

A STRUCTURAL EQUATION MODEL FOR HAPPY STREETS IN URBAN
RESIDENTIAL NEIGHBORHOODS

HAMED MIRZAEI

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Dedicated to my beloved family especially my parents, my wife, my child and my supportive supervisor Dr. Mehdi Moeinaddini. Thank you very much for being supportive, helpful and understanding.

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ABSTRACT

Urban areas provide opportunities to make people richer and recent studies have found more depression symptoms among these city residents in comparison to those who live in rural neighborhoods. Nowadays, most urban dwellers are not happy. Motorized lifestyle, air pollution, and noise pollution, as well as the stress are negative externalities of urban areas that can reduce happiness. Although happiness can be affected by environmental and design factors, there are very limited studies on happy environment, specifically at the street level. Therefore, this research identified the main street factors that can affect happiness. This research was divided into five stages to achieve its objectives. The first stage involved conducting a literature review to identify effective happy street factors and proposing a conceptual happy street model. The second stage was about designing a questionnaire based on a proposed conceptual model. In the third stage, 400 participants were interviewed to collect the data. These participants were randomly selected among Johor Bahru residents. The fourth stage involved the Structural Equation Modeling technique, which was applied to analyze data and develop the final happy street model. The final stage prioritized the significant factors in the proposed model to have happier streets. Initially, the main effective happy street factors extracted from the literature review were color, light, shape, environmental factors, social factors, and street facilities. In addition, related sub-factors were also extracted from the literature review. Happy street factors and their hypothetical relationships with happiness were used to develop the conceptual happy street model. The final happy street model was measured using Structural Equation Modeling technique to demonstrate the significant happy street factors with high level of associations. Based on prioritizing the level of associations, a final happy street model containing street facilities, shape, social factors, environmental factors, color, and light, which can be used to improve analytical street designs, as well as the assessment and improvement process to have happier streets was developed.

ABSTRAK

Walaupun kawasan bandar boleh menawarkan kekayaan, kajian terkini mendapati lebih banyak gejala kemurungan dalam kalangan penduduk bandar berbanding dalam kalangan penduduk di kawasan luar bandar. Kini, kebanyakan penduduk bandar tidak bahagia. Gaya hidup bermotor, pencemaran udara dan pencemaran bunyi, selain daripada tekanan, merupakan faktor luaran negatif kawasan bandar yang boleh mengurangkan kebahagiaan. Walaupun kebahagiaan dapat dipengaruhi oleh faktor alam sekitar dan reka bentuk, bilangan kajian mengenai persekitaran yang bahagia, khususnya di peringkat jalan adalah sangat terhad. Oleh itu, kajian ini telah mengenal pasti beberapa faktor jalan yang boleh mempengaruhi kebahagiaan. Kajian ini dibahagikan kepada lima peringkat untuk mencapai matlamat. Peringkat pertama melibatkan sorotan kajian untuk mengenal pasti faktor-faktor jalan bahagia yang berkesan dan mencadangkan model jalan bahagia konseptual. Tahap kedua pula melibatkan usaha merancang soal selidik berdasarkan model konseptual yang dicadangkan. Lebih daripada 400 individu ditemuramah semasa peringkat ketiga untuk mengumpul data yang diperlukan. Para responden dipilih secara rawak dalam kalangan penduduk Johor Bahru. Peringkat keempat melibatkan teknik Pemodelan Persamaan Struktur, yang digunakan untuk menganalisis data yang dikumpul dan untuk mencapai model jalan bahagia terakhir. Peringkat akhir melibatkan langkah mengutamakan faktor-faktor penting di dalam model yang dicadangkan untuk pembangunan jalan-jalan yang lebih bahagia. Faktor-faktor utama jalan bahagia yang berkesan, yang diekstrak daripada sorotan kajian adalah warna, cahaya, bentuk, faktor persekitaran, faktor sosial, dan kemudahan jalan. Di samping itu, sub-faktor yang berkaitan juga diekstrak daripada sorotan kajian. Faktor-faktor jalan bahagia dan hubungan hipotetikal mereka dengan kebahagiaan telah digunakan untuk membangunkan model jalan bahagia konseptual. Model jalan bahagia terakhir mengandungi faktor-faktor jalan bahagia yang penting, dengan tahap perhubungan yang tinggi, yang boleh digunakan untuk meningkatkan reka bentuk jalan analitik, serta proses penaksiran dan peningkatan untuk pembangunan jalan-jalan yang lebih bahagia.

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LIST OF ACRONYMS

SEM	-	Structural Equation Modeling
TU	-	Taman Universiti
TSC	-	Taman Scientex Mutiara Mas streets
EFA	-	Exploratory Factor Analysis
CFA	-	Confirmatory Factor Analysis
AMOS	-	Analysis of Moment Structures
SPSS	-	Statistical Package for Social Sciences
ML	-	Maximum Likelihood
GLS	-	Generalized Least Square
ADF	-	Asymptotic Distribution Free
KMO	-	Kaiser-Meyer-Olkin
CMIN	-	Chi-square test
<i>df</i>	-	Degree of freedom
<i>p</i>	-	<i>p</i> -value for chi-square test
CMIN/ <i>df</i>	-	Normed chi-square
GFI	-	Goodness-of-Fit index
AGFI	-	Adjusted Goodness-of-Fit Index
CFI	-	Comparative Fit Index
TLI	-	Tucker-Lewis Index
NFI	-	Normed Fit Index
RMSEA	-	Root Mean Square Error of Approximation
SOCFA	-	Second Order Confirmatory Factor Analysis

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Radwan (2014) believes that happiness is the feeling you experience when you realize that everything is exactly as should be. Therefore, happiness comes from everything around you that can give you satisfaction or pleasure feeling (Fiske *et al.*, 2010). The society changes rapidly and these changes affect lifestyle and the quality of life (Huang *et al.*, 2013). Motorized lifestyle, urban inequality, and poverty are examples of issues that decrease happiness and increase stress and pressure in urban areas (Meyers *et al.*, 2015). Therefore, people are not happy nowadays and this issue affects the quality of life (Serag El Din *et al.*, 2013).

In addition, happiness can be affected by people needs such as income, health, recreational activities, etc (Dolan *et al.*, 2008). Living spaces like urban areas have the influence on the mentioned needs. Mulligan *et al.* (2005) focused on the effects of happiness on the quality of life in urban areas. Happiness in urban areas can be related to natural amenities (Shapiro, 2006), social and human-created amenities (Cheshire and Magrini, 2005) and land use management (Mulligan and Carruthers, 2011; Mulligan *et al.*, 2005). Streets are important parts of living spaces in urban areas and people use street amenities frequently because of their mobility needs. This research attempts to use streets as opportunities to increase happiness as much as possible by introducing a happy street model.

Happy street is not defined by previous studies. However, it is possible to define it by developing a happy street model using a conceptual model for the happy

street. The proposed conceptual model can be developed based on the factors that extracted from the literature review. Based on the literature review, the effective factors that can affect happiness in the streets can be divided into four categories that include colors (e.g. red, yellow, orange, blue, green, and purple), light (e.g. white light, yellow light, enough lighting, combination of white and yellow, attractive lighting design), shape (e.g., curve shapes and lines in the landscape, angular shapes and lines in the landscape, curve shapes and lines in the furniture and building, angular shapes and lines in the furniture and building, combination of curve and angular shapes), social factors (e.g. social interaction, enough and useable public space, convenient social space, attractive social spaces, active social space), environmental factors (e.g. air pollution, noise pollution, convenient weather condition, cleanness, enough natural green space), and street facilities (e.g. enough and standard walking facilities, enough and standard cycling facilities, enough and standard public transport facilities, enough and standard recreational facilities, enough and standard shopping facilities, enough and standard daily service facilities). The combination and modeling of these factors extracted from the literature review can be used to define happy streets.

1.2 Problem Background

Decrease happiness and increase stress and pressure are some of the main issues facing the cities nowadays and these issues can affect the quality of life in urban areas (Serag El Din *et al.*, 2013). Nowadays, there are considerable mental and physical problems that are related to stress and pressure which come from various environmental and socio-economic factors (Kopp and Réthelyi, 2004). Increase urbanization and car-oriented development lead to various negative externalities such as inactive lifestyle, traffic congestions, air pollution, more fuel consumption, noise pollution and health problems. Since being healthy is one of the important factors for happiness (Strejcova *et al.*, 2014; Al-Qahtani *et al.*, 2014), these negative externalities that increase stress and health problems can affect happiness, life satisfaction, well-being and quality of life negatively. Although some solutions such as high density and mixed land use are proposed for these negative externalities, the effects of these solutions on happiness have not been investigated sufficiently.

The quality of life in urban areas cannot be at a desirable level without happiness (Montgomery, 2013). Well-being is one of the important factors that represents happiness in many studies (e.g. Gowdy, 2005; Dolan *et al.*, 2008; Welsch, 2009). Dolan *et al.* (2008) identified the positive and negative correlated factors for well-being. The positively correlated factors include income for participants, trust, membership of friendly relations or interest groups and belief in a God. The negative factors in this research are the incomes of others (because of rivalry), unemployment, separation, and divorce. The authors also tried to prove that the environmental factors such as air quality, climate, noise level and access to green spaces have important impacts on happiness. Living spaces like urban areas have the influence on the mentioned socio-economic and environmental factors (Mulligan *et al.*, 2005).

There are limited studies that consider the relationship between happiness and living environment (Marshall *et al.*, 2014). These limited studies (e.g. Ferreira *et al.*, 2013; Menz, 2011) focused on the macro-level factors such as air pollution, economy, life satisfaction and amenities at the city or country level (Breckenkamp *et al.*, 2004; Welsch, 2009). However, happiness comes from everything around people including micro-level living spaces facilities such as street level facilities. Therefore, this research attempts to fill this gap by focusing on micro-level factors at the street level that has not been investigated by previous studies.

1.3 Problem Statement

The quality of life in urban areas has decreased in recent years because of increasing in the levels of stress and pressure due to various environmental and socio-economic factors (Serag El Din *et al.*, 2013). Urbanization and car-oriented development are negative externalities that can affect health, which is an important factor for happiness, life satisfaction, well-being, and quality of life (Strejcova *et al.*, 2014; Al-Qahtani *et al.*, 2014). Happiness is one of the indicators of quality of life and well-being is an important factor that represents happiness, as reported in many studies (Gowdy, 2005; Dolan *et al.*, 2008; Welsch, 2009). Various socio-economic factors, such as income, trust, friendly relationships, employment, and marital status

can affect happiness (Dolan *et al.*, 2008). In addition, to the car-oriented development negative externalities and socio-economic factors, environmental factors, such as air quality, climate changes, noise level, and suitable amenities can also affect happiness (Dolan *et al.*, 2008).

Moreover, as expected, car-oriented planning in many cities leads private car become the most important and popular transport mode that people used for mobility needs (Simpson *et al.*, 1994, Richards, 2001) especially in Malaysia (Ministry of Transport Malaysia, 2010). Since, the private car gives the ability to the people to go to their destination from door to door when they require to reach their destination.

The increasing use of the private cars especially in Malaysia leads to more air pollution. In this regard, based on Klugman (2011), Malaysia had not only the third highest rate of carbon emissions in the worldwide but also Malaysia had grown 4.7 percent of carbon emissions from 1970 to 2008. Moreover, traffic congestion, social issues, and temperature increase are other disadvantages, which are consequent to the increasing the number of private cars (Rahman *et al.*, 2015; Hayati *et al.*, 2014; Latif *et al.*, 2014; Elsayed, 2012). These disadvantages, especially in Malaysia lead to decrease people's happiness and increase people's health problem such as physical and mental health. Therefore, this research attempts to find solutions that lead to decrease these disadvantages and encourage people to use non-motorized travel modes to be happier and healthier when they reach their destinations.

Since the shopping malls in Malaysia have good facilities and condition such as convenient temperature, suitable walking facilities for elderly and disable, and attractive facilities like food court and kindergarten. Malaysian people are satisfied when they are walking in these shopping malls, mainly because of provided facilities that lead to have great walking experience. However, people do not prefer to walk to reach their destination in the streets because the streets in Malaysia do not have standards and ideal walking facilities.

Living spaces in urban areas could also influence, on the socio-economic and environmental factors (Mulligan and Carruthers, 2011; Mulligan *et al.*, 2005) that

affect happiness. The limited studies that considered the relationship between happiness and living environment just focused on the macro-level factors at the city or country-level, but the effects of micro-level living spaces facilities such as streets, on happiness, have not been investigated by previous studies. However, streets that can act as the mobility network for daily activities can affect happiness as parts of the living environment, directly and indirectly.

It is worth mentioning, the streets in Malaysia have not enough facilities at the micro level to make satisfaction for people and make them happy when they use streets as pedestrians and bicyclist for mobility needs. These facilities can be related to the street design factors, street facilities, environmental, and social factors. Paying attention to these micro level factors can lead to increase people's happiness and encourage people to walk and cycle more for their mobility needs. Therefore, this research attempts to fill this gap by focusing on the effects of micro level factors at the street level on happiness.

1.4 Research Questions

This research has the main purpose, which is developing a happy street model. To attain this purpose, this research is going to answer the following questions:

- What are the street related happiness factors?
- How can the happy street factors be used to develop a conceptual happy street model?
- What are the happy street and street factors relationships in the proposed happy street conceptual model?
- How can improvements be prioritized based on the happy street model to have happy streets?

1.5 Research Objectives

Based on the research questions, the objectives of this research are following:

- To identify the street related happiness factors.
- To develop a conceptual happy street model using the street related happiness factors.
- To evaluate the happy street and street factors relationships in the proposed happy street conceptual model.
- To prioritize improvements based on happy street model for existing streets.

1.6 Scope of Research

This research attempts to consider the street-level factors that have an influence on happiness feeling. Therefore, different studies, which considered various aspects of street design and the micro street design (e.g., shape and color), have been reviewed to identify street factors. In addition, studies related to happiness have been reviewed to identify happiness related factors. This review achieved street factors and their relationships with happiness to determine a conceptual happy street model. This research needed data to test the proposed conceptual model, which were collected from residents in Johor Bahru, Malaysia. Street facilities and design may differ between new and old neighborhoods. To include both old and new neighborhoods, the participants are selected randomly from one of the main old neighborhoods and one of the main new neighborhoods.

1.7 Limitations of Research

This research encountered a limitation in identifying the street indicators that influence happiness, regardless of socio-demographic backgrounds. Happiness in this

research is limited to short-term happiness that may lead to long-term happiness positively. This research recommends the happy street model to be flexible for various types of living spaces by using the same process. Meanwhile, this research has limitations to specify the street factors in urban areas and neighborhoods. This research is also limited to participants' perceptions and using the Structural Equation Modeling (SEM) technique for model fitness. In addition, since the objectives of this research did not include proposing a logical method for suggesting improvements, the suggested improvements are limited to a simple observation on existing conditions and a simple comparison between standards or ideal conditions.

1.8 Expected Contributions

Lifestyle and the quality of life change rapidly these days. Urban residents, in particular, may experience increased stress and pressure and decreased happiness, and quality of life because of various factors, such as motorized lifestyle, urban inequalities, lack of amenities, and poverty. Happiness can be related to everything around people and it is obvious that people will be unhappy in conditions where basic human needs are not provided. Therefore, public spaces, such as streets in urban areas can be used as potential opportunities to increase short-term happiness feelings that are in line with long-term happiness feelings. This can be achieved by providing the required natural, social, and human-created amenities in addition to the considering the effects of micro design factors, such as shape and color, on happiness. Various happiness measurements, such as satisfaction, pleasure, reliability, and health can be affected by street-level factors. The effective street-level factors that make a happy street model can be used to define street opportunities that can increase happiness. Therefore, suitable analytic processes for street designing and evaluating are needed to construct an analytical model for happy streets. The proposed happy street model in this research can improve the analytical street design, assessment, and improvement process.

1.9 Significance of the Research

The main aim of this research is to develop a happy street model based on the impact of street factors on the different happiness measurements. The proposed model provides useful information for designing new streets and evaluating existing streets in order to have happy streets. Improvements for existing streets can be achieved by comparing existing conditions with standards or ideal conditions for each effective factor in the proposed model. The improvements can be prioritized based on the importance of each factor in the proposed model. Although living spaces and communities have significant effects on happiness and quality of life, there are limited studies in this case, especially in relation to street-level factors and happy street approach that have not been investigated in the current literature. Streets are public spaces that are essential for mobility. Urban planners and designers can use these spaces as potential opportunities for promoting happiness in the society. Finally, the value of this research is in providing a foundation to develop the happy street model that was not addressed previously. This model can be utilized for various streets in different cities, regardless of socio-economic contexts. Therefore, this model is suited to universal applications.

1.10 Research Design

This research has four main steps. Identifying happy street factors using the current literature is the first step. Most of the happiness related studies that focus on the effects of amenities and micro-level design factors on happiness measurements have been reviewed in this step. This research continued the reviewing process to encounter the points again that lead to the widest range of indicators. The second main step is the development of a conceptual happy street model which is based on happy street factors. Summarizing and categorizing the results from the first step based on the current literature lead to the development of the conceptual happy street model. SEM has been utilized in the third step, to test the fitness of the proposed conceptual model with the collected data in addition to the relationships between the happy street and street-level factors. The required data was collected by a questionnaire that was designed for this research. This research used SEM as one of

the suitable techniques to fit a conceptual model with collected data. Chapter 3 presents the details of the questionnaire design and SEM. Prioritizing improvements is the final step that is based on SEM results to have happy streets. Figure 1.1 summarizes the mentioned four main steps.

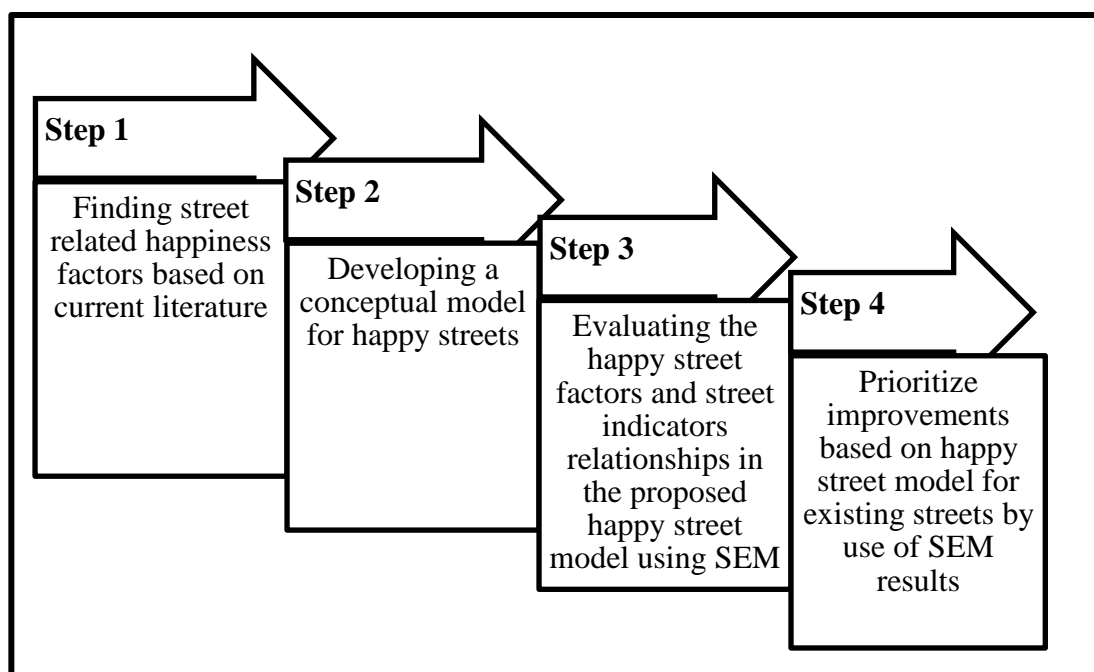


Figure 1.1: Research steps

1.11 Chapter Outlines

A summary of the research process, including current problems, research questions, research objectives, assumptions, limitations, and general information regarding research design are discussed in Chapter 1. Details of the literature review to find the happiness factors at the street-level and the effects of street-level factors on happiness are presented in Chapter 2. The information is used in this chapter to develop the conceptual happy street model. Chapter 3 contains the research methodology and technical aspects of the analysis methods. SEM that is one of the suitable techniques to fit a conceptual model with the collected data has been applied to find the relationships between the happy street and street-level factors. The analysis results regarding the proposed happy street model are discussed in Chapter

4. Finally, Chapter 5 presents the conclusions and discussions as well as the recommendations for further studies.

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