracurricular activities e.g. sport events) and self-study systems (educational fairs) (Tawanchai et al., 2006).

¹³⁸ The legend of Sin Chai addresses the concepts of: (1) gratitude, (2) bravery, (3) honesty, (4) dedication and (5) sufficiency (Tawanchai et al., 2006).

city's character, they have not followed their guiding policy. This evidence can be seen in pictures (a), (b), (c), (f) and (g) in figure 117. For a 2008 sporting event, the Khon Kaen municipality designed symbol (c) and mascot (b) based on the Sin-Chai concept. In 2012 they designed symbol (f) and mascot (g) for another sporting event. This symbol was based on the province's slogan. The 2012 designs used the same concept as in 1992 (a), even though the administrators were the same ones who defined the new urban policy and character. I realised the key factors which brought about this inconsistency may have come from the background of each local administrator in respect to their place of birth. In the in-depth interviews, I found most of the administrators are not locals, and also some of them came from other regions. This factor may contribute to the administrators not realising or knowing the importance of local perspectives, ways of life and community background.

4.2 Community Perspectives

As I mentioned in the previous section, even though KhonKaen is situated in the area of the 'Lan Chang' empire (including north-east Thailand (Isan region), Laos, Cambodia and Vietnam) and Sin-Chai has been a legend for the Mekong River for more than 900 years, the community does not have any relationship to the legend of Sin-Chai in terms of historical geography, calendar, sites and monuments (NKPCO, 2008). These inconsistencies of history meant the local people did not recognise Sin-Chai as a part of their local culture. There is evidence of this in the key findings in chapter 6. During the collection stage, the local participants did not mention Sin-Chai at all. Disapproval from local people was expressed about the legend of Sin-Chai not being embedded into local experiences. Though all the participants came from different age groups (15 and \leq 60), this disapproval was in the same direction, in particular, the study group of participants who were aged between 15 and 19 years. I thought they would recognise the Legend of Sin-Chai. This is because during the last six years of their education, students learn about Sin-Chai. However, their recognition of 'Khaen' and 'local textile' as a part of their tradition was the same as the other groups of research participants, not including some of the local administrators and experts.

Both of the experts¹³⁹ and Cowan (2001) argued that common cultural contexts in society were influenced by an individual's cognitive learning processes. Their mental

¹³⁹They are the experts in (1) urban design and (2) Isan folk art/culture and design, who were interviewed by me as part of the field work (see details, Chapter 6, pp.178-183).

abilities recognise some things based on their personal experiences; this means they can discover the value and meaning of those things (Hsueh & Peng, 2010). Therefore, Sin-Chai, in the minds of the locals, may be considered as an intangible legend which is learned in the local curriculum, and/or a new trend in urban policy to promote the new city's characters, events, decorations or selling points. In addition, Sin-Chai is not part of the original history, way of life, folk wisdom or traditional practice in the Khon Kaen community. It is the shared legend and belief of the Isan region and Lan Chang Empire. This is different from Khaen and the Isan textiles which are embedded in the local ways of life, folk wisdom and culture in Khon Kaen community. These tangible things are the local heritage that has been passed down from generation to generation for thousands of years (Siri, 2001).

4.3 Influence of Policies Reflected and Recognised in UTS Images

During 2009 and 2010, the BRT project was collaboratively planned between the Khon Kaen municipality and Khon Kaen University (Khon Kaen BRT, 2011) (see details, Chapter 3). Lynch (1960) argued that changes in the urban transport project would have a significant impact on modeling the image of cities, hence the development of a graphic support system that could be applied to assist people to recognise and use their urban space (J. Allard, 2008). The reformation of a public transport system needs to include the creation of a new user information system, including transit maps, map handouts, graphics on buses, tickets, graphic material in the stations, bus shelters and stops. The Khon Kaen BRT project not only reforms the operating system, but it will also modify the city's image by using the Environmental Graphic Design (EGD) approach. It is an opportunity to see the city's transformations and its changing image.

The legend of Sin-Chai was part of the key design concept for the BRT project, i.e as its corporate identity. Yet although the Khon Kaen municipality conducted the public hearings using experts and central/local organisations to discuss the BRT plan, the topic of corporate identity design for this project was not on the agenda. A top-down administrative system was used to define the corporate identity design for the project. Nevertheless, this design concept was drafted as the prototype which the Khon Kaen city municipality designed in association with (1) Khon Kaen University, (2) the Provincial Administrative Organisation, (3) Road Safe Fund Organisation, and (4) Office of Transport and Transport and Traffic Policy and Planning (Department of

Ministry of Transport, Thailand) (Khon Kaen BRT, 2011). Figure 118 presents some of the corporate identity designs of Khon Kaen city's BRT project.

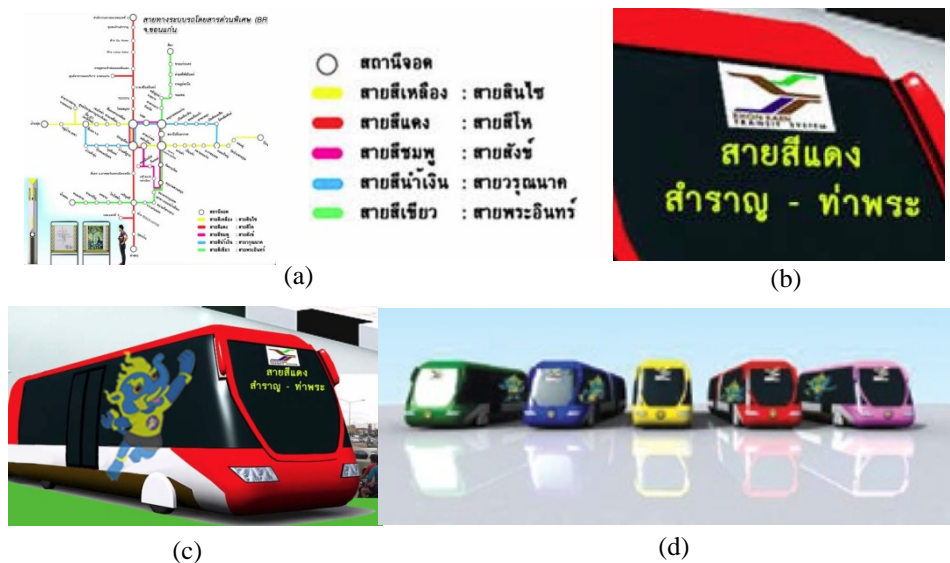


Figure 118 Corporate identity designs of the BRT

(a) BRT routes (names in Thai) and layout design, (b) the BRT logo with alphabet 'K' design, (c) one of the heroes in Sin Chai literature on a bus model and (d) a selection of design details on the BRT buses.

This point uncovers the local administration's development policy about the city's image. The consideration and study of the roots of knowledge and cultural background had been neglected, as had the holistic needs of the stakeholders in the community. Based on the top-down administrator system, the city identity was being created in tension with local needs. This was unusual. It made for inconsistencies with cognitive learning in the use of the UTS. For example, one resolution from the meeting of the Khon Kaen municipality defined the name of each BRT service route based on the name of Sin-Chai characters. This would produce a great deal of confusion for the local people who needed a 'sense of place' when they learned route names.

Tuan (1974), Tuan (1980) and Jackson (1994) defined the concept of 'a sense of place' from the study of culture: geography, anthropology, sociology and urban planning which related to the background of individuals. It included studying why certain places hold special meaning in people's minds. Steele (1981) stated that both physical geography¹⁴⁰ and social elements¹⁴¹ in a setting that surrounds a person can create a

¹⁴⁰For example; mountain, river, lake, hill, beach, etc.

¹⁴¹For example; monument, landmark, bridge, shopping mall, park, port etc.

strong sense and spirit of place in the mind, e.g. the feeling and ‘personality’ of places. These places have symbolic ties that create attachment to place and a sharing of affective meaning between the individual’s understanding and a particular setting/environment (Setha, 1992). However, as I have described, the legend of Sin-Chai does not have any relationship to the historical aspects of site, monument, and time in the community. Therefore, the application of characters’ names to represent the BRT route titles¹⁴² does not support the process of individual cognitive learning to recognise the relationship between a place and track service to that place in each BRT route. This indicates that the meeting team lacked the experience to evaluate the result of social, cultural and learning impacts after the decision had been made to use this (Sin-Chai) development concept.

Consequently, during the past two decades, the local government has used the ‘top-down’ strategy to develop urban policy that also includes the development of the city’s image as well as the UTS image. It can be said that local governments in each generation have neglected to pay attention to studying the needs of the community (given by local stakeholders) to questions such as ‘What are the key symbols?’ and ‘What is the most prominent form of local culture?’ before implementing the policy. Therefore, the key findings from my investigation will be able to guide the administrators when defining trends in the city’s (character) development. Also, the findings will play an important role with regard to key symbols and the representation of local culture, which will be applied as key components when developing other public design projects/events in local government, state agencies and private companies in the future. The next topic will propose a collaborative model to address this conflict of opinion situation.

4.4 Pilot Development of Thai Democratic Responsiveness in Public Design

The voice of the community from bottom up needs to be included in the process of developing public design systems, particularly in the design of public transport maps¹⁴³. This opinion is similar to Allard’s (2009) who claimed that the design of future public transport maps have not only to adapt to different languages, education and users’ characteristics, but also to differing cultural/community backgrounds. Allard requested

¹⁴²These consist of; (1) Sin-Chai (yellow) route, (2) Si-Ho (red) route, (3) Hoi-Sung (pink) route, (4) Waron-Nak (blue) route and (5) Phar-In (green) route.

¹⁴³Gibson (2009) claimed that public way-finding maps are key to directly involving and impacting on people using urban elements, e.g. transportation, work, study, play.

that the task be approached in an interdisciplinary way, based on the participation of social, behavioural and cognitive experts. Gibson (2009), Lynch (1960) Thienmongkol and Waring (2012) described this in a similar way to support Allard's idea that the design of graphic materials in a way-finding (transit) map needs to consider the relationship between graphic images and the background of individuals and groups, as well as their perceptions, sensations and memories. The understanding of these factors can empower the individual in terms of cognitive learning, visual interpretation and recognition (Cowan, 2001).

However, this study plans to incorporate a holistic response of all stakeholders in this community. Both sides had perspectives voicing support for the community's life cycle. Therefore, the administrators' requirements (Sin-Chai) needed to receive consideration. I integrated the Sin-Chai aspect into one of the key design concepts. This is because the Sin-Chai concept is contained in the city's urban development policy (since 2006) drawn up by the Khon Kaen municipality. The concept was also used to decorate the city environment in some parts of the city areas. Collaboration was needed in order to find appropriate ways of developing a sustainable Public Transport Map design concept, without conflict.

I applied a Thai philosophy of co-design to develop a participatory design in order to analyse stakeholders' opinions and define the methodological framework. This framework was utilised to define a suitable way to collect data and methods/tools for investigating the socio-cultural factors from the stakeholders in this community, based on the HCD discipline¹⁴⁴.

From the top-down policy of Khon Kaen municipality, it can be seen that three major groups of stakeholders played an important role in the city's (image) and BRT (project) developments. They include the group of (1) local administrators, (2) central state agencies and (3) experts. Although the developments of the BRT project were directed to the daily lives of citizens, the stakeholder model did not include citizenry participation. This is a significant point that made a conflict of opinion as mentioned above. Figure 119 (p.256) presents the collaborative model that I applied to design the Khon Kaen public transport maps. This model integrated local perspectives (human

¹⁴⁴HCD is a procedure and a set of techniques employed to develop new solutions for the world. This process involves situating the human at the centre of technology, service, environment, interaction systems and design products (IDEO, 2010). Gill (1991) and Jokela et al. (2003) described HCD as placing human skills, needs, potentiality and creativity at the centre of the design and development process. This PhD project applied the key principle of HCD to develop the research method which ensured my design connected better with the stakeholders I served.

factors) from all stakeholders including (local/non-local) people in the community. The collaborative strategy combines the bottom-up and top-down policies so they meet in the middle. Sanders and Dandavate (1999) and Sanoff (2005) stated that in many cases, using citizens' experiences can enhance achievement, in comparison with simply using external organisations. This is because citizen participation has a broad value to community life as seen through (1) public engagement, (2) trust building and (3) making better decisions for the community (Creighton, 1994).



Figure 119 The proposed model for developing collaboration between stakeholders in this new approach in Thai design

The model presents the participatory concept among the four major groups of stakeholders within the community including: (1) local administrators, (2) related experts, (3) people (local/non-local) and (4) the design team (middle man or professional). These stakeholders were able to share their individual/group perspectives which came out in the form of human factors (needs). A professional (designer) is the person/team organising, negotiating, integrating, producing and evaluating the human factors from all stakeholders based on the concept of participation, psychology, design principles and the usability test.

Finally, this integration incorporated recognition from all stakeholders (see results in chapter 7, table 31). During the evaluative design process, I saw that stakeholders felt they were part of the design and community ownership via this transit map. I believe that this collaborative model can create identity designs in public spaces. The model is based on democratic responsiveness, community ownership and respect for cultural

values. On the other hand, a top-down policy may work for other administrative purposes. This policy may distort the actual cultural values and the spirit of folk wisdom. In addition, conflict between groups indicates that current urban image policy is still far away from the thinking of local people.

Summary

A discussion of the key findings reveals the significance of human factors which are hidden in the Khon Kaen community. Local textiles, Khaen and the Koon flower are embedded in a context of psychology (the subconscious), physiology (geography), and society (Isan culture). Information design, HCD, and usability concepts are the core collaborative principles that I integrated for the purpose of collecting, analysing and organising data, in order to transform, contribute to and evaluate the transit map prototype.

The conflict of opinion between local administrators and the local people was solved using the collaborative model in Figure 119 (p.256). However, this conflict reflects a crisis situation in the development of public design projects in Thailand. My case study revealed that local government lacked comprehension of significant cultural issues and were unable to contribute to a participatory design process in this public space project. They defined the trend of the city's image and subsequent development policy. They also neglected to hear the voices of the local people. They did not have an efficient model for conducting a collaborative process which would investigate the holistic needs of the community's stakeholders. They did not view design as an integral part of a major transit project.

Therefore, an intensive examination of the community was needed to successfully assist us to create useful public design materials for the target audience. This achievement can be seen in my case study results that reflect the success of design communication based on cognitive learning, cultural values and appropriate designs. Finally, this participatory study is democracy and responsiveness working together to produce a public design model which empowers the stakeholders within the community to take ownership of the designs produced. I strongly believe that this transit map case study will provide a worthwhile pattern for developing a sustainable public design prototype for Khon Kaen and other cities in Thailand.

-Chapter 9- Design Process

Introduction

The chapter outlines my design processes used in this study (Khon Kaen BRT transit map). The practical process was conducted in two major stages. The *first stage* involved the design process of my transit map prototype. The *second stage* describes the processes of adaptation after I received key feedback from the Khon Kaen stakeholders. The development details are presented in a step-by-step format. The important parts of my data collation relate to the design processes and outcomes which are presented in this chapter.

Section 1: The Design Process Stage 1 (Design Prototype)

This stage presents the initial design processes. I collected, analysed and integrated the key findings from the secondary and primary data. The details are demonstrated in the following paragraphs.

Step 1: After I had received the city plan (map) from the Khon Kaen Municipality, I discussed with the head of Khon Kaen city (a town planner) the accuracy of the areas studied. I dealt with the urban design team to convert (export) the GIS view of the Khon Kaen city map to the 'Vector' or 'EPS.' file, using the Adobe AutoCAD programme. I conducted this transformation because I needed to import the GIS material to organise (design) the map, using the Adobe Illustrator program. Inside, the 'EPS.' file consisted of the city plan layout covering four layers: (1) the area of Khon Kaen municipality; (2) road structures/names; (3) the density level of buildings; and (4) natural topography. These layers were a part of my design materials. Figure 120 (top, p.259) presents the Khon Kaen GIS view before converting the file. Figure 120 (bottom left, p.259) demonstrates the conversion resulting from changing the GIS view to the EPS. file. It

can be seen that the converted file was able to cut off unnecessary details from the aerial photograph on the GIS map. Meanwhile, the right-hand side in Figure 120 (bottom right) displays the four city plan layers as defined above.

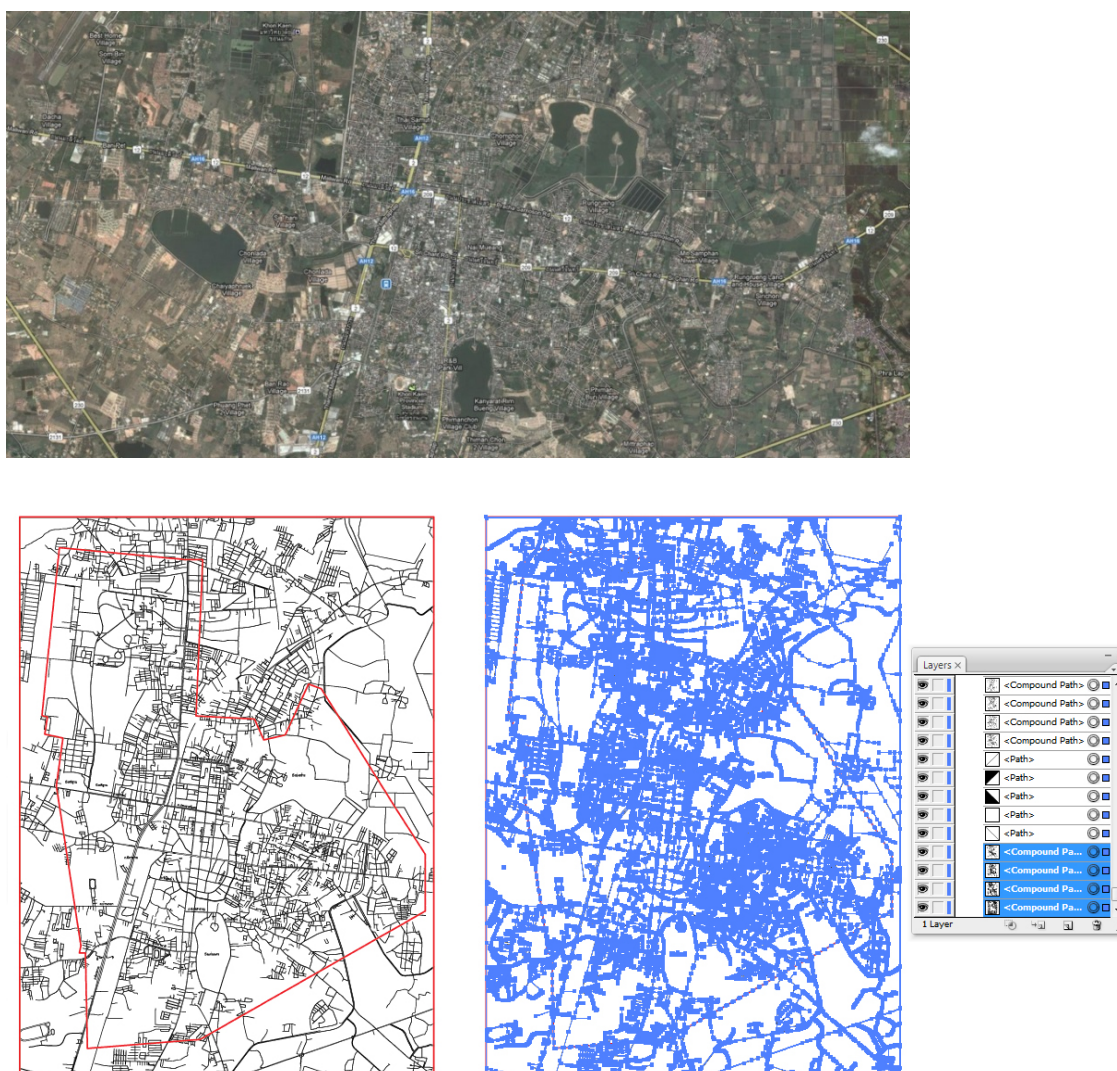


Figure 120 Geographic Information Systems (GIS) views of Khon Kaen city

Step 2: I went to ask the officer in charge of Khon Kaen's engineering department of Khon Kaen Municipality about the BRT project, progress report and route information. This was because I needed to know more details of the BRT project in respect to (1) route systems, (2) station and interchange points, and (3) the corporate identity design theme. I also went to the Khon Kaen Transport Centre and asked for the Song Thel service information. The officer provided details that the Song Thel service was divided into two modes. The first mode provides 10 service lines in the municipality area. The second mode can take commuters from the outskirts of the city to the CBD via 9 service lines. However, I had to observe the Song Thel service system using every bus line in the first mode to check that the routes were correct (this mode was observed as it

operated in my case study area and there was no pre-existing public information). I had noted and drawn the service tracks on the GIS paper map before I sketched the route on the design program and drew it in the form of graphical materials. Figure 121 (top left) presents survey pictures of the Song Thel system mode 1. The top right pictures in Figure 121 are the sketch designs of the Song Thel system mode 1 on the design program. The bottom picture in Figure 121 illustrates the draft of all service routes of the Song Thel system mode 1.

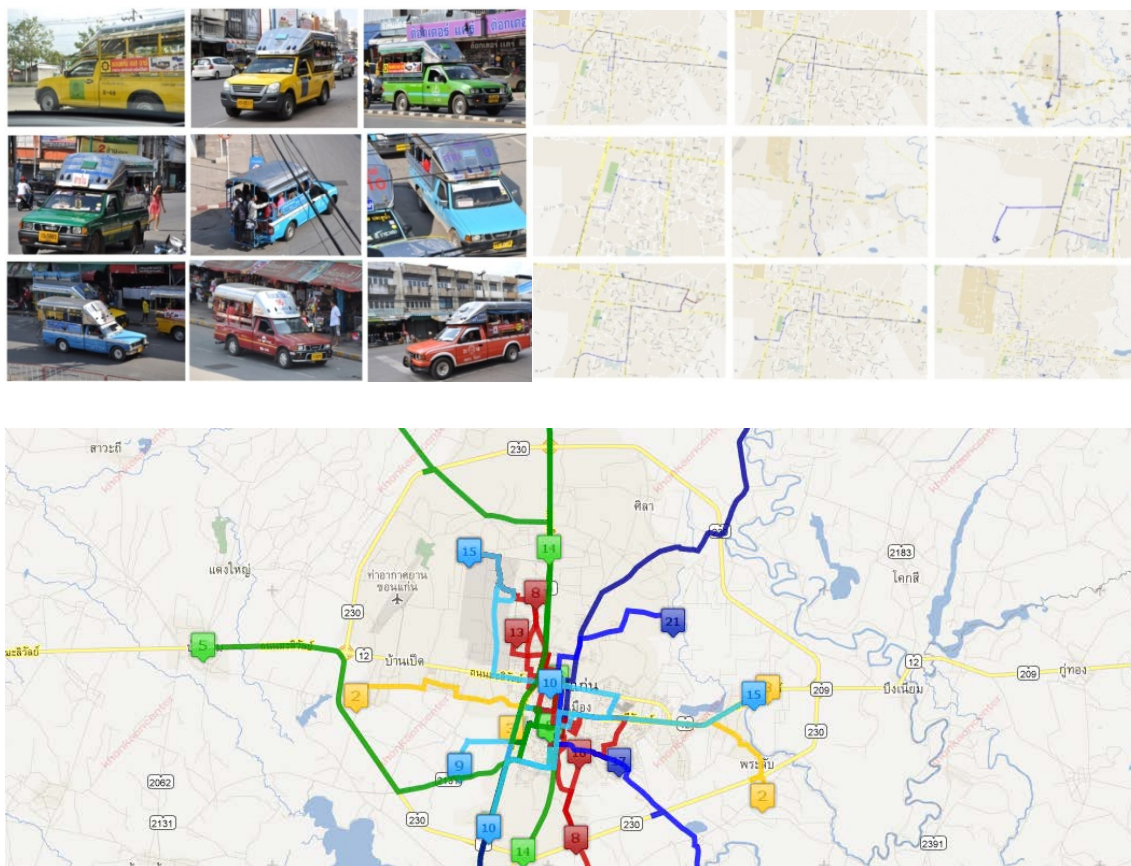


Figure 121 Routes of the Song Thel system mode one

Step 3: After I had analysed the collected data from stage one, I found that most of the Khon Kaen stakeholders selected ‘Isan textile’ (Khid pattern) as the highest priority of key local culture that they would like to present to outsiders. This key finding became the key design concept and principle about which I needed to learn more details. I went to the Silk Innovation Centre to learn the traditional processes of producing, creating and designing Isan textiles (see Figure 122, p.261). These folk wisdom processes underpinned the creation of the experimental and creative design materials within my design prototype. The experimental processes and learning details will be demonstrated in other steps.



Figure 122 My learning from local specialists

Step 4: Another key result from the first data collection stage was that ‘Sin Chai literature’ is the key aspect/identity that some local administrators believe the city image should look like (key finding from in-depth interviews) (see details in Chapter 6). Based on this output, I had to read more documents about Sin-Chai history. I also went back to the field in order to observe two temples in Khon Kaen province which have the Sin-Chai mural paintings (see detail in Figure 123). These observation details were applied as part of my design materials and concepts. The applied ideas are presented in steps 5.10, p. 273.



Figure 123 Observation processes at the Sin Chai murals

			Reason: 1) working, 2) business, 3) shopping, 4) commerce and 5) exercise	
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Table 32 Organising information (LATCH) model for the Khon Kaen public transportation map

After I had organised the transit information using the LATCH model, I was able to classify the main design sections on the Khon Kaen transit map. This consisted of seven sections: (1) BRT logo, (2) graphic routes, (3) graphics for fare rates and timetable systems, (4) route-symbol information, (5) key legends, (6) service information tables and (7) index symbols. These sections formed the key design framework of the Khon Kaen transit map. Further, these sections were the key design assessment topics in the second stage of data collection (evaluative design process) (see more details in the design process stage 2, p. 278).

Step 5.2 Logo Design: The Khon Kaen BRT logo was the first design step. ‘Khaen’ is the first key emblem of the city selected by more than 74% of the people interviewed (see more discussions, chapter 8). Based on this result, I was able to define the key design concept of the BRT logo which represented the Khaen features. I sketched several ideas in order to find a suitable design which reflected (1) the needs of stakeholders, (2) the representative Khaen and BRT transport system features, (3) design elements based on aesthetics and (4) communication with both local and international visitors. The final logo prototype (see Figure 156-a, p. 283) gives two meanings. Figure 124 is a sketch design of my Khon Kaen BRT logo and the final logo prototype.

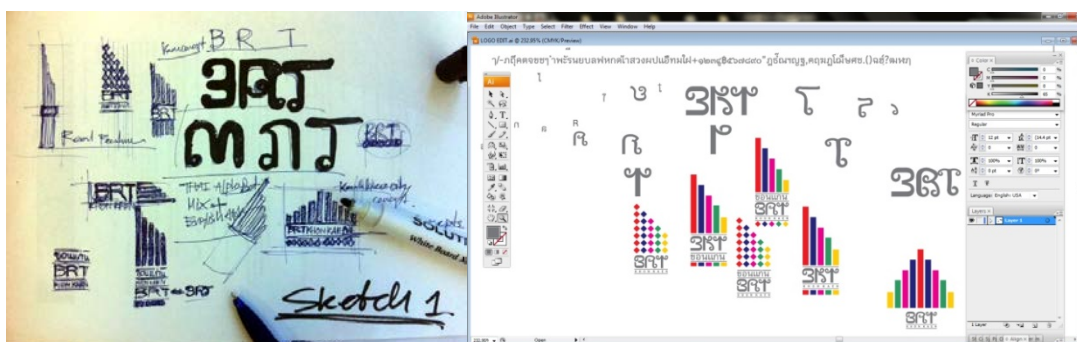


Figure 124 My sketch logo design

Step 5.3 Designing the Ground and Linear Information: I started to define my representative map scale at 1,000 feet or 500 metres using aerial photographs. I drew the road paths which relate to the route services of the Song Thel and BRT systems on the GIS view of the Khon Kaen city areas (see Figure 125). These roads were designed based on the diagram style¹⁴⁵. The 90-degree concept was applied to organise my route paths (Hadlaw, 2003). The natural topography (lakes) and district zones were defined as the first ground level of my map design layer (Figure 126). When designing the district zones, I applied the golden shower called ‘Koon flower’ as the key design concept. I designed and transformed the flower figure to the graphic form based on the Isan textile concept (see discussion, Chapter8). This graphic was put into the ground map in order to differentiate the district area outlines on the map (see Figure 126).

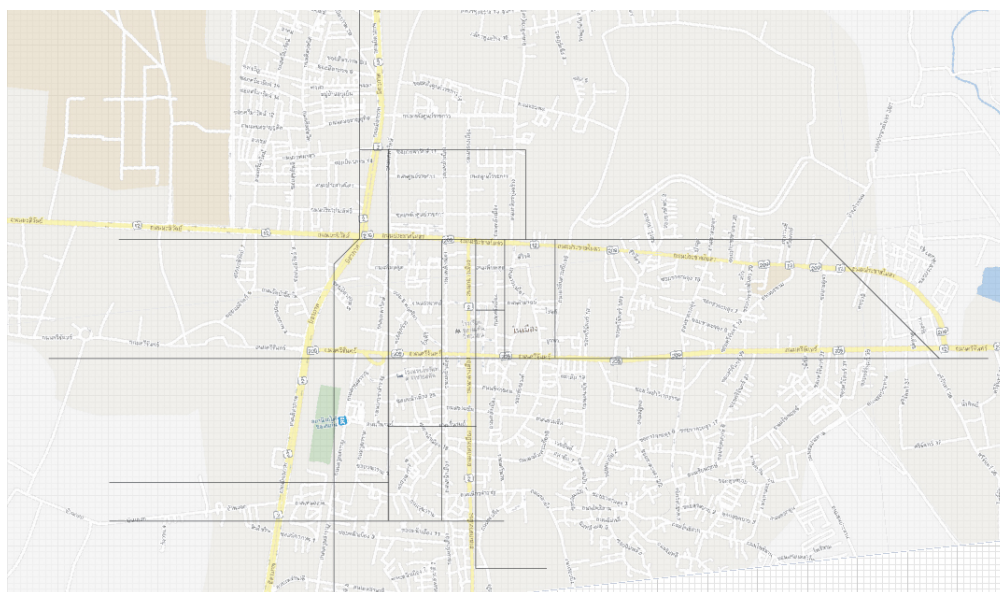


Figure 125 Mapping the road structure

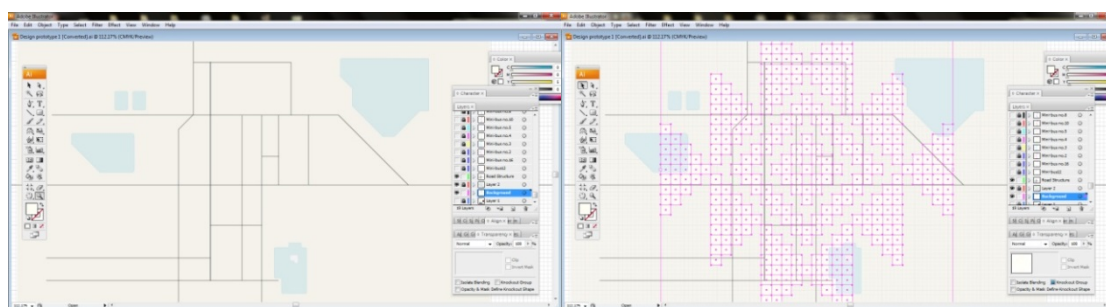


Figure 126 Design of road paths

¹⁴⁵The findings regarding map recognition style from the survey showed that 91.5 % of the sample groups (107 out of 131 respondents) in Khon Kaen city preferred to read the diagram map style.

Step 5.4 Designing the Route Systems: This map focuses on design and provides information about two public transport systems in Khon Kaen city. The minor system is the Song Thel (mini bus); the BRT is the major public transport system. I started to lay out the Song Thel routes on the background map. I used a different tone of colour to represent each service line in the Song Thel system (see Figure 127).

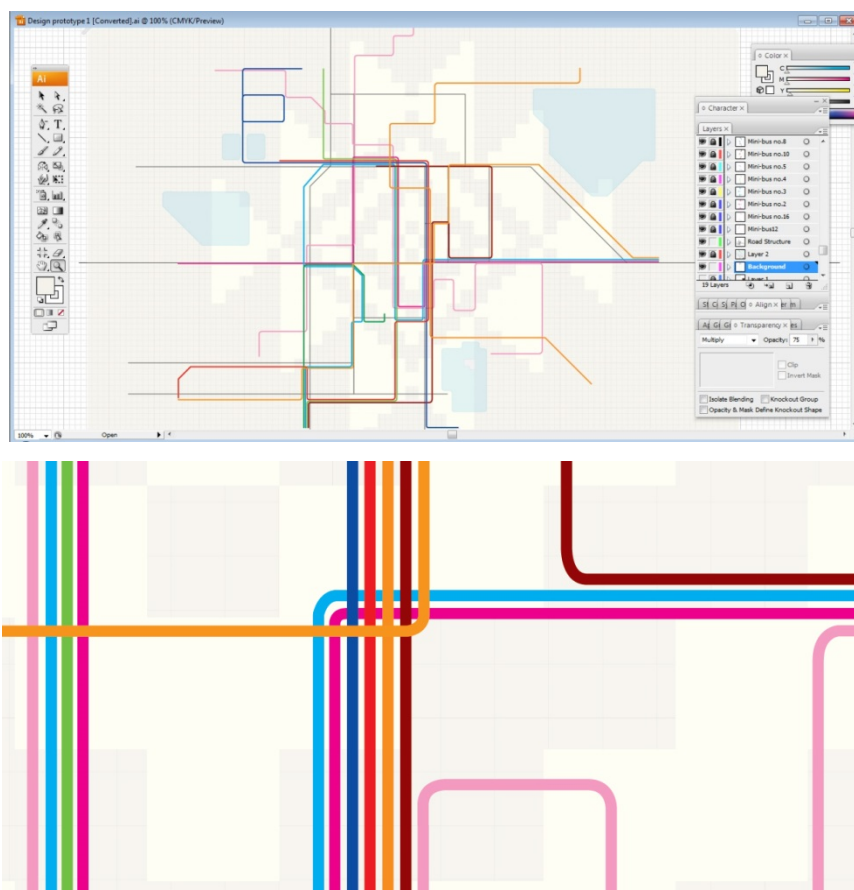


Figure 127 Draft of the Song Thel system on the city map layout

This process was my guide to mapping the routes before I replaced them with new experimental design ideas (see Figure 128, p.266). This experimental design concept was integrated using the key results (Isan textile) from primary data in the field work. Next, I put the BRT routes as the second layer in the graphic routes section of the map (see Figure 129, p.266). Both systems were integrated and provided their service information in this map.



Figure 128 Comparing ideas and drafting the route systems

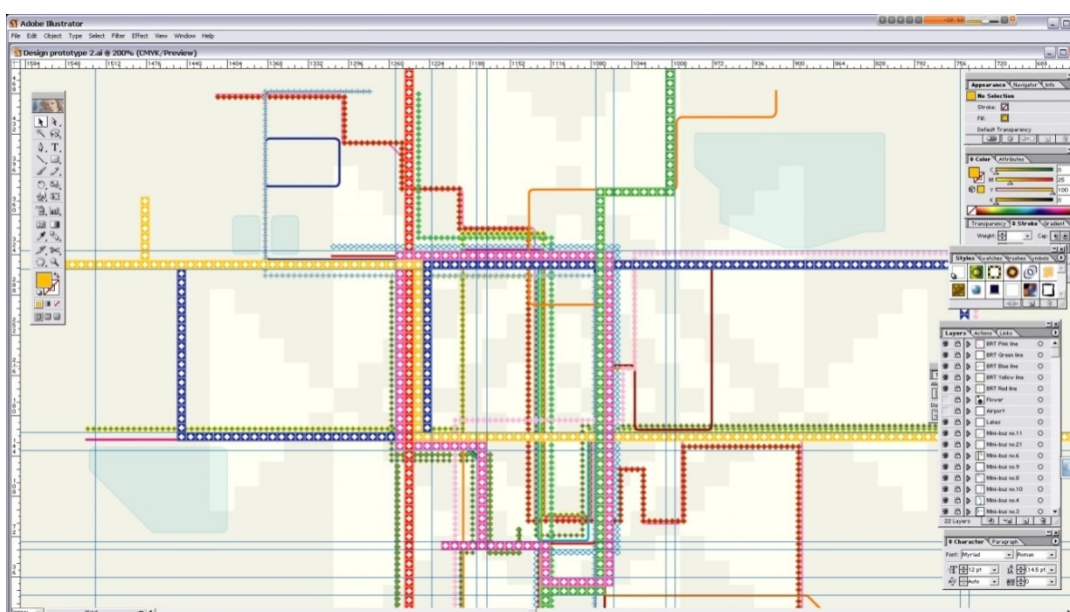


Figure 129 The integrated design organisation of the BRT and Song Thel systems

Step 5.5 Adapting Design Ideas: After I mapped this design layout, based on the Isan textile concept which I presented in Figure 129, I considered the Song Thel and BRT design lines should be developed to create a better representation of the Isan textile (Khid-silk) characters. Figure 131 (p.267) presents the comparisons between the previous and most recent ideas of the BRT route design. I put the Isan flower symbol in the middle of each box on each BRT line. Figure 130 (p.267) illustrates the adaptation of the Song Thel route design. I tried to put the isosceles triangle form on both the left and right sides in order to make the Song Thel line seem like a stroke rather than a dash.

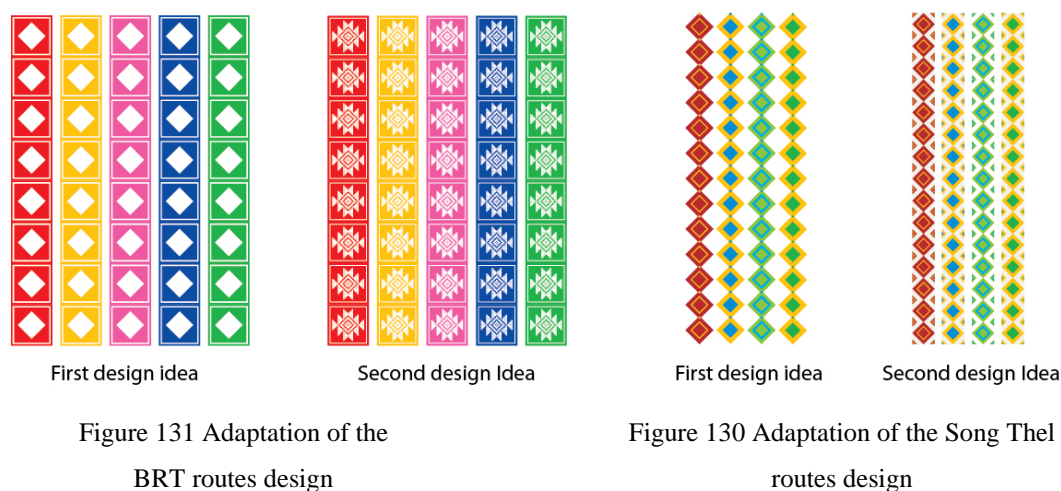


Figure 131 Adaptation of the BRT routes design

Figure 130 Adaptation of the Song Thel routes design

Step 5.6 Design Elements and Principles of Organisation: The design elements and principles of organisation design were applied to organise the graphic materials in the transit map. Katz (2012) and O’Grady and O’Grady (2008) noted that the use of proper design elements, such as line, value and colour, can create a reading hierarchy and help the viewer to quickly determine and order the information sets. I employed these principles so that readers can quickly comprehend figures and ground materials, and the hierarchy of information sets on the map (Katz, 2012; Ronnie Lipton, 2007). Lines, colours, spaces, forms, textures and shapes were utilised to create a graphic material which recognises the figures and ground layers on the map (Katz, 2012). For example, I applied different proportions in the service lines between the Song Thel and BRT systems (see Figure 132).

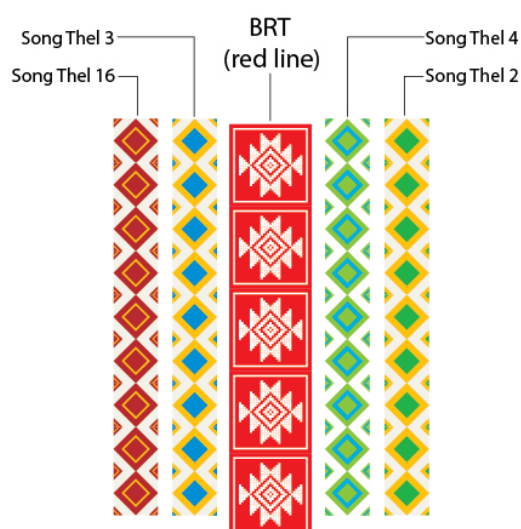


Figure 132 Different hues and scales of route designs of the BRT and Song Thel systems

In respect to colours, I employed contrasting hues, values and saturation to separate the groups of information sets (Gibson, 2009). For example, I used contrasting hues

(tertiary colours) to indicate different service numbers in both the Song Thel and BRT systems (see Figure 132, p.267). Meanwhile, the contrast in hue saturation was applied to separate the foreground (the contents) and background (grounds) in the graphic routes section. Contrasting colour values were employed to separate the types of service systems between the Song Thel and BRT (Gibson, 2009). I tinted the white colour, dropping the graphic contents of the Song Thel system, in order to shift the BRT materials and ensure they stood out from the background and Song Thel system (see Figure 133). These design principles created legible graphic materials which reflect the cognitive ability and information literacy¹⁴⁶ of readers (Ronnie Lipton, 2007). The principles also help readers to connect and rank the degree of information sets (O’Grady & O’Grady, 2008).

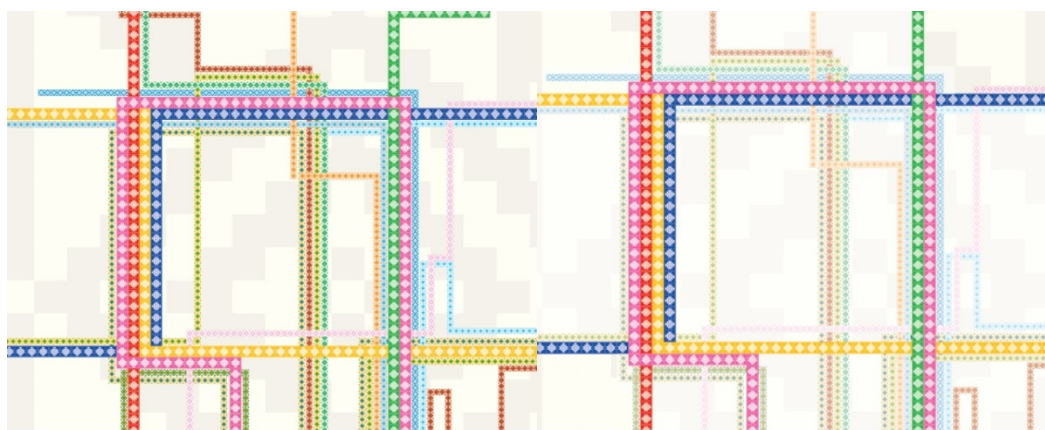


Figure 133 Comparison between before and after adding white colours in the Song Thel routes design

Step 5.7 Stations, Bus Stops and Interchange Points: Gibson (2009) stated that “once analysis and strategy phases are complete, the designer then determines how to fit signs into a total system”(p. 56). He called this process ‘sign programming’ in order to specify the locations of all signs or map symbols necessary for particular places. After I had finished the design and map processes, I started to work on studying the position of the BRT stations from the report of the Khon Kaen municipality (refer details in step 1, p.258). In respect to the Song Thel system, I needed to observe by driving a car so that I could check the current stops¹⁴⁷ in each line (see Figure 134, p.269).

¹⁴⁶Information literacy explains “an individual’s ability to recognise when information is needed, and then have the skills to find, evaluate, analyse, and effectively use that information” (O’Grady & O’Grady, 2008, p. 91).

¹⁴⁷This is because the Song Thel system did not correctly provide the stop information in any local state agency, such as the Khon Kaen transport centre, Khon Kaen municipality or Khon Kaen tourism centre.



Figure 134 Mapping BRT stations

When I had completed this data collection, I mapped both data systems on the map. The Isan textile concept was applied to create symbols of the BRT (stations) and interchange points (discussion about the design concept in Chapter 8, p. 235). These symbols were used to represent the individual stations of the BRT service (see figure 135). They were also employed to represent the three levels of interchange points: (level-1) interchange points between BRT and BRT lines, (level-2) interchange points between BRT and Song Thel lines, and (level-3) interchange points between the Song Thel and Song Thel lines. Scale was provided in different proportions in order to represent the different meanings between the BRT and Song Thel systems (see Figure 135).



Figure 135 Map symbols of BRT stations and interchange point levels

In the case of the Song Thel bus stops, I applied the real Song Thel features. I transformed the figures into graphic form by minimising some details (see figure 136, p.270). In this step I also designed the text box information along the side of

the interchange points in the map (see Figure 137). These graphic boxes will ensure that the reader understands which BRT and Song Thel route numbers apply.



Figure 136 The 'bus stop' map symbols of the Song Thel system

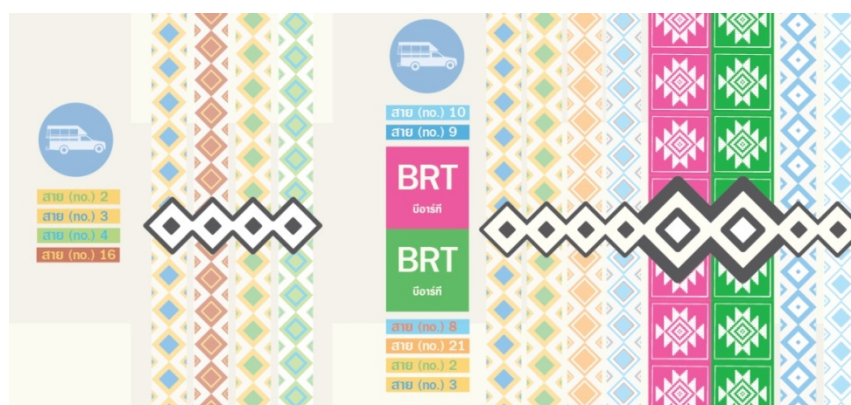


Figure 137 Further information about bus service numbers in the graphic boxes

Step 5.8 Key Legends on the Map: Calori (2007) explained that the landmark needs to be offered in overlapping areas on graphical maps. The signage system can be described as distinctive images for various sites, i.e. portals, meeting-points and landmarks. In this step, I used the data collected during the observation process: I took photos of city landmarks and other interesting sites. Checking the landmarks around the Khon Kaen municipality area, I created points which presented distinctive places for sites on the map. This graphic material helps people find their way through a real physical setting (Calori, 2007). It also enables people to become familiar with the city environment on the map. These opportunities will benefit commerce and tourism (Turner, 2010). This is because the city landmarks on the map include state agencies, healthcare centres, transport centres, sacred places, the convention hall and official service centres (see Figure 139, p.271). The graphic

style was based on each landmark, but physical details were reduced (see Figure 138).

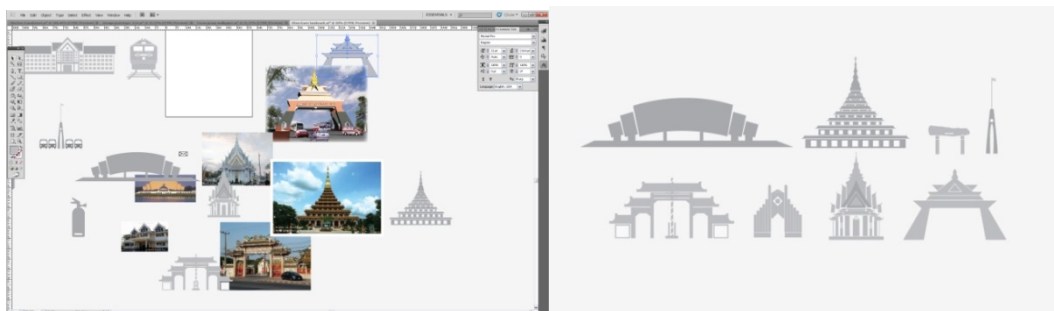


Figure 138 My design processes for graphic key legends (landmarks) in the design program



Figure 139 Key legends on the map

Step 5.9 Languages and Typography: This map is in two languages: Thai and English. Texts have been laid in a parallel style which was applied in every section in order to communicate at local and international levels (see Figure 140, p.272). However, the text scale and colour are different in Thai and English. The Thai language is printed in bold and uses more colour than the English language (see example in Figure 140, p.272). I needed to make Thai stand out because most of the transit passengers who will read this map are Thai (local) people. After all, the transport context is in the Isan region of Thailand.



Figure 140 Thai and English languages facilitate communication

With regard to typography, the Americans with Disabilities Act (ADA) defines the average letter size as a width(w)-to-height(h) ratio, which assists compromised readability across all ages. The letter ratio between 3(w):5(h) in every X-height (at least 9pt or around 3.16 millimetres) and 1:1 of a stroke width in every X-height are the regulatory requirements of the ADA (Gibson, 2009; O’Grady & O’Grady, 2008). At a viewing distance of 3.1 feet, the size of letters which promotes readability should be at least 9 pt (or around 3.15 mm in height) (O’Grady & O’Grady, 2008). Lipton (2007) and Spiekermann and Ginger (2002) supported the letter size of 9 pt as the smallest scale for compromised readers across ages.

I applied the “DSN LardPhrao”¹⁴⁸ as the main typeface for my map (see Figure 141, p.273). The ratios of this font meet the scale of compromised readability of the ADA. This can be proved by comparing the typeface between DSN LardPhrao and Myriad characters in Figure 141. The number six alphabet of DSN LardPhrao ratio seems like the second alphabet of Myriad; this English typeface is a recommended font in the ADA visual and tactile fonts standard (American Diabetes Association, 2012, p. 4). Furthermore, this Thai typeface looks modern by cutting off detail from the alphabet figures. The cutting concept became the Thai typeface style which type designers prefer to design and use nowadays. This practice seems like the ‘Serif’ and San-Serif styles of Roman and English alphabets (see Figure 141).

¹⁴⁸The “DSN LardPhrao” is the free font download that can be applied and used for educational and commercial purposes without copyright. (source from (in Thai): <http://www.f0nt.com/forum/index.php?topic=15450.0>)

In terms of the letter size, 9 pt¹⁴⁹ is the average scale of my (key) body copy, i.e. the names of stations (see Figure 140, p.272). Regarding leading space, I used the 100% (or 9pt (type)/9pt (leading space)) to make the print legible and my typography readable. Meanwhile, with regard to letter spacing, I applied the normal ‘0’ optical tracking. I did not adjust the tracking space between my letters because I used the regular typeface (DSN LardPhrao).

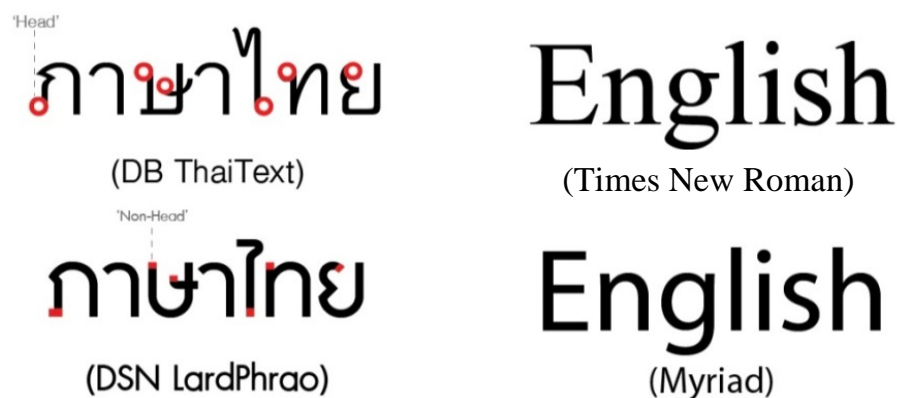


Figure 141 Comparison between Thai and English fonts

The bottom left and right examples illustrate the Thai font without ‘head’ and ‘san serif’ style in English.

Step 5.10 Fare Rates and Timetables: The design concept of graphic materials in the fare rates system was based on the results of the key findings such as the ‘Sin Chai’ legend (see more review and discussion in Chapter 3 and 8). After obtaining these key findings I went to the field to photograph the Sin Chai mural painting (see the pictures in Figure 123, p. 261). These pictures gave me the idea of creating the original characteristics of the ‘Isan’ icon design for the fare rates system. I used the tablet monitor with a real time display screen which connected to my main computer monitor. I imported the pictures from the field work to the design software. I selected the appropriate pictures pertaining to female, male, elder, and child in order to study the figure styles of the Isan mural painting. I used a digital pen to cut out figures and shapes from the original art work (see Figure 142, p.274). I combined these cutting pieces to make a new set of icons which represent the traditional style of the Isan people (see Figure 143, p.274).

¹⁴⁹I believe that the map reader has a different viewing distance from the driver. The map reader can move close to the map to read as much as he/she wants. Hence, using the font size (approximately 9pt) is not very effective in regard to the readability of this printed map (see the usability test result in Chapter 7).

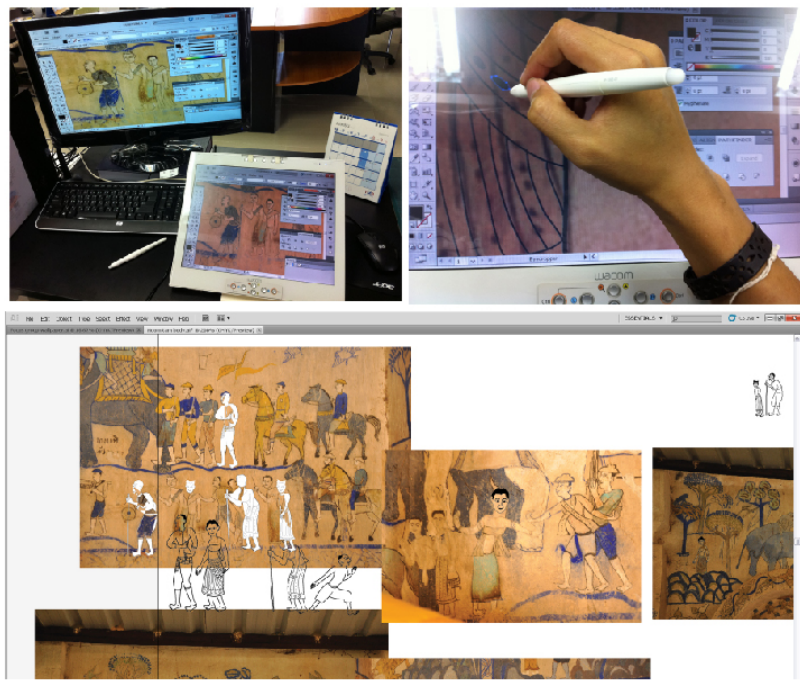


Figure 142 Development of a new set of icons for the fare rates system

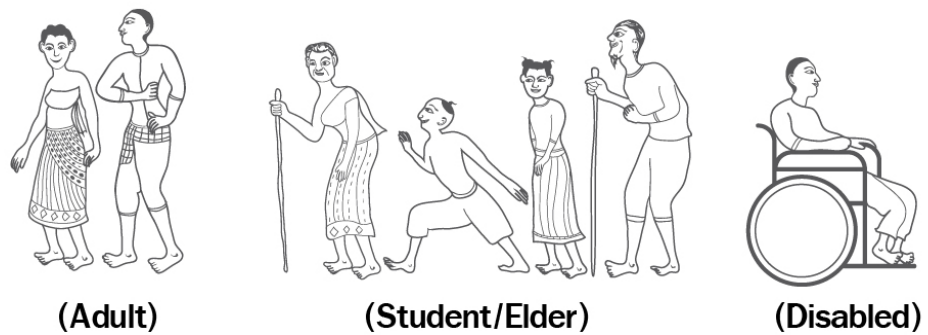


Figure 143 The set of icons for the fare rates system

In respect to the timetable, I could not design much more detail. This is because the BRT system is not operating and there is no plan for it to operate yet. The Song Thel

system does not have any timetables. I could design only the approximate times that I got from the BRT report of the Khon Kaen municipality¹⁵⁰ (see Figure 144).



Figure 144 Graphic timetable of the Khon Kaen BRT in the first map prototype

Step 5.11 Designing the Map Legends: This step provided the legend of map symbols for route information (BRT & Song Thel systems) and the key legend (see Figure 145 and Figure 139 (right, p.271)). These were offered to the map viewer in both Thai and English in order to ensure that he/she will not misinterpret these symbols.



Figure 145 Legends for both BRT and Song Thel systems

Step 5.12 Grid System and Index Symbols: The grid system was organised to give service information¹⁵¹ about the municipality areas which the BRT covers. These grids will work together with the section of ‘index of service information’. Both information sets will tell the passenger their location by their grid codes (alphabets and numbers). Meanwhile, this code will link with the code ‘index of service

¹⁵⁰The Khon Kaen BRT arrives at this station every 15 minutes.

¹⁵¹The categories of my service groups were based on the need of stakeholders who are regular and non-regular users of the local public transport system in the Khon Kaen municipality. The groups are (1) state agency, (2) restaurant, (3) market, (4) Thai temple, (5) accommodation, (6) institutes, (7) school, (8) park, and (9) shopping centre. I did not provide some of the logos and big names of hotel and shopping centres for commercial reasons.

information' tables at the bottom of the map. Inside the tables, I provide index symbols to describe the category of service information which serves the passengers around that grid. The legends of index symbols are provided in the 'index of service information' table (see the explanation steps in Figure 146).



Figure 146 How to use the grid system

Step 6: After I had finished designing the Khon Kaen BRT map prototype, I went onto production and preparation of the art work. (see Figure 147). The final scale of my prototype is A1 (590(H) x 840(w) mm) (see Figure 149, p.277). I also printed the seven design sections on the map prototype (see Figure 148, p.277) which I would use for evaluating the usability test in each section with the participants in the focus groups (see details, Chapter 7). Finally, I took the art work to the second stage of data collection. The adaptation processes will be illustrated in the next section.

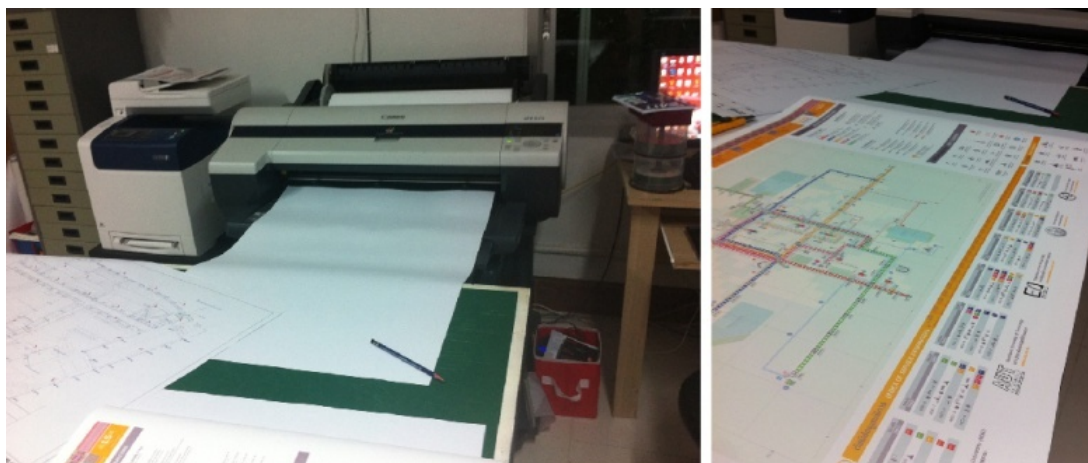


Figure 147 Printing my prototype map



Figure 148 Preparing to print the seven design sections

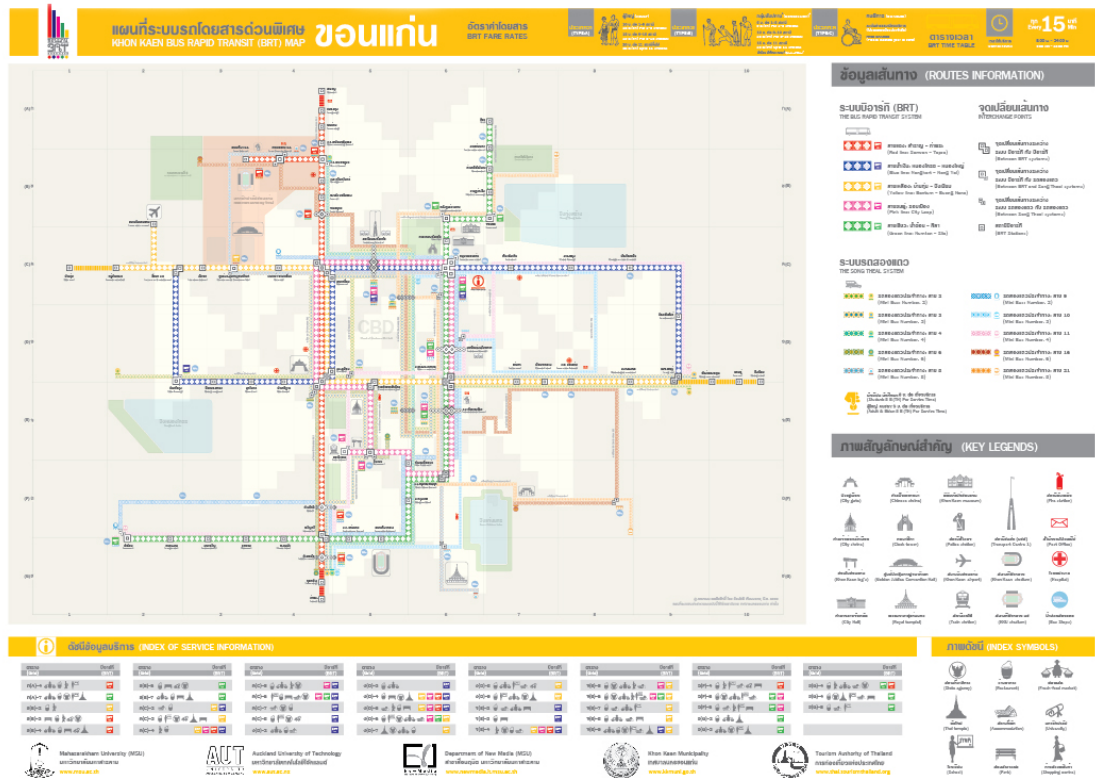


Figure 149 The design prototype of the Khon Kaen BRT map

Section 2: The Design Process Stage 2 (Final Design)

An international design firm and innovation consultancy (IDEO) suggested in their ‘Human Centred Design (HCD) Toolkit’ that a key method in HCD is the individual and group interview (IDEO, 2010). The feedback from both collection techniques enables an intensive and rich view of particular and multiple perspectives of stakeholders in design or research projects (Maguire, 2001). Once designers used HCD to evaluate a product, they could brainstorm key (human) factors that enabled them to create new design solutions (Maguire, 2001; Thienmongkol & Waring, 2012). These key factors can create the product usage while covering the task of efficiency, effectiveness and satisfaction (ISO9241-1, 1997; Jokela et al., 2003).

This stage presents the evaluative and adaptive design processes of my design artwork. The details of data collection in the second stage were explained in Chapter 5, p. 154. The evaluative processes can be divided into two major steps. The *first step* was the evaluative design using the in-depth interview technique with the questionnaire. The group of participants in this step included local administrators and experts (see details, Chapter 5, p.137). The *second step* was the focus group local/non-local people (see Chapter 5, p.137). The results and feedback from both data collections would facilitate the adaptation of the design materials in the map prototype before I created the final design. The design processes in the first step are outlined in the following paragraph.

Step 1: After I had interviewed both groups of local administrators and experts, I analysed the data (see analytic processes Chapter 5, p. 165) and listed the 10 key design issues that need to be adapted. These key points will be combined with the feedback from the focus group activity (see focus group details, Chapter 7). The next paragraphs illustrate the adaptation details and design results.

The key suggestions from the expert in urban planning: **Point 1**, he suggested I adapt the detail in the BRT fare rates. The characters ‘น’, ‘จ’ and ‘น’¹⁵² should swap to ‘อ’, ‘บ’ and ‘๓’¹⁵³ (see Figure 150-a, p.279). This is because these characters seem like the same ones I used to represent the letter codes in the grid system.

Point 2, I should have provided a map legend to explain to readers about the BRT’s

¹⁵²These are the first, second and third letters in Thai. They are like A, B and C in English.

¹⁵³These are Thai numbers, similar to 1, 2 and 3 in Arabic numerals.

red and yellow lines which are services outside the city area. I had designed the graphic contents in the map section but I had not offered an explanation (see Figure 150-b). **Point 3**, he suggested that direct signage has to be provided on the map. Moreover, each exit on the transit map should tell readers the name of the next province or the next big city (see Figure 150-c). **Point 4**, I should have adapted the legends on the ‘index symbol’ section to the same grid line with the ‘route information’ and ‘key legend’ sections (see Figure 150-d).

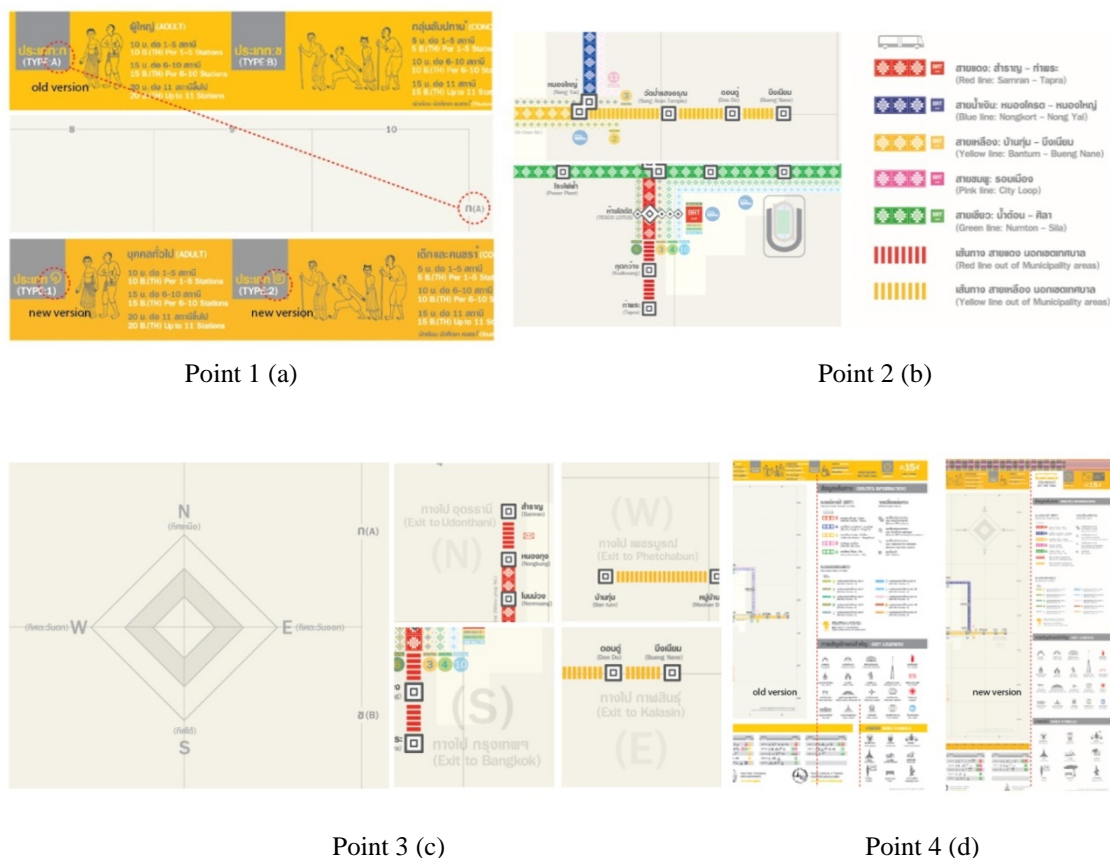


Figure 150 The four points of adaptation of the design

The key suggestions from the expert in art and design: **Point 5**, he suggested that I add something attractive at the first stage; for example, a map banner which would reflect more of a sense of Isan culture. From this point, I applied the ‘Pah-Kao-Mah’ (in Thai ‘ผ้าขาวม้า’) cloth as the concept design for my map banner (see Figure 151-a). This is because it is a famous Isan cloth which Isan people have used for many purposes e.g. dresses, work (turban and loincloth), or bathing. Moreover, ‘Pah-Kao-Mah’ can be recognised quickly as the Isan charter by Thai people who come from other regions (see more reviews about Isan textiles in Chapter 3& 6). **Point 6**, he suggested that the proportion of my map section should be increased –

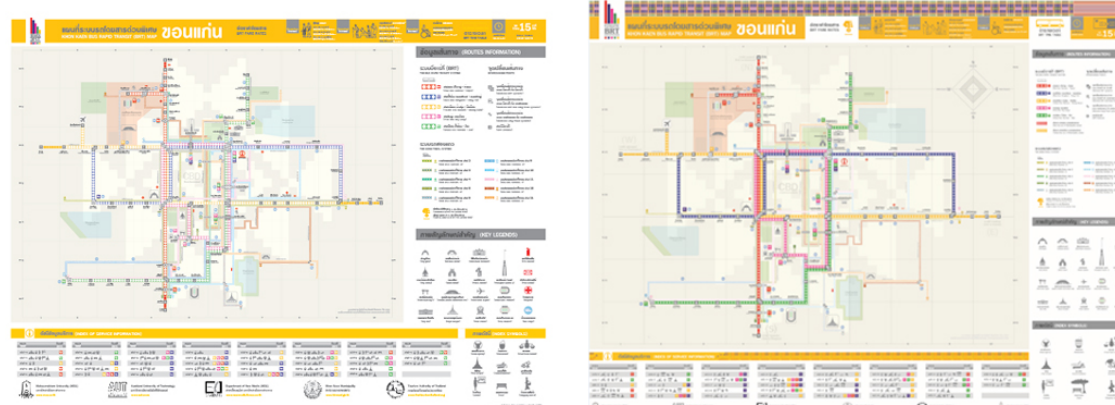
70% of the total art work area was his suggestion. He said this scale was a good proportion to create a high level of attraction for the route map section when the viewer looks at the graphic contents (see Figure 151-b). **Point 7**, he advised that I should switch the position of '(A)_n' to 'n(A)' in the grid system to the left side of the map. This change would make the sides of letters and numbers in the grid system relate to the position of the grid code in the 'index of service information' table (see Figure 151-c). **Point 8**, in the BRT timetable section, he requested that I add some key visual elements about the timing icons. He suggested that these icons could make the viewer immediately recognise my design materials (see Figure 151-d, p.281).



Point 5(a)

ตาราง (Grid)	บริการ (BRT)
๗(A)-4	BRT
๗(A)-7	BRT
๘(B)-2	BRT
๘(B)-3	BRT
๘(B)-4	BRT

Point 7(c)



Point 6(b)



Point 8(d)

Figure 151 The four points of design adaptation

*The key suggestions from the expert in transport engineering: **Point 9**, the expert asked me to swap the position of route services between the BRT green and pink lines in order to simplify the visuals. He said the pattern of the green line overlapping with the pink lines was unnecessary. He wanted me to push the green line to the outside and pull the pink line inside (see Figure 152).*

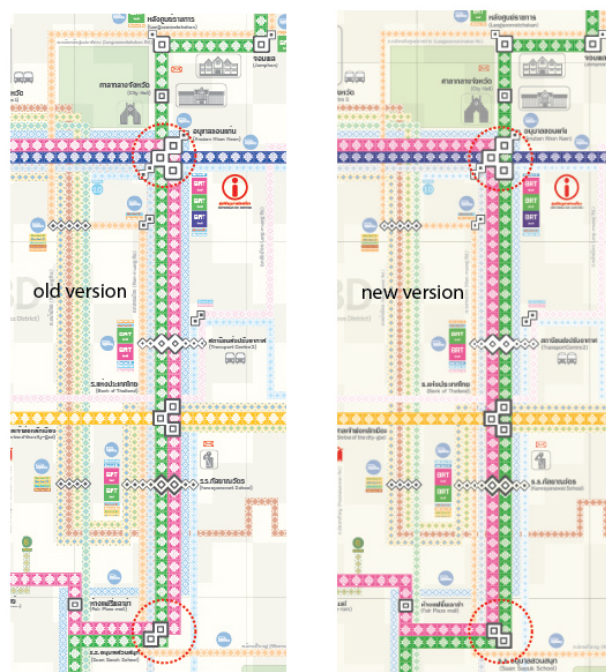


Figure 152 The point of design adaptation

*The key suggestion from the local administrators: **Point 10**, both the Khon Kaen mayor and chairman of the economic chamber suggested I add the logo of Khon Kaen University in order to give the institution credit. This is because the BRT report of the Khon Kaen municipality came from a research project of the faculty of engineering at Khon Kaen University.*

Step 2: After I had met and discussed the findings with my data collection team, we started to organise and prepare for the focus group activity. The questionnaire, using

interview techniques and discussion, was applied to evaluate the usability of my design prototype. The feedback from this activity would be integrated with the feedback from local administrators and experts, as I described above. The following paragraphs outline the design processes during and after my focus group activity.

Preparing for the focus group activity: I used a poster around the municipality area to advertise for participants in the focus group (see Figure 153). I selected the art gallery in the city as this place is more convenient for everybody to visit. I designed the presentation materials which consisted of; (1) a big vinyl inkjet poster (5000 x 2000 mm) (see Figure 153), (2) art works in each design section of my map prototype¹⁵⁴, (3) the real design prototype and (4) the label for identifying the group each participant belonged to. Next, my team and I started to clear the gallery, install the presentation materials, assemble chairs and set up the lights and electronic devices (see Figure 154).

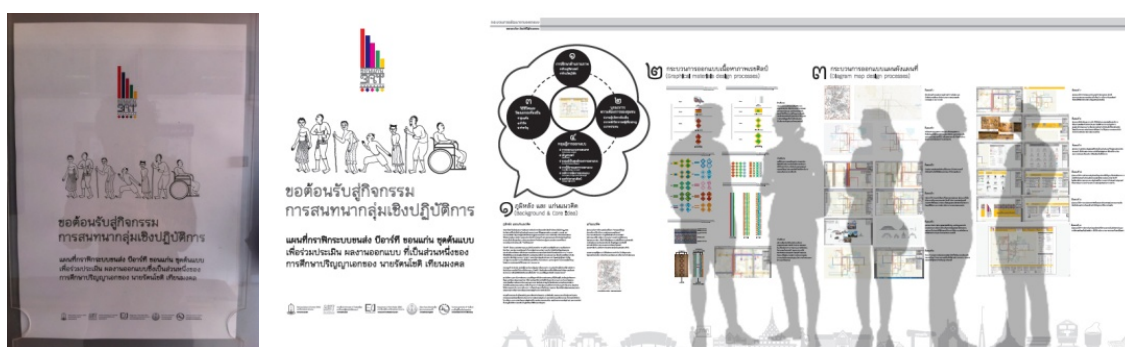


Figure 153 The poster used to advertise for participants

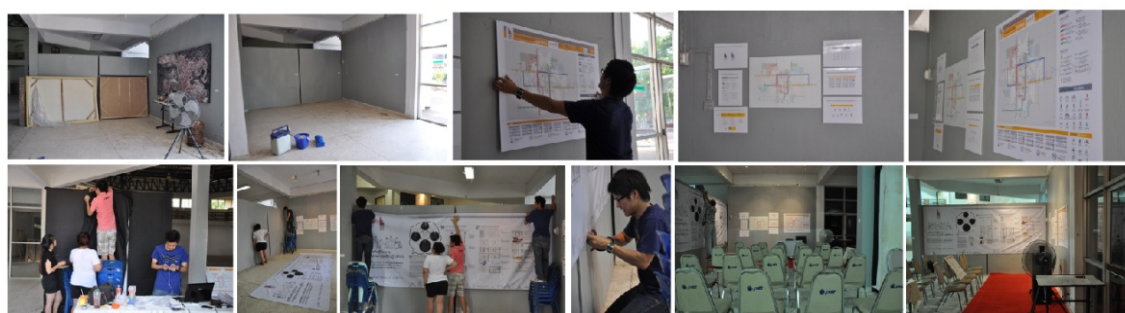


Figure 154 Preparing for my focus group in the art gallery

During the activity: My team gave ID labels to each participant in order to divide the interviewees into groups (see details, Chapter 5, p. 154). When the participants

¹⁵⁴The details of each design section consisted of; (1) the BRT logo, (2) graphic routes, (3) graphics for fare rates and timetable systems, (4) route symbols information, (5) key legends, (6) service information tables and (7) index symbols.

were ready, I introduced the background to my study. Next, we had a 15-minute break before coming back to do the usability test of my design sections and prototype. At the end of this focus group the moderator (me) held a discussion with all research participants (see Figure 155).

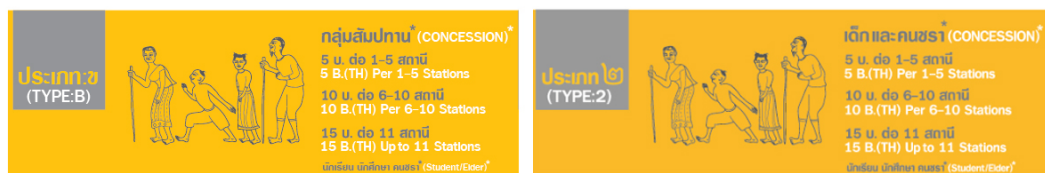


Figure 155 Presenting an outline of the activity during the focus group process

Key suggestions of the participants: After evaluating the design prototype and discussion, I analysed the data and found three points of feedback from the participants. **Point 1**, the typeface of ‘BRT’ on the logo needed adaptation. I used the Thai alphabet to create a typographic character that looked like the English letters ‘BRT’. However half the participants had difficulty with the spelling. At this point I cleared away the English letterset and replaced them with the old font (see Figure 156-a). **Point 2**, groups found the use of the word ‘Concession’ in Thai ‘Sum-Pa-Tan’ (สัมปทาน) was unclear (in the fare rates system section). In particular, the words to be replaced were ‘Dek-Ran-Kon-Cha-Ra’ (เด็กและคนชรา) meaning students and elders (see Figure 156-b, p.284). **Point 3**, I added more key visuals and details regarding the index symbols, based on a participant’s comment (see Figure 156-c, p.284) (Thienmongkol & Waring, 2012). The final design is presented in Figure 157, p.284.



Point 1(a)



Point 2(b)



Point 3(c)

Figure 156 The three points of design adaptation

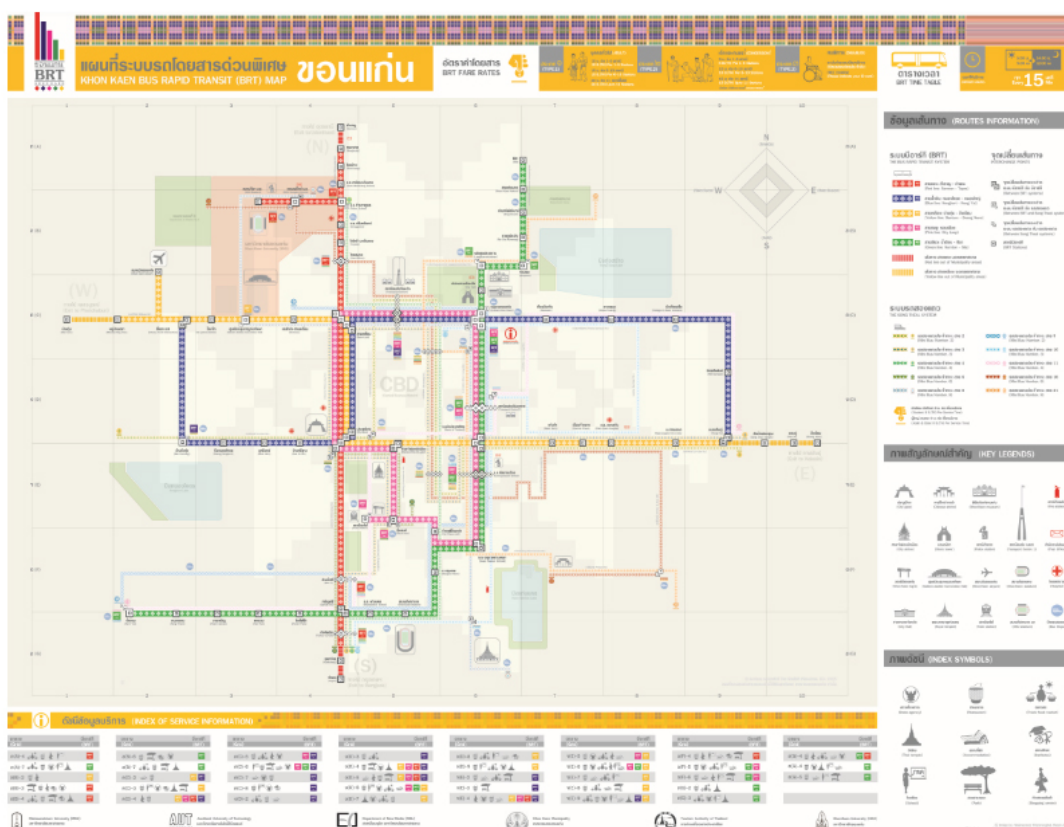


Figure 157 The final design

Summary

In this chapter I have discussed the relational processes of systematic thinking model (see details Chapter 4) in terms of practice. Three main philosophies follow: (1) co-design, (2) epistemology and (3) axiology. These were the core competencies contributing to the original design artefact (my map).

The co-design concept created a model of participatory design with the intention of analysing appropriate groups of **stakeholders** in this community. The important role of these stakeholders was shown in the priority they gave to each design process: (1) informant, (2) advisor, (3) user, and (4) evaluator. Meanwhile, the epistemology made me (the designer) consider the nature and range of knowledge that was hidden in the community (Brennan, 1994). These hidden factors can be described within the theoretical framework of systems psychology. I applied this approach in order to study and analyse the key human factors¹⁵⁵ based on the characteristics of the ethnic groups in the Isan culture (Singleton, 1989). The **HCD** theory was applied as the main principle of my research methods, in order to identify the key human factors of the stakeholders in this community. These factors allowed me to understand the key findings which led to the creation of the key design concepts (Thienmongkol & Waring, 2012). For example, the human factors in culture and society are expressed in the traditional Isan ways of life and folk wisdom in local textiles. This knowledge is reflected in the physical behaviour of local dress and products which make the Isan people look distinct from people in other regions. The local subconscious (psychology) and spirit of community are well expressed. Meanwhile, axiology was applied to contribute to the design artefacts by integrating the source of the key findings, public transport, urban plan and design theories (design elements and principles of organisational design). The **information design** principle was applied to categorise and arrange the information. Further, it was employed to organise the design theories in order to create graphic legibility and make the graphic contents clear for readers.

In summary, the ideas in my systematic thinking can be seen through three main principles. These consist of **stakeholder** analysis, **HCD** and **information design** theories. These key theories contributed to the original (identity) set of graphic materials in the Khon Kaen transit map. The graphics reflect the Isan culture and create a link

¹⁵⁵The three human factors are: (1) physiology (human behaviour), (2) psychology (experience) and (3) society/culture (complex system) (see reviews, Chapter 4, p. 124) (Brennan, 1994).

between map readers and their background knowledge. Finally, these design materials result from successful communication with the stakeholders and achieve the standard test of usability design concepts.

-Chapter 10-

Conclusion

Introduction

This chapter concludes the thesis and provides recommendations for future research and design. The first section summarises the key points of the thesis. The second section recommends further research and design of transit facilities and universal use.

Section 1: Summary of Thesis

The first section reviews the aim of the thesis and summarises the key points from the literature reviews, research design, findings, evaluative results and the contribution of the original design. Details are provided in the topics below.

1.1 Statement of Research Background

This PhD focuses on designing graphical navigation systems for a new public transport system in Khon Kaen city, Thailand. Khon Kaen is one of three major provinces involved in the BRT project. The Thai government nominated Khon Kaen as the first city to have its old UTS in the CBD reformed. Over the next few years, the city will reform the UTS by introducing the new BRT project and combine this with the old Song Thel local transport system. . The radical change into a whole new operating system will create culture shock. It will affect the transit usage behaviour of about 250,000 people in this community.

Although Khon Kaen city provides 20 lines in the Song Thel system, there is no public transport information to show people how to use it. Even the large transit nodes in Khon Kaen city provide no user information guidelines in graphic form (e.g. way-finding system of their minibuses with maps, timetables and fare rates).

A way-finding map system is a useful instrument that many scholars in the West have studied and applied to bridge the gap between passengers and their UTSs. The design standard of most graphical variables in these studies is based on Western cultures. These perspectives are very different from Thai and Khon Kaen (Isan) cultures, especially in individual cognitive learning, affecting long-term memory in the process of interpretation. The application of Western navigation system design standards to connect the gap between Khon Kaen passengers and the BRT system is not the best solution.

This point challenged me, in my roles as a Khon Kaen person, a user, a researcher and a graphic designer, to question “how can I research the real ‘local identity’ from the knowledge base of stakeholders in the community?” and “how can I transform this knowledge into the form of graphic materials on the BRT transit map?” I believed that the participation of stakeholders in the community could create identity designs in public spaces based on recognisable communication, democratic responsiveness, community ownership and respect of cultural values. To investigate this phenomenon, I chose research questions to ensure that I could identify the key variables and theories to support my graphical design materials in the public transport map of Khon Kaen city. This design contribution established an original map design which is inclusive and responsive to the knowledge base of stakeholders in the community, in order to ensure the map design reflects local cognitive experience and meets usability design concepts. The research used mixed methodologies to investigate, collect and analyse data. Thus, the study sought to answer these research questions:

- 1) How can we apply and integrate trans-disciplinary, information design, human-centred design and the knowledge of Khon Kaen stakeholders, to provide new public transport map systems for the Khon Kaen UTS which reflect Thai cognitive experience (psychology, physiology and society/culture) and meet usability design concepts.
- 2) What is the best design solution to communicate the UTS into Khon Kaen’s cultural context, in order to respond to:
 - 2.1 Community communications
 - 2.2 Suitability for the local urban transport system (BRT)
 - 2.3 Issues of representation of local (Isan) identity designs

1.2 A Critical Review of Literature

The key ideas within the literature review are divided into three main chapters: (1) literature review, (2) regional setting, and (3) theoretical framework.

(1) *Literature review*: this chapter described the key terminology, principles, applications and case study backgrounds which were engaged in my PhD. It was structured in three sections: (1) the UTS, (2) the way-finding system in the UTS and (3) case study background. The material in each section was explained, analysed and synthesised using scholars and my critical thinking in order to integrate the key critical ideas which were applied in the research processes. For example, the summary ideas of:

Urban transport system (UTS): this section explained the concepts and role of the UTS, covering the review of transit models, urban transit with geography, and trip pattern models. These principles were applied to analyse the context of the UTS in Khon Kaen city and aided me in defining the collection data areas (transit nodes) in my case study. It also helped me to understand and categorise the set of urban transport information before organising the details in map layers.

Way-finding system: this section described the conceptual framework of a way-finding system that influences the uses of the UTS. The review was divided into three major parts. Part one explained the main characteristics of the way-finding concept in the UTS guidance system. Part two explained the context of the way-finding and environmental graphic design approach in a UTS. Part three described the principle of roles, types and components in a way-finding map system. It also included a critical review about the significance of symbolism in public transport map communication. This section is the biggest section in my literature review. The material helped me understand the types of public transport maps, the influence of map symbols and symbolism in map communication, and the semiotic thinking in the ability to read maps.

Case study backgrounds: this section studied the developing concept of public transport maps in UTSs with two groups of countries, i.e. (1) developed and (2) developing. These case studies gave an overview of the conceptual framework in

issues to do with improving way-finding map processes in a UTS, solving transit problems in urban areas, analysing the improvement of a transit strategy, and passenger behaviours. It also included examples of the advantages, problems and barriers to improving a public transport map in the UTS. The material indicated developing trends and used the experiences in developed and developing countries regarding UTS contexts. The London transport system has a useful strategy when developing their urban transport map; indeed Londoners have had map reading ability for more than 100 years. The ‘Transantiago’ project of Chile is a case study that showcased the communication problems confronted by local passengers during the first period of its operation. This project illustrated the problems of urban transport reformation when not inviting users to participate in the design process. The Bangkok case study also indicated long-term problems in the Thai government’s UTS policy. This obstacle has affected the transit behaviour of users and bus drivers in Thailand. The situation not only appears in the capital but spreads to other cities in Thailand.

(2) *Regional setting*: this chapter was divided into three main sections. The first section explained the historical background of Isan culture that includes what Isan is, their ways of life, entertainment, folk art and wisdom. This material helped me to understand the roots of Isan social behaviour that influence their beliefs, perspectives, actions, cognitions and interpretations. These factors are embedded in the subconscious and ways of life that are articulated, with individual experiences, to appreciate, discover and interpret the value of everything in their existence. The second section described the overview of the Khon Kaen context – my case study area. The details covered demography, trends in urban development policy, new roles of the city, city and transit structures. The last section mentioned transport contexts and included the UTS, transit facilities, transit behaviour and culture and the new UTS.

(3) *Theoretical framework*: this chapter described systematic thinking, a phrase used to represent the research framework of my PhD. I employed holistic thinking to define the direction of research design and development for creating the transit map assisted with inquiring into the *knowledge* base of the stakeholders in the community. The knowledge reflected the local ways of life, culture and perspectives of the Isan people. These human factors contributed to the original design concept for this PhD.

1.3 Key Research Design

This topic summarises the key research design and is divided into two parts (1) research participants and (2) mixed-methods approach.

(1) Research participants: I used a stakeholder mapping technique to determine the main strategy for recruiting potential research participants, and who would be involved with the process of data collection. This concept further extended our understanding of the different perspectives, views, relationships and roles of people in the Khon Kaen community. I categorised the main group of participants, who would be the representatives of Khon Kaen stakeholders, as follows: (1) local people, (2) experts, and (3) key informants consisting of two sub-groups (a) local administrators and (b) community users/drivers of local transport. These groups were placed in different positions on the stakeholder matrix. The detail of participant groups is provided in Table 33.

BOX A: are people who have high-influence and high-importance in the community and BRT project.

This is the Key Informants group 'A', consisting of five heads of local administration:

(1) Mayor/Khon Kaen Municipality, (2) Head Officer/Khon Kaen Transport Centre, (3) Head Officer/Khon Kaen Tourism Centre, (4) Head Officer/City Sport and Tourism, (5) Chairman of City Economic Chamber

BOX B: are people, who have high-importance but low-influence in the community and the BRT project. There are three groups:

Local people (130 people, Male/Female): the group of local people such as: (1) people with disabilities, (2) elderly persons, (3) students, (4) workers, (5) business people, (6) people on high/low incomes, (7) monks

Key Informants Group B (2 people): (1) a passenger (representative 1 female), (2) a Song-Thel driver (representative 1 male)

Expert groups (3 people): (1) Transport engineering field (1 academic), (2) Urban design field (1 academic), (3) Isan folk art and Isan culture fields (1 academic)

Table 33 Details of research participants in Box 'A' and Box 'B'

(2) Mixed-methods approach: the research used a mixed-methods approach, with both quantitative and qualitative methods. Because I dealt with large and small groups of people in the community, I needed to combine several approaches, for example: deductive (quantitative) and inductive (qualitative) processes to investigate key variables (see the mixed-methods process in Figure 158, p.292).

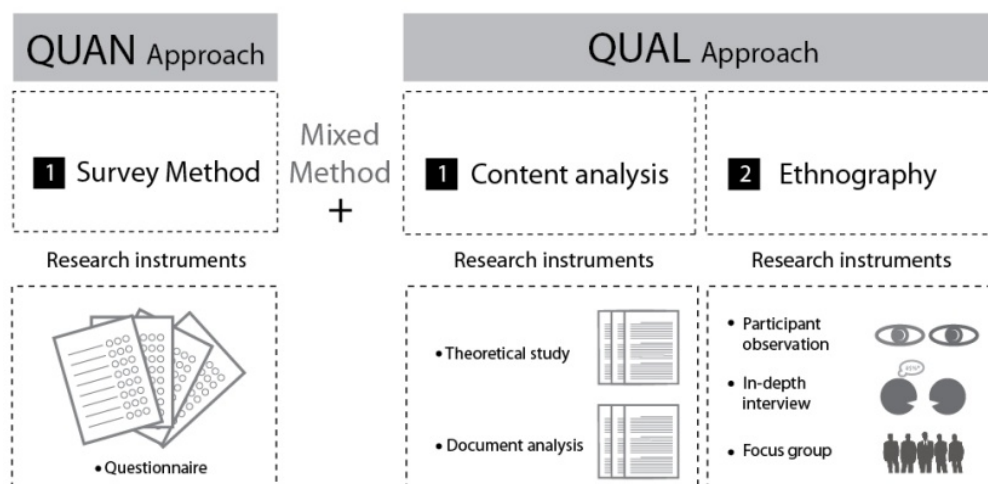


Figure 158 Mixed-method approach for data collection: the methodologies used are shown and the research instruments within each methodology are described

Questionnaire: I used a questionnaire as the main instrument to survey the sample group of target populations. The questionnaire was a deductive process. Interviewers were provided because some groups of participants might not have been able to read, or might have had disabilities which would create challenges in their participating. I applied a descriptive research methodology as the main approach to design the questionnaires. In the first phase, I piloted questions, using a choice of answer format and technical devices. In the second phase, I used random selection to choose a purposive sample. The results from the pilot group were not included in the process of data analysis.

Document Analysis and Theoretical Study: in my theoretical study, I classified the main content of the theoretical framework: (1) my systematic thinking (2) key theory concepts (information design, HCD, usability and stakeholder analysis). Documentary analysis identified the context of transport, transit behaviour and culture, cognitive map, semiology, and transit structures. It was divided into five main sections within three chapters. These consist of (1) the UTS, (2) the way-finding system in the UTS, (3) case study backgrounds, (4) Isan culture and (5) an overview of the Khon Kaen context.

Participant Observation: I used field-note techniques to record observations, and applied autoethnography to record the researcher's perspective (designer voice), which I obtained from reflections in my site work. These processes presented a transparent relationship between my field work community and me. The recording devices were a digital camera and voice recorder.

In-depth Interviews: I applied a semi-structured format which included closed (structured) and open-ended (unstructured) questions. I used unstructured questions to define the framework of questions, creating a relaxed atmosphere during the interview process. The sample group of my in-depth interviews included (1) the key informants in group A and group B, and (2) the expert groups. A snowball technique was used to recruit one academic and two local specialists in order to collect more information about the Isan textile concept.

Focus Group: my focus group process defined the usability concept as the main theme of discussions. Sub-themes included (1) usability, (2) desirability and (3) functionality (Jokela et al., 2003). My focus group was set up in the form of discussions and workshops. I used questionnaires, noted discussion ideas, and screened (classified) the group of participants as part of data collection. I used the overhead projector to present the design work, real-design prototypes and voice recorders.

1.4 Key Findings

The summary of key findings is divided into two stages, followed by the collection and analysis strategies.

1.4.1 Key Findings: First Stage

(1) In respect to transit culture and behaviour, the survey revealed 87 respondents (66.4%) regularly used the Song Thel system. More than 94% did not know how many service lines there were in this system. In addition, over 70% of Song Thel passengers were not sure about the exact route of the Song Thel service they regularly used. Regarding the new urban transport system BRT, the key findings indicated that more than 90% of Song Thel passengers did not know what the BRT system was. Moreover, 95.4% had never used a BRT system before. Meanwhile, 86.2% had never used a graphical way-finding system for travelling on a public transport system. Further, none of the respondents who regularly used local transport had ever seen any information about graphical way finding for the UTS at any bus stop in the city areas. Recognition of the service and information needs of the UTS's service quality in the Song Thel way-finding system stayed at a low level (94.2%). More than 94.3% of respondents (from a total of 87 people) needed the graphic way-finding system for the new Song Thel and

BRT systems. They (93.1%) wanted the Khon Kaen municipality to install this navigation system.

Summary idea 1: These findings reflect the results of oversight from local administrators who are in charge of the UTS e.g. Khon Kaen municipality, Khon Kaen transport centre and Khon Kaen tourism centre. During the survey and observations in the field, I found numerous people who preferred to ask for transit information from Song Thel drivers, passengers, shopkeepers or their local friends. This transit culture came from the psychical variable of poor urban transit facilities and the lack of guidance systems (transit maps, time tables, fare rates) in transit stations, shelters and stops. The lack of information created these transit behaviours, which are now deeply embedded in the transit culture of this community. Therefore, the use of a transit guidance system is a new learning experience and is an innovation for local people in the city.

(2) With regard to city and cultural perspectives, stakeholders were in agreement about the definition of Khon Kaen city. They mentioned that Khon Kaen is the centre of the Isan region with respect to the economy, transportation, education, investment, culture and medical care. More than 70% of the people, 67% of the experts' group, and 100% of the key informants group B (drivers and passengers) selected 'Khaen' as the symbol of Khon Kaen city. Sixty per cent of the key informants group A (local administrators) chose the Sin Chai hero as the symbol of Khon Kaen city. In terms of the most favoured prominent forms of local (Khon Kaen) culture that the stakeholders wanted to present to visitors, results indicated that 40% of the local administrators, 100% of community drivers/passengers, 67% of the experts and 75% of the people's group chose traditional Isan textiles. Sixty per cent of the local administrators supported Sin Chai as the most favoured prominent form of Khon Kaen culture.

Summary idea 2: The result of cultural perspectives from stakeholders can be separated into two major parts. The first is the people's and expert groups; the second is local administrators. The people's group also included key informants B. Most of the experts selected 'Khaen' (70.1%) and 'local flower' (13.1%) as the symbol of the city. They also selected 'Isan textile' as their favourite prominent form of local culture. These perspectives differ. Most of the local administrators (80%) and a small number of experts (30%) selected 'the legend

of Sin Chai’ as the symbol and the most favoured prominent forms of local culture; even though this legend was not concerned with the historical sites or the geography and calendar of Khon Kaen city.

I analysed the inconsistency between both perspectives and found that the first group selected Khaen, the local flower and Isan textile, based on social behaviour, which is concerned with their local ways of life, nature, beliefs and folk wisdom. These variables were embedded in their subconscious and evidenced through observations. I found the design artefacts in city areas such as a hotel building, Khid patterns on the road, design sculptures, road signs and some street furniture were related to Khaen, Isan textiles, and the Koon (local) flower. These express the traditional ways of life in this community, which is consistent with the suggestions from the experts regarding the Khon Kaen city slogan¹⁵⁶. The evidence also corresponds with historical art in the murals on the walls of the temples in the province. Meanwhile, the second group found that the legend of Sin Chai and Sin Chai heroes were chosen as the key culture and symbols of the community because of the urban development policy. They said that the legend of Sin Chai could become a selling point for the community, educational system, urban policy and townscape in order to respond to the aims of central government. The second group contained many participants who were not Isan born and raised.

Summary idea 3: From the findings in the first stage, I noticed that the Sin Chai concept was not prominent in the locals’ minds. Without any answer from the people, the groups discussed Sin Chai; though the sculptures of Sin Chai heroes had been installed on the top of power poles around downtown areas by the Khon Kaen municipality. The Sin Chai concept was also defined as the design theme for creating the new UTS identity. This evidence reflects how the local administrators overlooked the voice of the people when participating in the public design process.

Summary idea 4: The implementation of public design policies without involving the participation of the local people is an expression of the ‘top-down structure’ the local government has employed in their administrative system,

¹⁵⁶In the KhonKaen slogan, the key statement talks about Khaen, the local flower and Isan textile (Par-Mai).

with no genuine public consultation. The component in this system consists of (1) local administrators, (2) central or state agency and (3) local university. From these components, it can be seen that the local people just play the role of users, who have never had the chance to share their voices. However, they are the target recipients and users.

Summary idea 5: This study plans to incorporate an holistic response of all stakeholders in this community. Both groups had perspectives voicing support for the community's life cycle. Therefore, the administrators' requirements (Sin-Chai) needed consideration. Consequently, after I had analysed the data from all stakeholders and documents (secondary data) in the first stage of data collection I found Khaen, the local flower, Isan textile and Sin Chai were the key representations that the stakeholders recognised as symbols and key aspects of the local culture in their minds. These things were brought in to define the key design concepts for my transit map prototype.

1.4.2 Key Findings: Second Stage

This stage summarised the key findings from the evaluative design of my transit map prototype. The sum of all the design scores from all groups of participants¹⁵⁷ stayed at 3.73 from four points or 93.25% from 100% (see Table 34, p.297). This number represented the level of the usability test standard of the ISO9241-1. This standard consists of three criteria: (1) efficiency (usability), (2) effectiveness (functionality), and (3) satisfaction (desirability) (ISO9241-1, 1997; Jokela et al., 2003). The total of 93.25% from this test gained the public communication achievement of ISO7001, which the code defines as 'developing comprehension in public information design symbols'.

¹⁵⁷These include the local administrators (5), experts (3) and local people (24).

The description of sum design scores (map prototype)				
Sections	Numbers (N)	Min	Max	Mean
(Sec. 2) BRT logo	32	2.66	4	3.65
(Sec. 3) Graphic routes	32	3.1	4	3.73
(Sec. 4) Fare rates & timetables	32	2.88	4	3.65
(Sec. 5) Route-symbol information	32	3.15	4	3.68
(Sec. 6) Key legends	32	3.15	3.96	3.78
(Sec. 7) Service information tables	32	3.16	4	3.68
(Sec. 8) Index symbols designs	32	2.85	3.96	3.7
(Sec. 9) Overall design materials	32	3.33	4	3.83
Sum design scores	32	3.22	3.91	3.73
Valid N (list-wise)	32			

Table 34 Recognition of sample groups in the design prototype

Summary idea 1: Since 1970, the ISO suggested the level of public communication success should reach a figure of 67% comprehension of the control group using the symbol system (ISO7001, 2007a). Hence it can be stated that the sum design scores of this transit map have been achieved as suggested by the level of ISO7001 regulation, before being used in public space. However, the low point figures in table 34, section 2 (2.66), 4(2.88) and 8 (2.85) raised my awareness regarding which parts were unclear in the graphic material in the map prototype. I re-designed and re-organised the material following comments from all participants. The next paragraphs summarise my redesigned outcomes in each low point section.

Redesigned Outcomes: In **section 2**, the adapted point was the typeface of ‘BRT’ on the logo. I applied the Thai alphabet to create a typographic character that looked like the English ‘BRT’ alphabet; however half the participants had difficulty with the spelling. At this point I cleared the typeface of the English alphabet and replaced the old font (see picture (c) in Figure 159, p.297). In **section 4**, the word ‘Concession’ in the Thai language “Sum-Pa-Tan” was found to be unclear (in the section about the fare rates system). In particular, the words to be replaced were “Dek-Ran-Kon-Cha-Ra” (students and elders). Regarding the timetable, I adapted the day and night period icons (sun and moon) and colours to enable fast recognition (see pictures (a) and (b) in Figure 159). In **section 8**, I added more key visuals and detail to index symbols based on one

participant's comment (see picture (d) in Figure 159). The final design is presented in Figure 157, Chapter 9 (p.284).



Figure 159 Results from focus group feedback

(a) Adaptation part of fare rates, (b) Adaptation part of timetable, (c) New logo and (d) Adaptation part of index symbols.

Summary idea 2: From the results of the evaluative design process, the significant finding in the interpretative process of local people with a symbolic system needed consideration, and to be extended in more detail. For example, design section 8 (index symbol) showed that the minimum score of the usability test remained at 2.85 from four points (see table 34, p.297). The participants asked me to improve some of the problematic symbols. They wanted me to add a new key visual in order to make the meaning clearer. A new key visual occurred during the focus group activity. The revision process ensured the form of the symbols remained close to the actual objects each symbol represented.

With this revision, it can be seen that the cognitive level of participants was close to the semantics stage. Clarke (1987) and Daniel (2007) state that semantics is one of the three semiotic levels which is placed at the first stage of human cognition. Semantics describes the relationship between signs and things;

they refer to denotation. Simply, the level of semantics was ‘image-related’. Many scholars define this level of semantics as a highly pictorial representation of the object or action considered; it is also a direct comprehension of the symbol itself (Beardon, 1992; Modley, 1976; Y. Rogers, 1989). However, this natural learning helped me develop suitable map symbols that related to the cognitive level of my target users. This discovery may be useful for any designer who wants to study and develop public design in this community.

1.4.3 Limitations

A critical review and case study of Western theories, philosophies and methodologies and the ideas they trigger on graphic way finding, or participatory design, in a Thai and Isan context, has not been attempted before. This has led to my exploring and experimenting with Western concepts, and interrogating them as to how they might usefully translate to the Thai context. A key change in the focus is in the move from individual to a community starting point for the researcher. I have used this approach to break new boundaries in Thai design through a holistic approach which enabled a new understanding of what ‘participation’ in public design means, in a Thai context.

My research design is very experimental and original in Thai academic design contexts. The use of mixed methods based on a qualitative approach to investigate a community is unusual in Thai academic design research. My attempts at holism may have compromised depth and texture at times, especially when I had a small number engaged in some fieldwork participation.

1.5 Key Contributions

This topic summarises the key contributions in this PhD and is divided into three domains. (1) design artwork (my transit map), (2) new approaches for Thai design practice, (3) participatory model and (4) prototype design.

(1) Design artwork: I created an original transit map design based on the knowledge base of stakeholders in my community. The key findings were experimented with and then transformed into the graphic materials that articulated the roots of local culture, folk wisdom, ways of life and cognitive experience. The summary of my design concepts and experimental ideas are as follows:

I utilised the knowledge base of the local people and experts and the needs of local administrators in my design. Figure 160 presents the design of the BRT logo, based on the concept of ‘Khaen’ and the five new routes of the BRT system. The colours on the logo reflect the arrangement of the route construction beginning with the red route and ending with the yellow route. I also addressed the needs of the local administrators by applying the Sin-Chai mural painting style to the map (in the fare rates information). The pictograph of people was created based on a local artist’s style (see Figure 161).



Figure 160 The developing concept of the BRT logo. The key idea came from a Khaen

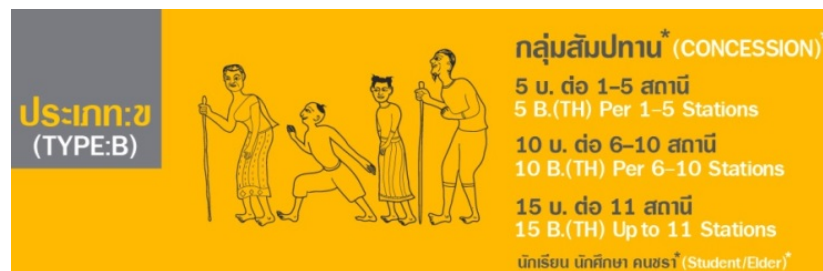


Figure 161 The development design of the fare rates system. The concept of these pictographs was taken from a mural on the wall of a local temple. It is a part of the Sin Chai story

Figure 162, p.301 shows the design concept as applied to a basic pattern of traditional local textiles (Par-Mai) to create the original graphic style for the Khon Kaen BRT map. The designing of Isan textiles consists of two pattern lines (the major and sub lines pattern). I found a logical link between Isan textile design and the Khon Kaen UTS context and applied this traditional knowledge to define the concept of our transit map prototype. I substituted the BRT as the major pattern because, the BRT will be the major transit system of the city. Meanwhile, the mini-bus system was represented as sub patterns because this mode will become a supporting part of the BRT system. The final completed map is provided in chapter 9, figure 157.

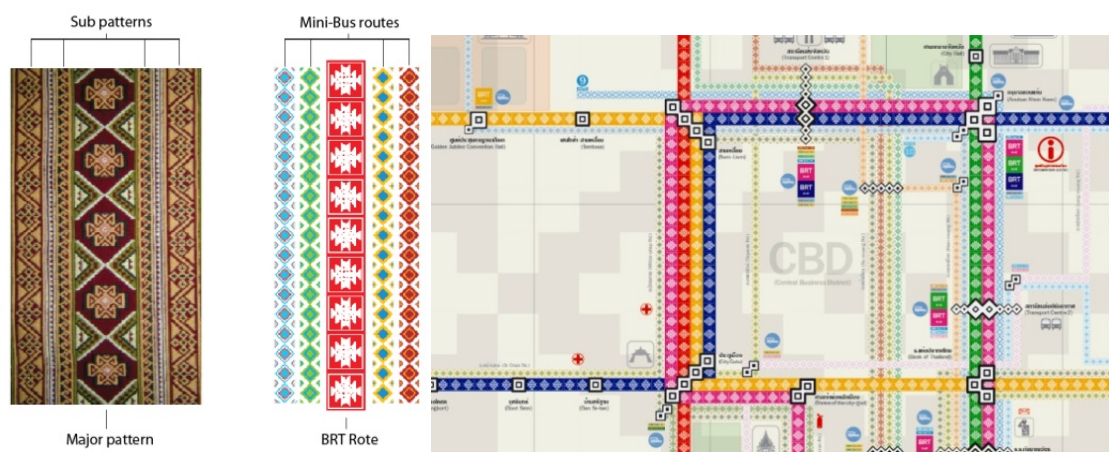


Figure 162 shows experimental design concepts from a local textile concept used to create the original design of graphic routes on the Khon Kaen BRT map

(2) *New approaches for Thai design practice*: Systematic thinking was applied to organise complex data across social behaviour, phenomenology and ethnography. I managed complex variables of each factor, and searched for the relationships between them in order to create an efficient workflow in my research investigation. My research investigation applied a pragmatic paradigm, which placed my research inquiry as central, and applied all approaches to understanding the problem (Creswell, 2008). This triangulation of methods generated an internal validity of the findings and created external validity when applied to the results of other findings. This is a significantly new approach in Thai design.

I conducted fieldwork to inquire into the knowledge base of the stakeholders in the community reflecting the local ways of life, culture, arts, folk wisdom, cognitive learning, development of urban policy, and community design ownership. These human factors contributed to the original design concept for my map design. This is a new approach to design in a Thai public policy context. It could be further applied to develop a public design model for other cities in Thailand but the variations of stakeholder and human factors need to be considered anew, given the different contexts in each community.

(3) *Participatory model*: This model was created to accommodate many stakeholders in the Khon Kaen community. Sharing their knowledge and experience was a key principle in my design process. The conflicting perspectives between stakeholders in the field, especially the local administrators and the people's groups, in respect of city

symbols and cultural concepts, made me realise that the top-down administrative system could not support the developing trend of public design (city image) policy. The integration of a bottom-up model in this case study was required.

My participatory model was based on democratic response and community participation in the public design project. I analysed the components of stakeholders who were involved with the new UTS (BRT) project and gave them a chance to share their voices in a sense of community ownership.



Figure 163 My proposed model of participatory and collaborative design in a public design project

This model (figure 163) was applied to integrate the knowledge base of stakeholders in my case study in order to facilitate the sharing of their voices about public design in their community.

(4) *Prototype design*: My fieldwork approach can be applied as a prototype to organise public design in other cities in Thailand. The variety of stakeholders in each component may have to change because of the different contexts including local policy, city structure, size and leaders, all of which are keys to implementing this participatory model. This is a new paradigm of design context in Thailand. This is the first time a Thai (graphic design) academic used a high level conceptual model to form the texture of research design. From my research experience in Thailand, research is not built

from paradigms or methodological levels, research in design also develops ideas in a different context. The next section describes future research and practice issues that have emerged as further design/public policy fields in this thesis, in which I wish to engage.

Section 2: Recommendations

This section recommends the further design and study which the Khon Kaen public transport map needs to be connected with in the future. These recommendations will support and facilitate the UTS to completely achieve service communication and usability. It consists of two main topics, design suggestions and transit facility and universal use.

2.1 Design Suggestion

To extend the recognition of the new UTS by users, Khon Kaen municipality needs to provide the corporate design on service vehicles by designing the remarkable system. This remarkableness will articulate and increase individual remembrance between the map symbols (on the transit map) and virtual object of service vehicle. Figure 164 presents design ideas which could be applied by merging the map symbols of route information onto the service vehicles. This merging idea will be also applied to the road texture in the stop zone.



Figure 164 Design suggestions

I suggest that these design ideas should be associated with a commitment from the local state agencies that should include (1) Khon Kaen city municipality, (2) Khon Kaen transport centre and (3) Khon Kaen provincial police (department of traffic police). I believe that these organisations have the power to implement these design ideas, and define the new traffic policy for this. In the future, these design ideas should be defined as the design standard in the UTS toolkit of the city municipality, when they need to improve or construct a new transit facility, e.g. a new service vehicle, stop, or bus shelter. The toolkit is described in the next topic.

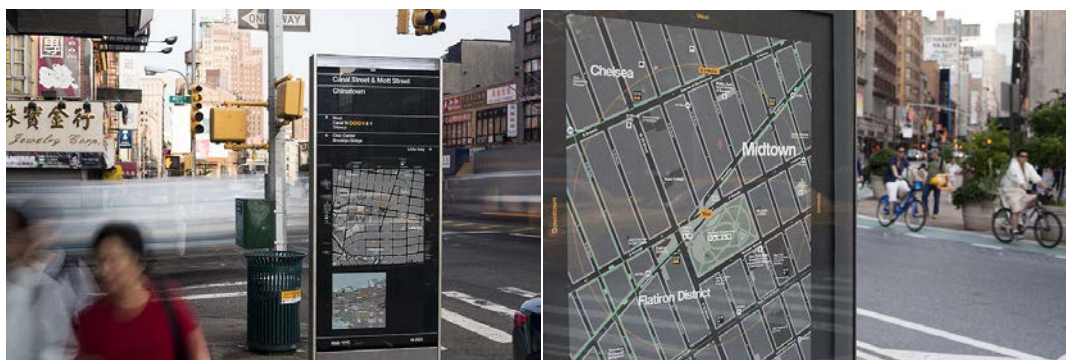


Figure 165 Examples of street furniture

A city information system (or city way finding system) is another significant piece of research which is an emergent consideration for the city. The system would not only provided linkage with the way finding for UTSs in Khon Kaen community, this would also provide information alternatives for residents and visitors. In developed countries such as United State (New York) and United Kingdom (London) found that more than 31 per cent of all trips are made on foot (Fast Company, 2014) (see Figure 165). These information systems can support and increase the numbers of pedestrians to get to their destinations. A research team for London transport found that for a sample group of pedestrians provided with pedestrian way finding maps getting lost decreased by 65 per cent. In addition, the numbers of pedestrians increased by 5 per cent in these areas (Fast Company, 2014).



Figure 166 A cycleway map of Auckland City provided for cyclists

In the future, I considered that this system should also include cycleway maps for people who are riding bikes (see Figure 166). Wi Fi technology with hotspot locations linked to mobile telephones or smart devices can provide navigation.

2.2 Transit Facility and Universal Use

This topic recommends further study of the new UTS of Khon Kaen city including the transit facility which is concerned with a barrier free design concept. The lead organisation needs to pay greater attention to this issue in order to support disabled persons along with the average person using the UTS. Street furniture is a grouping term for items and pieces of kit installed on streets for different objectives. It can be street name signs, phone boxes, post boxes, bollards, traffic lights and signs, way-finding boards, bus stops and shelters. In some situations, such as a transportation context it may be called a ‘transit facility’ (see Figure 167, p.306). The design process of street furniture relates to human physiology such as, human proportions (height and width averages) and eye perceptions (vertical and horizontal fields of vision). It also includes the physiology of disabled people, in order to make facilities meet with requirements of the main universal standard of usage (Neufert, 1993). This is the main idea that requires study for an holistic approach to the UTS. It is not only development of a service track, bus system, or service time; rather the city needs to consider the development of a universal design concept in order to support a whole new UTS.



Figure 167 Examples of street furniture

2.2.1 The Relationship between Transit Facility and Universal Design Concepts

Body dimension and reach characteristics of humans are a significant component of architectural designs, which includes the field of transit facilities (Neufert, 1993). Universal design is an international concept of the United Nation. They promote full access for all in physical environments. People with disabilities can use all facilities designed in buildings and environmental settings (The Institute of Siamese Architects, 2009). The development of this design concept moves from accessible designs into adaptable designs, and finally, barrier free designs (Story, 2001). These concepts were accepted as principles of universal design and involve the equitable, flexible, simple and intuitive uses of facilities, with different ages, sexes, physiques and disabilities (Story, 2001). The universal design principle also includes perceptible information, tolerance for errors, sizeability and the human body to move in space for reaching dimensions (Neufert, 1993; Preiser & Smith, 2011). Therefore the design of a transit facility has to take into account the collaboration between the practice of universal concepts and human body movement. For example; in the case of designing a public transport map in a board, designers need to understand the eye perception of both groups of people (average and disabled persons) who come to wait in a bus shelter. Many people with a disability (children and/or short people) have eye perception in the sitting position, while the average person prefers the standing view (see Figure 168, p.307). Therefore, to design a board to meet with 'equitable use' under the concept of universal design, designers have to consider the size, space and height levels of the way finding board in meeting the requirements of both human physiologies.

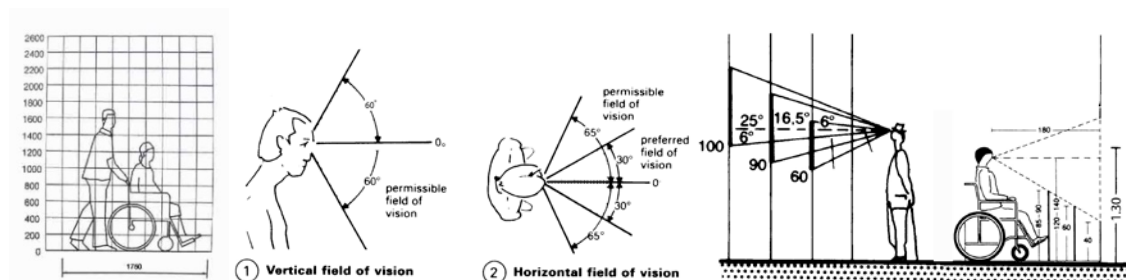


Figure 168 Eye perceptions between average and disabled persons,

2.2.2 Why the Universal Design Concept is Important for a UTS in Khon Kaen City

The National Statistical Office (NSO) (NSO of Thailand, 2007) reported that the number of disabled people increased 2.0% from 1991. This percentage means that 2 in 100 Thai people will be persons with disabilities. Meanwhile, the Northeast (Isan) region ranks number one in the country with 328,686 disabled people and Khon Kaen was ranked second in this region at 28,567 people (MSDHS, 2009a, 2009b). The Thai government promulgated three Acts to cover people with disabilities: the Act of Rehabilitation for Disabled (1991), the Act for Elders (2003), and the Act for Disabled and Elders (2005). These Acts address special support in a variety of fields, for example: medication, education, life-skills (The Institute of Siamese Architects, 2009). These Acts also include the condition of facility designs in an environment, for example: building structures (hospitals, markets, shopping centres), vehicles (buses, ferries, airplanes, and trains), and transportation (bus and train stations, airports, footpaths roads), but most organisations have ignored these regulations (The Institute of Siamese Architects, 2009). This problematic situation also includes the UTS organisations in Khon Kaen city. The UTS will be the backbone of social activities, which involves the daily life of every person, but Khon Kaen city has ignored the development of transit facilities in the CBD area. The transit facilities are of a poor standard to serve these groups, as demonstrated in Chapter 6, Figure 79 (p.188).

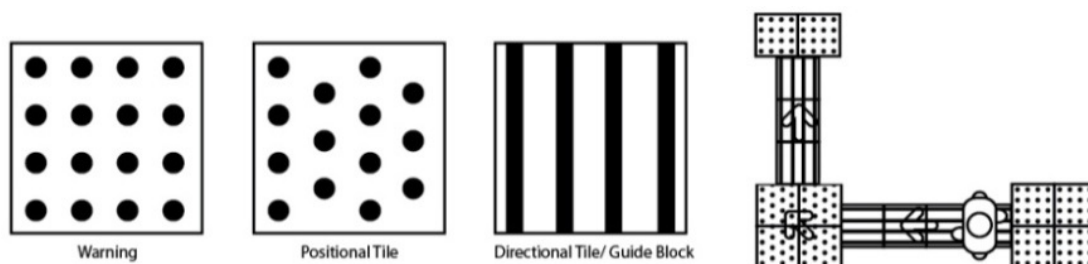


Figure 169 These pictures present the guideline block that is one of the design conditions under the concept of Barrier-Free Access design,

The Barrier-Free Access (BFA) for public transport passenger facilities under the concept of universal designs can assist Khon Kaen city to improve their transit facility to meet the standard level. The BFA concept divides general guidelines for designing passenger facilities into three modes; (1) Guidelines concerning passenger movement (pathway and slope); (2) Guidelines for location guides (visual display facilities, and guidance facilities for handicapped people, children, short people and those with a load to carry); (3) Guidelines for facilities and devices (ticket machines, and information desks) (ECOMO, 2001; The Institute of Siamese Architects, 2009). For example in the first mode, the pathway under BFA concepts needs to install a positional tile (or guiding block) on the pathway in order to guide direction for blind people in the area of bus shelters. The meaning of each block is defined by the texture of the tile (see Figure 169). With the second mode; the height of information boards, its conditions need to limit the height level, which should meet the eye level of disabled in a wheelchair, children, and short people. Figure 170 (p.309) presents some examples of BFA for public transport passenger facilities under the concept of universal design, for example: the (top-left) picture shows the high level that meets with the requirements of average and disabled people (children and short people); the (top-right) picture presents the high level and distances for installing information signs that do not hide the disabled in a wheelchair (children and short people); and the (bottom) picture shows the appropriate height level of a ticket machine for disabled on a wheelchair (children and short people). It also includes the height level of navigation boards with the eye level of average/disabled and short people (or children) inside the bus shelter. Regarding the third mode; the ticket machines, the height and width levels of the machines need to be appropriate for the disabled, children or short people.

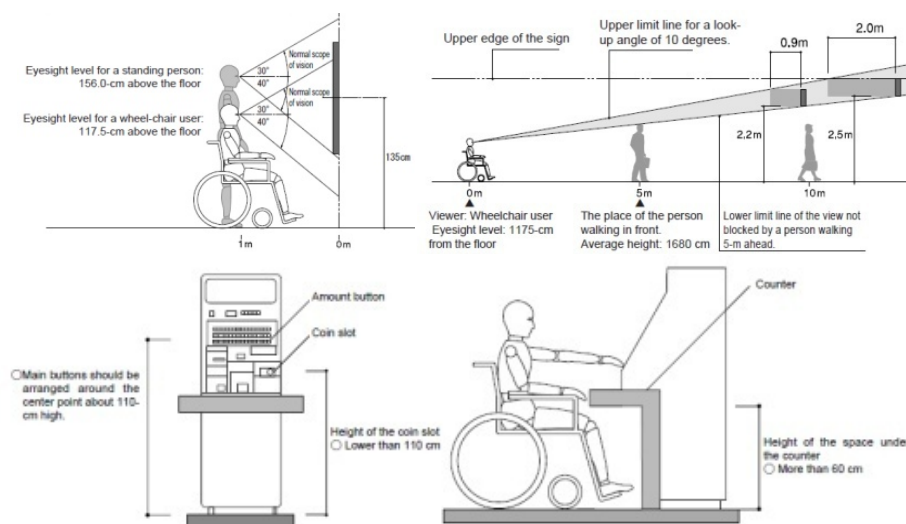


Figure 170 Public transport passenger facilities signage in the context of universal design,

Finally, the collaboration between the transit facility and universal design based on human factors (ergonomic) are the key principles to design the Khon Kaen UTS transit facility design guidebook. This collaboration will involve the standard installations in the transit facility (chairs, shelter, and pillar boards) and the navigation system sign board, in each transit level. Although the facilities will be created under the requirement of universal design, it will be based on the physiological human factor of Thai people. It involves the relationship of using space with Thai body size, and reach dimensions of normal/disabled people in a bus shelter, including the height level of visual display facilities (navigation systems), which will be installed in any bus stops.

Summary

The statement of research background, literature review, key research design and findings were concluded in the first section. Meanwhile, the design suggestions and further study that the Khon Kaen UTS needs to consider were provided in the next section. Finally, the original graphics in my transit map are not created based on an ego perspective. They aim to share and exchange the knowledge of local spirit, folk wisdom and way of life via the cultural perceptions of visitors who read my map. In the meantime, my participatory model can be the prototype for the local government to create community participation in a public design project. I believe that this case study will express the democratic responsiveness in a public design for my country and empower people within the community to take ownership of such design.

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-GLOSSARY-

-Abbreviation-

3Ds	Three Dimentions
ADA	Americans with Disabilities Act
AEC	Asean Economic Community
AIGA	American Institute of Graphic Arts
BART	Bay Area Rapid Transit
BFA	Barrier Free Access
BMCL	Bangkok Metro Public Company Limited
BMT	Bangkok Mass Transit
BMTA	Bangkok Mass Transit Authority
BRT	Bus Rapid Transit
BTS	Bangkok Transit System
CLID	Centre of Lifelong Infrastructure Development
EGD	Environmental Graphic Design
EWEC	East-West Economic Corridor
GDP	Gross Domestic Product
GIS	Geographic Information System
HCD	Human-Centred Design
ISO	International Organisation for Standardisation
KKLTAO	Khon Kaen Land Transport Authorisation Office
LATCH	Location, Alphabet, Time, Category and Hierarchy
LRT	Light Rail Transit
LUG	London Underground
MRT	Mass Rapid Transit
NESD	National Economic and Social Development
NSO	National Statistical Office of Thailand
OTP	Office of Transport and Traffic Policy and Planning

TL	Transport for London
TOD	Transit-Oriented Development
TP	Trip Patterns
TS	Transantiago
UN	United Nations
UTS	Urban Transport System
YAH	You Are Here

-Thai and Isan terminologies-

Chadok	or ‘Jataka stories’ are the stories of the Lord Buddha’s birth. Most of the Chadok stories present just the last 10 worlds from 1,000 of the Lord Buddha’s world (‘world’ means the cycle of birth and death)
Heat Sim Song	The twelve traditions of Isan people
Hooptam	An Isan mural art
Isan	Refers to the Northeast region in Thailand and the people who live there
Isan people	The people who are original citizens in Northeast region of Thailand with a strong cultural identity and way of life e.g. foods, eating, customs, culture, amusements and beliefs
Ka Trip Kau	An Isan household container particularly for keeping sticky rice
Kaen-Na-Kron Lake	The name of lake in Khon Kaen city
Khaen	An Isan mouth organ made from bamboo
Khid	A name of the Isan weaving techniques
Khon Kaen	The name of province in Thailand
Khon Kaen Log	The timber symbol of Khon Kaen city
Koon Flower	The name of local flower in Khon Kaen province
Krong Sim See	The fourteen manners of Isan people
Lan Chang Empire	From 1326 to 1778, the Lan Chang Empire covered the area of the Mekong River, Laos and north-eastern Thailand, some parts of Cambodia, Myanmar, Vietnam and southern China
Line Kor	One of the Khid patterns which represent the shape of a hook
Morlum	Isan country folk music is the most entertaining for the people of Isan

Pah-Kao-Mah	Isan loincloth
Pang Jan City	The name of city in Chadok Tales
Par Mai	A silk cloth
Sim	Buddhist temple
Sin Chai	Sin-Chai is the legend of the MeKong River culture in the Lan Change Empire
Song Thel	The name of local transit system in Khon Kaen city

-APPENDICES-

Appendix A: Approving of ethics document from Auckland University of Technology



MEMORANDUM

Auckland University of Technology Ethics Committee (AUTEC)

To: Marilyn Waring
 From: **Dr Rosemary Godbold** Executive Secretary, AUTEC
 Date: 3 November 2011
 Subject: Ethics Application Number 11/280 **Using information design and human-centred approaches to create navigation systems for new urban transport systems in Khon Kaen, Thailand**

Dear Marilyn

Thank you for providing written evidence as requested. I am pleased to advise that it satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC) at their meeting on 10 October 2011 and I have approved your ethics application. This delegated approval is made in accordance with section 5.3.2.3 of AUTEC's *Applying for Ethics Approval: Guidelines and Procedures* and is subject to endorsement at AUTEC's meeting on 28 November 2011.

Your ethics application is approved for a period of three years until 3 November 2014.

I advise that as part of the ethics approval process, you are required to submit the following to AUTEC:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/research/research-ethics/ethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 3 November 2014;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/research/research-ethics/ethics>. This report is to be submitted either when the approval expires on 3 November 2014 or on completion of the project, whichever comes sooner;

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are reminded that, as applicant, you are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

Please note that AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to make the arrangements necessary to obtain this. Also, if your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply within that jurisdiction.

When communicating with us about this application, we ask that you use the application number and study title to enable us to provide you with prompt service. Should you have any further enquiries regarding this matter, you are welcome to contact me by email at ethics@aut.ac.nz or by telephone on 921 9999 at extension 6902.

On behalf of AUTEC and myself, I wish you success with your research and look forward to reading about it in your reports.

Yours sincerely

Dr Rosemary Godbold
Executive Secretary
Auckland University of Technology Ethics Committee

Cc: Ratanachote Thienmongkol ratanachote.t@msu.ac.th, jpc3498@aut.ac.nz

From the desk of
 Dr Rosemary Godbold
 Executive Secretary
 AUTEC

Private Bag 92006, Auckland 1142
 New Zealand
 E-mail: ethics@aut.ac.nz

Tel: 64 9 921 9999
 ext 6860
 Fax: 64 9 921 9925
 page 1 of 1

Appendix B: The indicative question for an in-depth interview: Key informants group A

Indicative questions for interviews (English)



KA: The interview questions for local administrators of Khon Kaen city municipality

G-1: How many years have you lived in Khon Kaen province or Isan region?
.....

G-2: How would you describe “Khon Kaen Municipality” from your perspective?
.....

G-3: What are your favourite prominent forms of local (Khon Kaen) cultures?
.....

G-4: What is a key symbol of Khon Kaen province in your opinion?
.....

KA-1: What will the character of Khon Kaen Municipality look like in the next 10 years?
.....

KA-2: What do you think about the efficiency of the local transportation service (Song Thal) in Khon Kaen Municipality in the following aspects?

KA-2.1: The service time

KA-2.2: The pickup/drop off points

KA-2.3: The local transport information service

KA-2.4: Other
.....

KA-3: What are the urgent problems of local transportation (Song-Thal) that should be addressed, in order to improve the quality of services and support the public sector, business and tourism industries, for making Khon Kaen Municipality a hub of transportation in the Isan region?
.....

KA-4: What plans are there to offer a local transport information service in the Khon Kaen Municipality area?

KA-4.1: How do visitors and foreigners learn how to use local transport?
.....

KA-5: Have you considered the installation of wayfinding (transit) map system for urban transportation in Khon Kaen Municipality area? (e.g. service timetables, routes map, pickup/drop off points, and fare rates)

KA-5.1: Who should be responsible for this system?
.....

Indicative questions for interviews (English)

KA-6: Have you visited cities anywhere that have graphical navigation systems for urban transportation?

KA-7: What are the developments plans to improve the urban transport system in Khon Kaen Municipality?

KA-7.1: Short term development plans (3-5 years)

KA-7.2: Long term development plans (10-20 years)

KA-8: How do you plan to change the transit behaviour of Khon Kaen people for the future BRT system?

KA-9: DO you have plans to “Improve the service quality of the Song Thal system”?

KA-9.1: What are these plans?

KA-10: If Khon Kaen Municipality is to have a modern urban transport system, what changes would you expect in the city?

Thank you for your time

Appendix C: The indicative question for an in-depth interview: Key informants group B (Users)

Indicative questions for interviews (English)



KB1: The interview questions for community users of local transport (Song Thal) in Khon Kaen city

G-1: How many years have you lived in Khon Kaen province or Isan region?

.....

G-2: How would you describe “Khon Kaen Municipality” from your perspective?

.....

G-3: What are your favourite prominent forms of local (Khon Kaen) cultures?

.....

G-4: What is a key symbol of Khon Kaen province in your opinion?

.....

KB1-1: How many local bus (Song Thal) tracks are serviced in Khon Kaen Municipality?

.....

KB1-2: How did you/do you find out how the Song Thal system works?

.....

KB1-3: Do you get-on and get-off the local bus at permitted stops in the Khon Kaen city municipality, or wherever you want to?

.....

KB1-4: Do you know the timetables of the local bus that you regularly use at your regular stop?

.....

KB1-5: Would it be useful for you to have local transport information, such as:

KB1-5.1: routes service

KB1-5.2: timetables

KB1-5.3: pickup/stop areas

KB1-5.4: Why?

.....

KB1-6: Would you like Khon Kaen Municipality to install a graphical navigation system (e.g. routes service, timetables, and pickup/stop areas) for local transport?

.....

Indicative questions for interviews (English)

KB1-7: Do you have any suggestions to improve the service quality of the local transport system in Khon Kaen Municipality?

.....

KB1-8: What do you know about the new urban transport (BRT) system that will be operating in Khon Kaen?

KB1-8.1: What do you think about it?

.....

Thank you for your time

Appendix D: The indicative question for an in-depth interview: Key informants group B (Drivers)

Indicative questions for interviews (English)



**KB2: The interview questions for community drivers of
local transport (Song Thal) in Khon Kaen city**

G-1: How many years have you lived in Khon Kaen province or Isan region?

.....

G-2: How would you describe “Khon Kaen Municipality” from your perspective?

.....

G-3: What are your favourite prominent forms of local (Khon Kaen) cultures?

.....

G-4: What is a key symbol of Khon Kaen province in your opinion?

.....

KB2-1: How long have you worked in the Song Thal business in Khon Kaen Municipality?

.....

KB2-2: Do you operate your service according to a timetable?

.....

KB2-3: Do you have a specific route or routes that you keep to?

.....

KB2-4: Do you have known regular bus stops on your routes?

.....

KB2-5: What comments or a question do you regularly hear from passengers?

.....

KB2-6: What is your response to those?

.....

KB2-7: Do you want Khon Kaen Municipality to install a graphical navigation system for local transport?

.....

KB2-8: Do you have any suggestions to improve the service quality of the local transport system in Khon Kaen Municipality?

.....

KB2-9: What do you think about the new urban transport (BRT) system that will be operating in the city in 2017?

.....

Indicative questions for interviews (English)

KB2-10: What might be done to “Improve the service quality of Song Thal system”?

.....

Thank you for your time

Appendix E: The indicative question for an in-depth interview: Experts

Indicative questions for interviews (English)

**EA: The interview questions for transport engineers**

G-1: How many years have you lived in Khon Kaen province or Isan region?

G-2: How would you describe “Khon Kaen Municipality” from your perspective?

G-3: What are your favourite prominent forms of local (Khon Kaen) cultures?

G-4: What is a key symbol of Khon Kaen province in your opinion?

EA-1: When you think about the local Song Thel system, what do you think might improve the current situation? Why?

EA-2: Do you think the “urban elements” of Khon Kaen Municipality have provided an appropriate infrastructure that relates to the concepts of Transit-Oriented Development (TOD)? Why?

EA-3: We can classify the transit nodes in Khon Kaen Municipality at three levels, for example:

-Level 1 (Bus) Stops, such as any stop around the city.

-Level 2 Bus shelters, such as the bus shelters in front of Sanambin School, and Khon Kaen Vittayayon School.

-Level 3 Interchange stations, such as Khon Kaen transport centre (no.1), Khon Kaen transport centre (no.2), Kanrayanawat School, and the Central Plaza Khon Kaen (the biggest shopping mall in this region).

EA-4: Do you have other criteria to classify the level of transit nodes in Khon Kaen Municipality?

EA-5: When the new urban transport (BRT) system in Khon Kaen Municipality is completed, do you think the installation of graphical navigation systems for urban transport (e.g. route maps, time tables, fare rates, pick up/stop points, and interchange stations), in order to provide service information to local passengers, visitors, and foreigners, is a priority?

Indicative questions for interviews (English)

EA-5.1: Can you describe the scale of importance in the overall BRT project, of these systems for a passenger to use the BRT system?

.....

EA-6: What technological innovations might assist designing wayfinding systems, for example; saving energy, internet connections, E-services?

.....

EA-7: Would you support the creation of a graphical navigation system for urban transport in each transit nodes level in Khon Kaen Municipality?

EA-7.1: What do you think, about the creation of a design handbook to define a standard of graphical systems in each transit node level?

EA-7.2: Who should be responsible for this system? Why?

.....

EA-8: What you think is the trend of urban transport systems in Khon Kaen Municipality and Thailand in the next 5-10 years?

EA-8.1: How will these systems affect the transit behaviour of Thai people?

.....

Thank you for your time

Indicative questions for interviews (English)



EB: The interview questions for urban designers

G-1: How many years have you lived in Khon Kaen province or Isan region?

.....

G-2: How would you describe “Khon Kaen Municipality” from your perspective?

.....

G-3: What are your favourite prominent forms of local (Khon Kaen) cultures?

.....

G-4: What is a key symbol of Khon Kaen province in your opinion?

.....

EB-1: When you think about the local Song Thel system, what do you think might improve the current situation? Why?

.....

EB-2: Do you think the “urban elements” of Khon Kaen Municipality have provided an appropriate infrastructure that relates to the concepts of Transit-Oriented Development (TOD)? Why?

.....

EB-3: We can classify the transit nodes in Khon Kaen Municipality at three levels, for example:

-Level 1 (Bus) Stops, such as any stop around the city.

-Level 2 Bus shelters, such as the bus shelters in front of Sanambin School, and Khon Kaen Vittayayon School.

-Level 3 Interchange stations, such as Khon Kaen transport centre (no.1), Khon Kaen transport centre (no.2), Kanrayanawat School, and the Central Plaza Khon Kaen (the biggest shopping mall in this region).

.....

EB-4: Do you have other criteria to classify the level of transit nodes in Khon Kaen Municipality?

.....

EB-5: If you were to create a graphical navigation system for the urban transport system, and make a design handbook to define a standard of installation for these navigation systems, in each transit node level of Khon Kaen Municipality, what would be your main suggestions?

.....

Indicative questions for interviews (English)

EB-6: What technological innovations might assist into designing wayfinding systems, for example; saving energy, internet connections, E-services?

.....
EB-7: From the physical geography of roading structure within Khon Kaen Municipality, do you think the appropriate way to install the BRT and bus stop systems should be set up on the left or right of footpaths/or the centre of the road?

EB-7.1: Which would reduce the effects on the environment?

EB-7.2: Which would create a good townscape?

EB-7.3: Which would be best to support future improvements?

.....
EB-8: What would be your priorities to develop infrastructure in Khon Kaen Municipality, in order to support the lifelong development under the concept of urban sustainability?

.....
Thank you for your time

Indicative questions for interviews (English)



EC: The interview questions for local and Isan folk arts culture designers

G-1: How many years have you lived in Khon Kaen province or Isan region?
.....

G-2: How would you describe “Khon Kaen Municipality” from your perspective?
.....

G-3: What are your favourite prominent forms of local (Khon Kaen) cultures?
.....

G-4: What is a key symbol of Khon Kaen province in your opinion?
.....

EC-1: What are favourite prominent forms of Isan cultures that should be presented?
.....

EC-2: The relationship between Isan and Khon Kaen (local) cultures;

- (1) Do you think these cultures are related? How?
 - (2) Do you think these cultures are different? How?
-

EC-3: What do you think are the main features of cross-cultural influence of Western perspectives on Isan cultures?

- (1) In aspects of society and living?
 - (2) In aspects of cognitive learning?
 - (3) In aspects of the art and design?
-

EC-4: Some writers describe three principles of human factors as (1) physiology; (2) psychology; and (3) culture and society.

EC-4.1: Do physiology factors create different perspectives between Western and Isan cultures in terms of art and design perspectives? How?

EC-4.2: Do psychology factors create different perspectives between Western and Isan cultures in terms of art and design perspectives? How?

EC-4.3: Do culture and society factors create different perspectives between Western and Isan cultures in terms of art and design perspectives? How?
.....

Indicative questions for interviews (English)

EC-5: What would you consider the key principles to integrate design concepts between Western and Isan cultures in 2011?

.....

Thank you for your time

Appendix F: The observation protocol

Observation Protocols (English)



Observation and Field Note Papers

Dates:..... Places:.....

Observer names:.....

Research topic: *Using information design and human-centred approaches to create navigation systems for new urban transport systems in Khon Kaen city, Thailand*

TIMES	NOTES	REFLECTIONS
6.00 am.-9.00 am.		
11.00 am.-1.00 pm.		
4.00 pm.-6.00 pm.		
6.01pm.-8.00pm.		

Including: Voice Recorders (only my voice)*

Appendix G: The questionnaire protocol

Questionnaire (English)

dd/mm/yyyy

THE QUESTIONNAIRE OF USING URBAN TRANSPORT SYSTEM IN KHON KAEN CITY

This questionnaire is one parts of my Doctoral study*Research Topic: Using information design and human-centred approaches to create navigation system for new urban transport system in Khon Kaen , Thailand***Plases create the mark in the box that meet with you demand *****Notes: Definition of terminologies*

- The 'Khon Kaen City Municipality' or 'Khon Kaen City' words have the same meaning which includes 4 sub-districts: (1) T. Naimung; (2) T. Ban-Ped; (3) T. Srira; and (4) T.Mungkoa
- A 'Song Thal' or 'Local transportation' means a mini bus that is providing a service in Khon Kaen city areas
- The BRT system means the Bus Rapid Transit system
- A picture on page 9 will shows "Navigation systems"

Section A. Demographic questions

1. Gender? 1. Male 2. Female
2. Age? 1. 15-19 Years 2. 20-29 Years 3. 30-39 Years 4. 40-49 Years 5. 50-59 Years 6. Over 60 years
3. Current family members in your household (include yourself)?
1. 1 People 2. 2 People 3. 3 People 4. 4 People 5. 5 People 6. Up to 6 People
4. Do you have a disability? 1. Yes 2. No
5. Education?
1. Junior high school 2. Senior high school 3. Undergraduate Degree 4. Postgraduate Degree
5. Others.....
6. Occupational Class?
1. Self employed 2. Government officers 3. Private company officers 4. Students
5. University Students 6. Farmers 7. Labourer 8. Housewife 9. Bus and taxi drivers
10. Retired people 11. Others.....
7. Salary (Unit: Thai Baht)?
1. Lower 5,000 2. 5,001-10,000 3. 10,001-15,000 4. 15,001-20,000 5. 20,001-30,000
6. 30,001-40,000 7. 40,001-50,000 8. 50,001-60,000 9. 60,001-100,000 10. Up to 100,001
8. Are you a Khon Kaen local? 1. Yes 2. No
9. Do you live in Khon Kaen City? 1. Yes (if 'Yes' go to Section B) 2. No
10. How many days per week do you regularly come into Khon Kaen city 1. 1 Day 2. 2 Days 3. 3 Days
4. 4 Days 5. 5 Days 6. 6 Days 7. None
11. How many years have you regularly come to do any activity or business in Khon Kaen city?
1. Less than 1 year 2. 1-2 Years 3. 3-5 Years 4. 6-10 Years 5. 11-20 Years 6. Up to 20 Years

1 | Page

Questionnaire (English)

dd/mm/yyyy

THE QUESTIONNAIRE OF USING URBAN TRANSPORT SYSTEM IN KHON KAEN CITY

Section B. General information about the use of vehicles and urban transport systems in Khon Kaen city

1. Do you use Song Thal as your primary and secondary for travelling in Khon Kaen city? *(Please indicate by number 1 and 2 in ** If you have answered 'No', please go directly to section C4**)*
 1. Yes 2. No
2. Do you know how many service lines of the Song Thal system are operating in Khon Kaen city? 1. Yes 2. No
3. Do you know the information about the start and destination points of the Song Thal service lines that you regularly use?
 1. Yes 2. Not sure 3. No
4. Is there a timetable for the Song Thal that comes to pick you up at your regular stop?
 1. Yes 2. Not sure 3. No
5. Do you know the fare rate in your passenger class? 1. Yes 2. Not sure 3. No
6. Do you have access to a car? 1. Yes 2. No

Section C. The use of transit behaviours in Khon Kaen city**C1. The use of local transit behaviours**

1. What are your reasons for choosing the Song Thal service for travelling in the city? *(you can choose more than one reason)*
 1. Comfortable 2. Fastest 3. Save money 4. Can not find a car park 5. I don't have any private vehicle 6. Available service information 7. Other reasons (Please identify)
2. What are your regular travel times on weekdays? *(You can choose more than one choices)*
 1. 4.00 – 6.00 am 2. 6.01-8.00 am 3. 8.01-10.00 am 4. 10.01 am -12.00 am 5. 12.01 am -2.00 pm
 6. 2.01-4.00 pm 7. 4.01-6.00 pm 8. 6.01-8.00 pm 9. 8.01-10.00 10. Others (Please identify).....
3. What are your regular travel times in the weekends? *(You can choose more than one choices)*
 1. 4.00 – 6.00 am 2. 6.01-8.00 am 3. 8.01-10.00 am 4. 10.01 am -12.00 am 5. 12.01 am -2.00 pm
 6. 2.01-4.00 pm 7. 4.01-6.00 pm 8. 6.01-8.00 pm 9. 8.01-10.00 10. Others (Please identify).....
4. The reasons you need to travel in Khon Kaen city? *(You can choose more than one choices)*
 1. Working 2. Study 3. Shopping 4. Business 5. Commerce 6. Others.....
5. If you are at the (bus) stop and you are not sure about service routes of the Song Thal system that you are going to use, what do you do?
 1. Call a friend 2. Ask a Song Thal driver who stops a car around that area 3. Ask another passenger or shopkeepers around that (bus) stop 4. Asking traffic police 5. Other way (Please identify).....

Questionnaire (English)

dd/mm/yyyy

THE QUESTIONNAIRE OF USING URBAN TRANSPORT SYSTEM IN KHON KAEN CITY

C2. Used experiences with a Bus Rapid Transit and Graphical Navigation Systems

6. Do you know what a Bus Rapid Transit (BRT) system is? 1. Yes 2. No
7. Have you ever been used a Bus Rapid Transit (BRT) system before? 1. Yes 2. No
8. Have you ever been used a graphical navigation system, e.g. routes map, service timetables, and fare rates (see examples in p.9) for travelling? 1. Yes 2. No
9. Have you ever seen any information about the graphical navigation system for urban transportation at any (bus) stop in Khon Kaen city areas or not? 1. See 2. Never see

C3. Direction of new urban transport and graphical navigation systems in Khon Kaen city

A Bus Rapid Transit (BRT) System is a term applied to a variety of public transportation systems using buses to provide faster, more efficient service than an ordinary bus line.

10. What do you think if the BRT system will replace the Song Thal system?
1. Agree 2. Disagree 3. Using both systems 4. No comments
11. Would you like to see the service information of BRT or not? (e.g. routes map, service timetables, fare rates)
1. I would like 2. I wouldn't
12. Do you agree to install the graphical navigation system for urban transportation in the Khon Kaen city? (e.g. routes map, service timetables, fare rates)
1. Agree 2. Disagree

(Go to the section D1)

C4. Using of a private vehicle behaviours

13. Why you are not preferred to use the Song Thal system? *(you can answer more than one reason)*
1. Information are unclear 2. Uncertain service times 3. Take a long time on board
4. Unconvinced with Song Thel services 5. They do not pass my meeting places 6. Others
14. If Khon Kaen city has the high quality in urban transportation systems and services, do you want to use the public transport system replace using your private vehicle or not? 1. Use 2. Not Use
15. What do you think if the BRT system (see definition in the section C3) will replace the Song Thal system?
1. Agree 2. Disagree 3. Using both systems 4. No comments
16. Would you like to see the service information of BRT? E.g. routes map, service timetables, and fare rates
1. I would like 2. I wouldn't
17. Do you agree to install the graphical navigation system for urban transportation in the Khon Kaen city? E.g. routes map, service timetables, and fare rates (see examples in p.8)
1. Agree 2. Disagree

Questionnaire (English)

dd/mm/yyyy THE QUESTIONNAIRE OF USING URBAN TRANSPORT SYSTEM IN KHON KAEN CITY

(Go to the section E)

Section D1. The quality and service needs of "Navigation Systems" at (bus) stops in Khon Kaen city

D1-1 The quality assessment of a Song Thal navigation system service in Khon Kane city area **Choose level of the service quality in the Song Thal navigation systems as follows: 1 =very poor quality, 2 =low quality, 3 = average quality, 4 = good quality, 5= premium quality** Please create the mark in the box that meet with you demand

The levels of service quality in Song-Thal navigation systems (Khon Kaen city areas)	1	2	3	4	5
1. The service quality of providing transit information for a passenger (e.g. routes map, service timetables, fare rates) in any (bus) stop *see sample picture in page 9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. The accessibility of route service information on a Song Thal and any (bus) stop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The accessibility of fare information on a Song Thal and any (bus) stop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The accessibility of timetable information on a Song Thal and any (bus) stop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. The overview of service quality of Song Thal navigation systems in Khon Kaen city	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

D1-2 The assessment of information needs on the urban (local) transport system in Khon Kaen city **The need levels will be replaced by 1= not need, 2= not sure, and 3= needs** Please create the mark in the box that meet with you demand

The levels of urban transport information needs (Khon Kaen city areas)	1	2	3
6. Do you need the graphical navigation systems for local transport (and BRT system)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Do you need the map hand out of local transport (and BRT system) that provides the service information in each track service? *see sample picture in page 9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Do you need Khon Kaen city installs the graphical navigation system for Urban Transport System (UTS) (e.g. routes map, service timetables, and fare rates) in any (bus) stop and transit areas?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Do you need information about government agencies, sightseeing places, parks, and others important places are provided on the UTS map?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Do you need any Song Thal (and BRT) have their own route maps on their buses?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section D2. Other comments to improve and need of service quality in graphical navigation systems and street furniture for the Khon Kane local transportation

- Do you have any suggestion about the graphical navigation system?

Questionnaire (English)

dd/mm/yyyy THE QUESTIONNAIRE OF USING URBAN TRANSPORT SYSTEM IN KHON KAEN CITY

Section E. The question about Isan background and local perspectives

E1. The question about Isan background and local perspectives ** Please create the mark in the box that meet with you demand and describing your opinion in opened-questions**

1. How many years do you live in Khon Kaen province?
 1. 1-3 Years 2. 3-5 Years 3. 6-10 Years 4. 11-20 Years 5. 21-30 Years 6. Over 31 Years

2. Do you want other people who are not Khon Kaen local see characters of Khon Kaen city look like? * you can answer more than one character
 1. Modern city and business centre of Isan region 2. City of folk art and Isan cultures 3. Scenery town
 4. City of education centre 5. Others.....

3. วัฒนธรรม What is a prominent point of local (Khon Kaen) cultures that should be presented?
 1. Traditional Isan textile 2. Friendship custom 3. Silk festival 4. Folk singer 5. Song kran festival
 6. Sin-Chai legend (the traditional of Isan mural) 7. Others.....

4. What is the symbol of Khon Kaen city in your opinion?
 1. Cassia fistula 2. Isan Mouth Organ (*Khane') 3. Silk 4. Log 5. Khon Kaen buddha's relics
 6. Dinosaur 7. Khon Kaen city gate 8. Kaen-Nakorn Lake 9. Sin-Chai 10. Bamboo container
 11. Others.....

5. What is the key colour that represents to Khon Kaen city?
 1. Red 2. Yellow 3. Orange 4. Green 5. Light-blue 6. White 7. Black 8. Blue 9. Others

E2. The question about local people perspectives with the signage and colour systems **Please you write the answer follows the box in the right hand side (remember that you do not draw a picture in this section)

Question about Signage systems (Places)	
6.	The word 'government agency', what is the first picture in your mind? 1. <input type="checkbox"/> City Hall 2. <input type="checkbox"/> City municipality 3. <input type="checkbox"/> Garuda 4. <input type="checkbox"/> Thai Flag 5. <input type="checkbox"/> Others
7.	The word 'fresh market', what is the first picture in your mind? 1. <input type="checkbox"/> Woman seller 2. <input type="checkbox"/> Basket 3. <input type="checkbox"/> Fish 4. <input type="checkbox"/> Vegetable 5. <input type="checkbox"/> Others
8.	The word 'parks', what is the first picture in your mind? 1. <input type="checkbox"/> Three 2. <input type="checkbox"/> Bench 3. <input type="checkbox"/> Lawn 4. <input type="checkbox"/> People with work out 5. <input type="checkbox"/> Others
9.	The word 'temple', what is the first picture in your mind? 1. <input type="checkbox"/> Pagoda 2. <input type="checkbox"/> Buddhist temple 3. <input type="checkbox"/> Image of Buddha 4. <input type="checkbox"/> Monks 5. <input type="checkbox"/> Others
10.	The word 'schools', what is the first picture in your mind?

Questionnaire (English)

dd/mm/yyyy

THE QUESTIONNAIRE OF USING URBAN TRANSPORT SYSTEM IN KHON KAEN CITY

	1. <input type="checkbox"/> Children 2. <input type="checkbox"/> Thai Flag 3. <input type="checkbox"/> Stationary 4. <input type="checkbox"/> Teacher 5. <input type="checkbox"/> Others
11.	The word 'hospital', what is the first picture in your mind? 1. <input type="checkbox"/> Physician 2. <input type="checkbox"/> Nurse 3. <input type="checkbox"/> Red Cross 4. <input type="checkbox"/> Hypodermic syringe 5. <input type="checkbox"/> Others
12.	The word 'police station', what is the first picture in your mind? 1. <input type="checkbox"/> Police 2. <input type="checkbox"/> Handcuffs 3. <input type="checkbox"/> Cell 4. <input type="checkbox"/> Sword 5. <input type="checkbox"/> Others
13.	The word 'hotel', what is the first picture in your mind? 1. <input type="checkbox"/> Bed 2. <input type="checkbox"/> High building 3. <input type="checkbox"/> Reception 4. <input type="checkbox"/> Pillow 5. <input type="checkbox"/> Others
14.	The word 'plaza', what is the first picture in your mind? 1. <input type="checkbox"/> Paper-Bag 2. <input type="checkbox"/> Goods 3. <input type="checkbox"/> Purchasing 4. <input type="checkbox"/> People 5. <input type="checkbox"/> Others
15.	The word 'banks', what is the first picture in your mind? 1. <input type="checkbox"/> Coin 2. <input type="checkbox"/> Bank note 3. <input type="checkbox"/> ATM 4. <input type="checkbox"/> Bank Building 5. <input type="checkbox"/> Others
16.	The word 'library', what is the first picture in your mind? 1. <input type="checkbox"/> Book 2. <input type="checkbox"/> Student 3. <input type="checkbox"/> Candle 4. <input type="checkbox"/> Librarian 5. <input type="checkbox"/> Others
17.	The word 'bus stop', what is the first picture in your mind? 1. <input type="checkbox"/> Song Thel 2. <input type="checkbox"/> Bus 3. <input type="checkbox"/> Passenger 4. <input type="checkbox"/> Bench 5. <input type="checkbox"/> Others
Question about Signage system (Persons & Things)	
18.	The word 'monk', what is the first picture in your mind? 1. <input type="checkbox"/> Monk 2. <input type="checkbox"/> Monk's alms-bowl 3. <input type="checkbox"/> Temple 4. <input type="checkbox"/> Others
19.	The word 'Buddhist women ascetic', what is the first picture in your mind? 1. <input type="checkbox"/> Buddhist women 2. <input type="checkbox"/> Monk's alms-bowl 3. <input type="checkbox"/> Temple 4. <input type="checkbox"/> Others
20.	The word 'disabled people', what is the first picture in your mind? 1. <input type="checkbox"/> Wheelchair 2. <input type="checkbox"/> Amputee 3. <input type="checkbox"/> Blind man 4. <input type="checkbox"/> Others
21.	The word 'elder', what is the first picture in your mind? 1. <input type="checkbox"/> Man with cane 2. <input type="checkbox"/> Hunchback 3. <input type="checkbox"/> Man wear sarong 4. <input type="checkbox"/> Others
22.	The word 'Isan boy', what is the first picture in your mind? 1. <input type="checkbox"/> Student hair cut style 2. <input type="checkbox"/> little boy 3. <input type="checkbox"/> Boy with topknot 4. <input type="checkbox"/> Others
23.	The word 'Isan girl', what is the first picture in your mind? 1. <input type="checkbox"/> Skirt 2. <input type="checkbox"/> Girl with two topknots 3. <input type="checkbox"/> Girl with braid hair 4. <input type="checkbox"/> Others

Questionnaire (English)

dd/mm/yyyy

THE QUESTIONNAIRE OF USING URBAN TRANSPORT SYSTEM IN KHON KAEN CITY

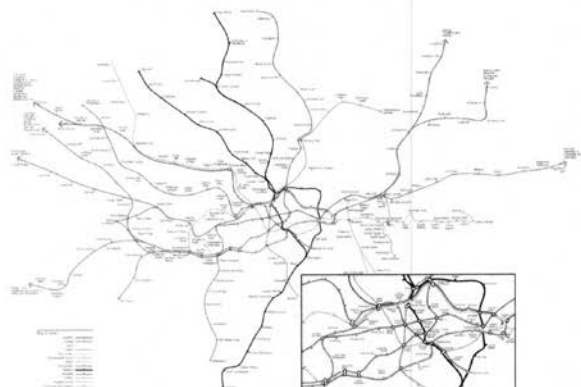
24.	The word 'Isan male', what is the first picture in your mind? 1. <input type="checkbox"/> Loincloth 2. <input type="checkbox"/> Moustache 3. <input type="checkbox"/> Man wear suit 4. <input type="checkbox"/> Others
25.	The word 'Isan female', what is the first picture in your mind? 1. <input type="checkbox"/> Women wear sarong 2. <input type="checkbox"/> Lady with put up one's hair 3. <input type="checkbox"/> Skirt 4. <input type="checkbox"/> Others
26.	The word 'buses', what is the first picture in your mind? 1. <input type="checkbox"/> Song Thel 2. <input type="checkbox"/> Passenger waiting for a bus 3. <input type="checkbox"/> Bus 4. <input type="checkbox"/> Others
27.	The word 'belongings', what is the first picture in your mind? 1. <input type="checkbox"/> Baggage 2. <input type="checkbox"/> Carry baskets 3. <input type="checkbox"/> Tent 4. <input type="checkbox"/> Others
28.	The word 'knowledge', what is the first picture in your mind? 1. <input type="checkbox"/> Candle 2. <input type="checkbox"/> Computer 3. <input type="checkbox"/> Book 4. <input type="checkbox"/> Others
Question about Signage system (Activities)	
29.	The word 'tourism', what is the first picture in your mind? 1. <input type="checkbox"/> Camera 2. <input type="checkbox"/> Sea 3. <input type="checkbox"/> Mountain 4. <input type="checkbox"/> Others
30.	The word 'shopping', what is the first picture in your mind? 1. <input type="checkbox"/> Carry basket 2. <input type="checkbox"/> Trolley 3. <input type="checkbox"/> Woman with paper bags 4. <input type="checkbox"/> Others
31.	The word 'eating', what is the first picture in your mind? 1. <input type="checkbox"/> Bamboo basket 2. <input type="checkbox"/> Plate 3. <input type="checkbox"/> Spoon and fork 4. <input type="checkbox"/> Others
32.	The word 'work out', what is the first picture in your mind? 1. <input type="checkbox"/> Man is running 2. <input type="checkbox"/> Barbell 3. <input type="checkbox"/> Football 4. <input type="checkbox"/> Others
33.	The word 'vehicle', what is the first picture in your mind? 1. <input type="checkbox"/> Car 2. <input type="checkbox"/> Motor cycle 3. <input type="checkbox"/> Train 4. <input type="checkbox"/> Others

Section F. The question about reading (map) perspectives**** Please create the mark in the box that meet with you demand ****

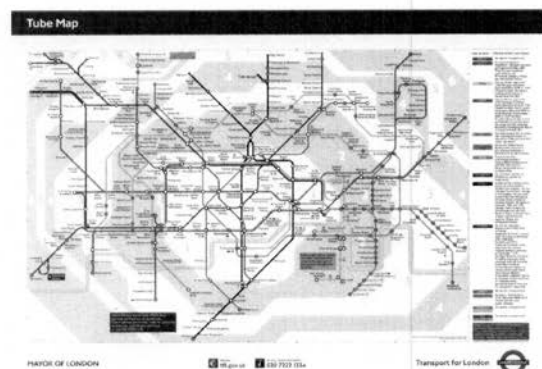
1. Which picture you feel comfortable to read the information? (See the choice in next page)

Questionnaire (English)

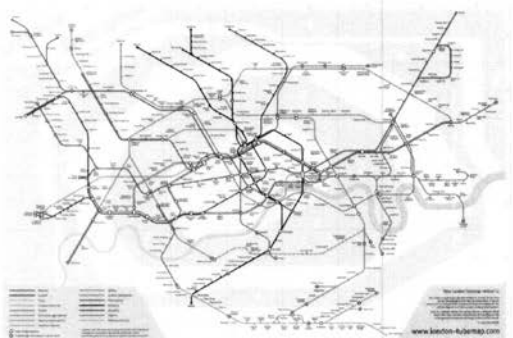
dd/mm/yyyy THE QUESTIONNAIRE OF USING URBAN TRANSPORT SYSTEM IN KHON KAEN CITY



1. Geographical styles



2. Graphical diagram styles



3. Combinative styles

****Thank you for your time****

Questionnaire (English)

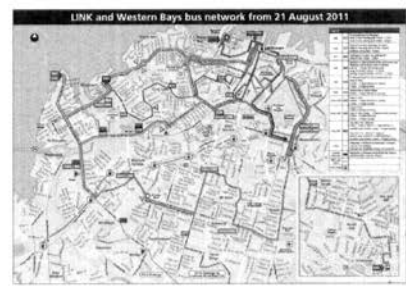
dd/mm/yyyy THE QUESTIONNAIRE OF USING URBAN TRANSPORT SYSTEM IN KHON KAEN CITY

Appendix: A sample picture about "Navigation systems" in the urban transport system

Pictures below presents a graphical navigation system that employs to indicate the public transit information in developed countries, e.g. England and New Zealand



(1)



(2)

The picture (1) and (2) are the samples of transit map in London (England) and Anuckland city (New Zealand), in order to make a passenger can see the whole service lines before they will use a system



(3)



(4)

The picture (3) and (4) are graphical information boards that were installed at transit stations, in order to presents a track service, timetables, fare rates and service stations in New Zealand and England



(5)



(6)



(7)


The picture (5) is the real time digital display in the main bus stop at New Zealand

The picture (6) is the automatic ticket machine that was install in main bus stops

The picture (7) is the map handout

Appendix H: Indicative questions for focus group

Indicative questions for Focus groups (English)

	EVALUATIVE QUESTIONNAIRE FOR PUBLIC TRANSPORT MAP PROTOTYPE OF KHONKAEN CITY
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Research Topic: Using information design and human-centred approaches to create public transport map for a new urban transport system in Khon Kaen city, Thailand

This evaluative questionnaire was developed for interviewing the stakeholder groups in Khon Kaen city. It consists of three sections; (1) local administrator, (2) expert/specialist and (3) people groups. The questions in this document centred on the 'usability design concept' as the core idea to evaluate the transit map prototype. The results and feedback will only be applied for adapting the graphical materials in the prototype in order to develop the final design.

Details

1: This document consists of 10 sections
 2: Section 1 please create the mark in the box that meets with your demand
 3: Sections 2-9 please create the mark in the box that meets with your demand. The evaluative levels will be replaced by four rating scales which consist of; 4= Very Good, 3= Good, 2= Average, 1= Not Good
 4: Sections 2-8 will be evaluated along with the design prototypes
 5: Section 10 is for suggestions

Section 1: Demographic questions (Only for people groups)

1. Gender? 1. Male 2. Female
2. Age? 1. 15-19 years 2. 20-29 years 3. 30-39 years 4. 40-49 years 5. 50-59 years
6. 60+ years
3. Education?
 1. Junior high school 2. Senior high school/college 3. Undergraduate Degree
 4. Postgraduate Degree 5. Others.....
4. Occupational Class?
 1. Self-employed 2. Government officers 3. Private company officers 4. Students
 5. University Students 6. Farmers 7. Labourer 8. Housewife 9. Bus and taxi drivers
 10. Retired people 11. Others.....
5. Salary (Unit: Thai Baht)?
 1. Lower 5,000 2. 5,001-10,000 3. 10,001-15,000 4. 15,001-20,000 5. 20,001-30,000
 6. 30,001-40,000 7. 40,001-50,000 8. 50,001-60,000 9. 60,001-100,000 10. Up to 100,001
6. Are you a KhonKaen local 1. Yes 2. No

Indicative questions for Focus groups (English)

Section 2: Evaluation of Logo Design

Questions regarding Communicating Efficiency	Very Good (4)	Good (3)	Average (2)	Not Good (1)
1. The logo represents the characteristic of KhonKaen city				
2. The logo can denote the meaning of BRT service routes				
Questions regarding Visible Effectiveness	Very Good (4)	Good (3)	Average (2)	Not Good (1)
3. The use of colour makes the logo stand out from the background				
4. The size of characters in the logo suits your readability				
5. The overall proportion of logo suits your readability				
Question regarding Design Satisfaction	Very Good (4)	Good (3)	Average (2)	Not Good (1)
6. Desirability and simplicity of design with the logo				

Section 3: Evaluation of Graphic Routes

Questions regarding Communicating Efficiency	Very Good (4)	Good (3)	Average (2)	Not Good (1)
1. Understanding of graphical contents with the route systems				
2. Understanding of the sense of places between the location and city landmark				
3. Understanding of the graphical material of BRT stations				
4. Understanding of the graphical material of BRT interchange points				
Questions regarding Visible Effectiveness	Very Good (4)	Good (3)	Average (2)	Not Good (1)
5. The design proportion of graphic routes suit your readability				
6. The sizes of character in the graphic routes suit your readability				
7. The use of typeface in graphic route system suits your readability				
8. The use of colour shades in the map background suits your readability				
9. The overall colour shades in the graphic routes suit your readability				
Question regarding Design Satisfaction	Very Good (4)	Good (3)	Average (2)	Not Good (1)
10. The design feature of graphic routes reflects Isan textile concept				

Section 4: Evaluation of Graphics for Fare Rates and Timetable Systems

Questions regarding Communicating Efficiency	Very Good (4)	Good (3)	Average (2)	Not Good (1)
1. Understanding of character design in each group of fare rate systems				
2. Understanding of graphic materials in service timetable				
Questions regarding Visible Effectiveness	Very Good (4)	Good (3)	Average (2)	Not Good (1)
3. The design proportion of graphical material in fare rate table				
4. The design proportion of graphical material in service timetable				
5. The sizes of character in the fare rate system suits your readability				
6. The sizes of character in the service timetable suits your readability				



Indicative questions for Focus groups (English)

7. The use of typeface in the fare rate and service timetable suits your readability				
8. The use of colour shades in the fare rate and service timetable suits your readability				
Question regarding Design Satisfaction	Very Good (4)	Good (3)	Average (2)	Not Good (1)
9. The design characters of fare rate system reflects Isan 'Hoop-tam' style				

Section 5: Evaluation of Routes Information

Questions regarding Communicating Efficiency	Very Good (4)	Good (3)	Average (2)	Not Good (1)
1. Understanding of graphical symbols in BRT system				
2. Understanding of graphical symbols in interchange points				
3. Understanding of graphical symbols in Song Thel system				
Questions regarding Visible Effectiveness	Very Good (4)	Good (3)	Average (2)	Not Good (1)
4. The design proportion of graphical symbols in BRT system				
5. The design proportion of graphical material in Song Thel system				
6. The design proportion of graphical material in interchange points				
7. The sizes of character in routes information suits your readability				
8. The use of typeface in routes information suits your readability				
9. The use of colour shades with the character in routes information suits your readability				
10. The use of colour shades in graphical symbols of BRT system suits your readability				
11. The use of colour shades in graphical symbols of Song Thel system suits your readability				
12. The use of colour shades in graphical symbols of interchange point suits your readability				
Question regarding Design Satisfaction	Very Good (4)	Good (3)	Average (2)	Not Good (1)
13. The design feature of graphical symbols in this section reflects Isan textile concept				






Section 6: Evaluation of Key Legends

Q	Symbol	Question	Very Good (4)	Good (3)	Average (2)	Not Good (1)
1-1		Do you recognise the symbol of city gate				
1-2		The design proportion of this symbol				
1-3		The use of colour with this symbol				
2-1		Do you recognise the symbol of city shrine				
2-2		The design proportion of this symbol				
2-3		The use of colour with this symbol				

Indicative questions for Focus groups (English)

3-1		Do you recognise the symbol of KhonKaen logs				
3-2		The design proportion of this symbol				
3-3		The use of colour with this symbol				
4-1		Do you recognise the symbol of city hall				
4-2		The design proportion of this symbol				
4-3		The use of colour with this symbol				
5-1		Do you recognise the symbol of Chinese shrine				
5-2		The design proportion of this symbol				
5-3		The use of colour with this symbol				
6-1		Do you recognise the symbol of clock tower				
6-2		The design proportion of this symbol				
6-3		The use of colour with this symbol				
7-1		Do you recognise the symbol of Golden Jubilee Convention Hall				
7-2		The design proportion of this symbol				
7-3		The use of colour with this symbol				
8-1		Do you recognise the symbol of Royal temple				
8-2		The design proportion of this symbol				
8-3		The use of colour with this symbol				
9-1		Do you recognise the symbol of KhonKaen museum				
9-2		The design proportion of this symbol				
9-3		The use of colour with this symbol				
10-1		Do you recognise the symbol of police station				
10-2		The design proportion of this symbol				
10-3		The use of colour with this symbol				
11-1		Do you recognise the symbol of City Airport				
11-2		The design proportion of this symbol				
11-3		The use of colour with this symbol				
12-1		Do you recognise the symbol of train station				
12-2		The design proportion of this symbol				
12-3		The use of colour with this symbol				
13-1		Do you recognise the symbol of KhonKaen stadium				
13-2		The design proportion of this symbol				
13-3		The use of colour with this symbol				
14-1		Do you recognise the symbol of KKU stadium				
14-2		The design proportion of this symbol				
14-3		The use of colour with this symbol				

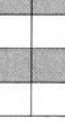
Indicative questions for Focus groups (English)

15-1		Do you recognise the symbol of transport centre 1				
15-2		The design proportion of this symbol				
15-3		The use of colour with this symbol				
16-1		Do you recognise the symbol of fire station				
16-2		The design proportion of this symbol				
16-3		The use of colour with this symbol				
17-1		Do you recognise the symbol of post office				
17-2		The design proportion of this symbol				
17-3		The use of colour with this symbol				
18-1		Do you recognise the symbol of hospital				
18-2		The design proportion of this symbol				
18-3		The use of colour with this symbol				
19-1		Do you recognise the symbol of bus stops				
19-2		The design proportion of this symbol				
19-3		The use of colour with this symbol				









Section 7: Evaluation of Index of Service Information

Questions regarding Communicating Efficiency	Very Good (4)	Good (3)	Average (2)	Not Good (1)
1. Do you understand the process for using Index of Service Information				
2. Do you understand the symbol system in this service information				
3. Do you understand the working process between the symbols and graphic table				
Questions regarding Visible Effectiveness	Very Good (4)	Good (3)	Average (2)	Not Good (1)
4. The sizes of character in the service information table suits your readability				
5. The use of colour shades in the service information table suits your readability				
Question regarding Design Satisfaction	Very Good (4)	Good (3)	Average (2)	Not Good (1)
6. The desirability of graphical materials in the Index of Service Information				

Section 8: Evaluation of Index Symbols

Q	Symbol	Question	Very Good (4)	Good (3)	Average (2)	Not Good (1)
1-1		Do you recognise the symbol of state agency				
1-2		The design proportion of this symbol				
1-3		The use of colour with this symbol				

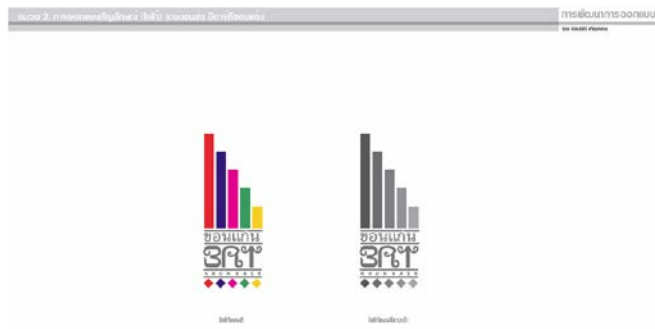
Indicative questions for Focus groups (English)

2-1		Do you recognise the symbol of Thai temple				
2-2		The design proportion of this symbol				
2-3		The use of colour with this symbol				
3-1		Do you recognise the symbol of school				
3-2		The design proportion of this symbol				
3-3		The use of colour with this symbol				
4-1		Do you recognise the symbol of restaurant				
4-2		The design proportion of this symbol				
4-3		The use of colour with this symbol				
5-1		Do you recognise the symbol of accommodation				
5-2		The design proportion of this symbol				
5-3		The use of colour with this symbol				
6-1		Do you recognise the symbol of park				
6-2		The design proportion of this symbol				
6-3		The use of colour with this symbol				
7-1		Do you recognise the symbol of fresh food market				
7-2		The design proportion of this symbol				
7-3		The use of colour with this symbol				
8-1		Do you recognise the symbol of institute				
8-2		The design proportion of this symbol				
8-3		The use of colour with this symbol				
9-1		Do you recognise the symbol of shopping centre				
9-2		The design proportion of this symbol				
9-3		The use of colour with this symbol				

Section 9: Evaluation of Overall Designs in the Public Transport Map

Questions regarding Communicating Efficiency	Very Good (4)	Good (3)	Average (2)	Not Good (1)
1.The overall understanding of the using process of map symbols				
2.The overall understanding of the colour system that represents a meaning of map symbols				
3.The overall understanding of the use of (Thai) language				
Questions regarding Visible Effectiveness	Very Good (4)	Good (3)	Average (2)	Not Good (1)
4.The overall proportion of map symbols suits your readability				
5.The use of colour shades in the map prototype suits your readability				
6.The overall sizes of character in the map prototype suits your readability				

Appendix I: The separate printing of seven design sections



(a) Section 2: BRT logo



(b) Section 3: graphic routes



(c) Section 4: Graphics for fare rates and timetable system

ข้อมูลเส้นทาง (ROUTES INFORMATION)

ระบบบีอาร์ที (BRT)
THE BUS RAPID TRANSIT SYSTEM

- สายสีแดง - กำแพง (Red line: Samran - Tapra)
- สายฟ้าสีน้ำเงิน - นวมองใหญ่ (Blue line: Nongkrot - Nong Yai)
- สายเหลือง - บ้านบุญ - บ้านนวม (Yellow line: Banbun - Bang Nua)
- สายชมพู - วงเมือง (Pink line: City Loop)
- สายเขียว - บ้านดง - สีลา (Green line: Numon - Sira)

จุดเปลี่ยนเส้นทาง
INTERCHANGE POINTS

- จุดเปลี่ยนเส้นทางระหว่างระบบ บีอาร์ที กับ ยี่อาร์ที (Between BRT systems)
- จุดเปลี่ยนเส้นทางระหว่างระบบ บีอาร์ที กับ รถสองแถว (Between BRT and Song Theal systems)
- จุดเปลี่ยนเส้นทางระหว่างระบบ รถสองแถว กับ รถสองแถว (Between Song Theal systems)
- สถานีบีอาร์ที (BRT Stations)

ระบบรถสองแถว
THE SONG THEAL SYSTEM

- รถสองแถวประจำทาง: สาย 2 (Mini Bus Number: 2)
- รถสองแถวประจำทาง: สาย 3 (Mini Bus Number: 3)
- รถสองแถวประจำทาง: สาย 4 (Mini Bus Number: 4)
- รถสองแถวประจำทาง: สาย 6 (Mini Bus Number: 6)
- รถสองแถวประจำทาง: สาย 8 (Mini Bus Number: 8)
- รถสองแถวประจำทาง: สาย 9 (Mini Bus Number: 2)
- รถสองแถวประจำทาง: สาย 10 (Mini Bus Number: 3)
- รถสองแถวประจำทาง: สาย 11 (Mini Bus Number: 4)
- รถสองแถวประจำทาง: สาย 16 (Mini Bus Number: 6)
- รถสองแถวประจำทาง: สาย 21 (Mini Bus Number: 8)

ระยะเวลาให้บริการ: 8 น. ถึง 16.00 น. (Service Time: 8 A.M. to 4 P.M.)
 (ผู้ใหญ่: 9 น. ถึง 16.00 น.) (Adult: 9 A.M. to 4 P.M.)

(d) Section 5: Routes information

ภาพสัญลักษณ์สำคัญ (KEY LEGENDS)



(e) Section 6: Key legends

ดัชนีข้อมูลบริการ (INDEX OF SERVICE INFORMATION)

สายรถ	จุดจอด	สายรถ	จุดจอด	สายรถ	จุดจอด	สายรถ	จุดจอด
Line	Stop	Line	Stop	Line	Stop	Line	Stop
MAI-4	...	MDI-6	...	MCI-5	...	WDI-3	...
MAI-7	...	MDI-7	...	MCI-6	...	WDI-4	...
MDI-2	...	MDI-2	...	MCI-7	...	WDI-5	...
MDI-3	...	MDI-3	...	MCI-8	...	WDI-6	...
MDI-4	...	MDI-4	...	WDI-2	...	WDI-7	...
WDI-4	...	WDI-5	...	WDI-4	...	WDI-4	...
WDI-9	...	WDI-6	...	WDI-5	...	WDI-5	...
WDI-2	...	WDI-7	...	WDI-6	...	WDI-6	...
WDI-3	...	WDI-8	...	WDI-8	...	WDI-2	...
WDI-4	...	WDI-9	...	WDI-3	...	WDI-3	...

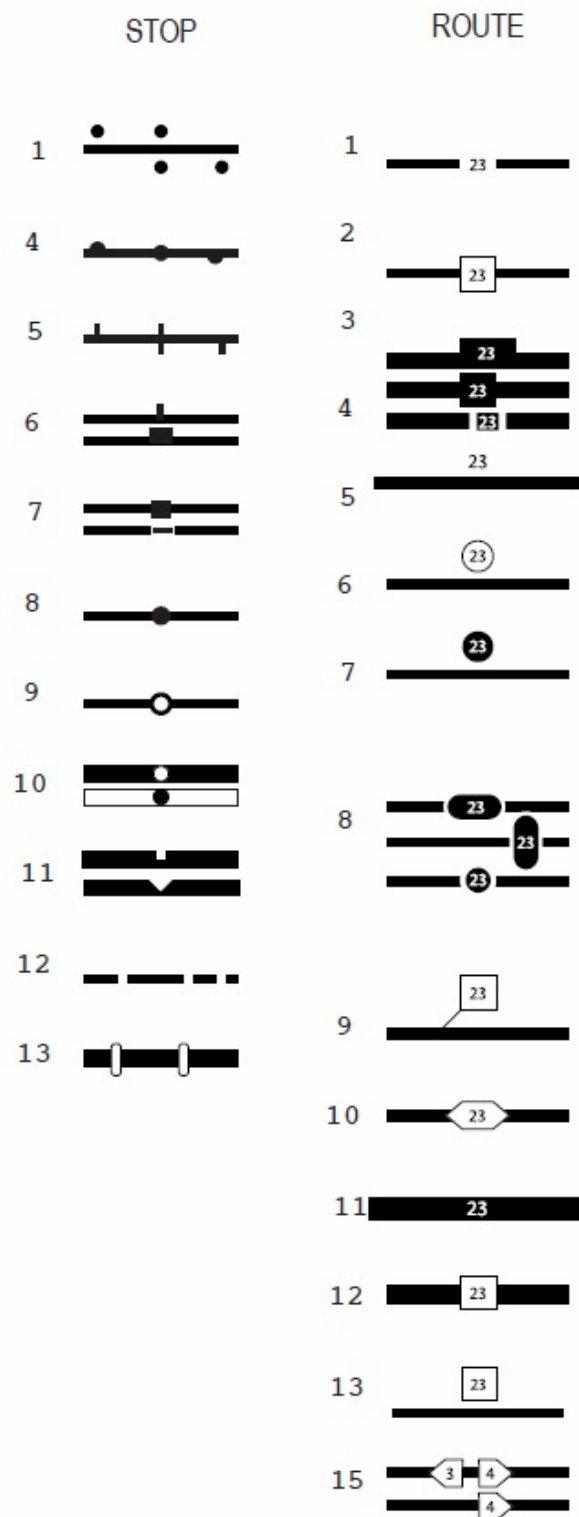
(f) Section 7: Service information tables



(g) Section 8: Index symbols

Appendix J: An overview of existing designs for stop and route symbols in public transport maps around the world. The source is Allard (2009).

SYMBOL



Appendix K: An overview of the existing design of interchange station symbols in public transport maps around the world. The source is Allard (2009).

Interchange Stations

Ring	
Rings Connected	
Rings Stressed	
Concetric Rings	
Dot	
Regular Polygon	
Irregular Polygon	
Pie	
Color Overprint	
Area	
Pictogram	
Blank Space	
String	

Appendix L: My research timeline

