Budapest University of Technology and Economics
Faculty of Transportation Engineering and Vehicle Engineering
Department of Transport Technology and Economics

MASTER'S THESIS

Analysis of individual travel behaviour and promotion of sustainable mode choice using a route-planning application

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Presentation Outline

- Introduction
- Methodology
- MoveCit Route-Planning Application
- Results
- Study Limitations
- Recommendations and Future Development Directions

Introduction

The main research problem	Understanding travel behaviour and individual mode choice
Research objective	To investigate what factors influence travel behaviour and how a route-planning application can be used to encourage sustainable travel behaviour for daily travels in an urban area
The main research question	**How can individuals' travel behaviour be changed towards sustainable mode choices using a route planning application?**
Data source	The data analysis was conducted based on MoveCit application and its database

Methodology

- The study is descriptive quantitative research
- The method of data collection is considered as a revealed preference surveying:
  - Primary data is divided into two groups:
    - Information related to the profiles of MoveCit users
    - Data on trips made by the users
  - Secondary data (relevant statistical and general information on passengers transportation in Budapest)
- The choice model implemented in the application is multinomial discrete choice model
- The main data analysis methods:
  - Correlation analysis
  - Distribution analysis
  - K-means clustering analysis

MoveCit Route-Planning Application

The application creates possible routes for four modes of transport

Walking	Cycling	Public transport	Private cars

Influencing factors presented in MoveCit

Travel time, *min*	Travel cost, *HUF*	Emission, *g*	Health effect, *kcal*

Travellers set priorities (weights) for each factor from 1 to 5 in the application, where:

1 – is the least important
5 – is the most important

During the registration process on MoveCit website, the following information should be specified:

Personal information			Travel habits and preferences	
Gender	Year of birth	Home and work addresses	The most frequently used mode of transport	•Regularly used mode(s) (at least once a week) and additional information related to the chosen mode(s)

Results

MoveCit as a Tool of Persuasive Techniques

Tunnelling

- The users are guided towards their choices
- The uncertainty is reduced because they are able to plan their trips step-by-step

Suggestion

- The mode of transport which is proposed to the user based on personal preferences is highlighted
- All modes are ranked from 1 to 4, where 1 – is the best option according to the user's preferences

Personalization

- MoveCit offers personalized content which helps reaching better results

Cause-end-Effect Simulation

- It informs users about possible consequences of choosing a particular transport mode
- The application depicts estimated CO_2 emissions, burned calories, travel cost and travel time for each transport mode

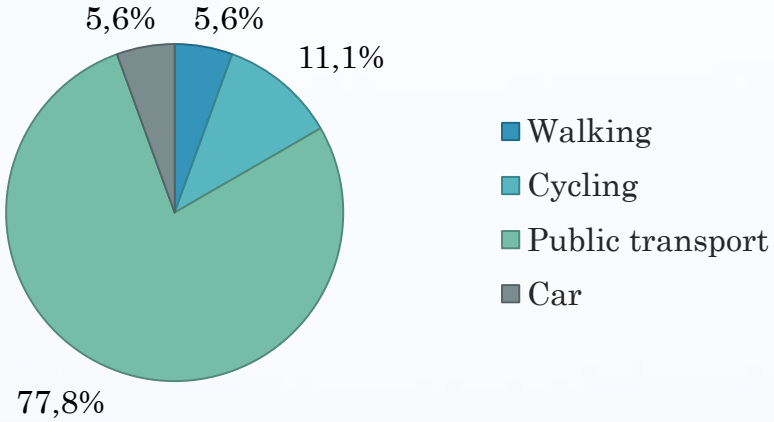
General Analysis of MoveCit Pilot Data

- The number of profiles created in MoveCit is **69**
- The number of trips generated by the users is **207**
- The number of feedback messages left in the application is **60**
- The number of feedback messages with specified home addresses is **23**

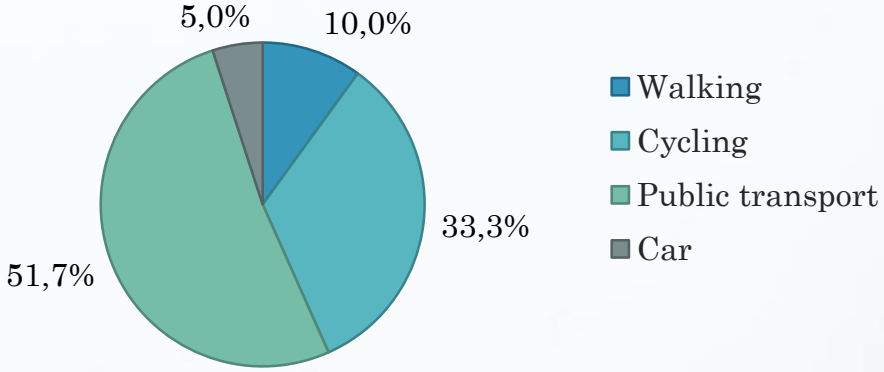
Parameter	Groups/options	Number of users	Percentage
Gender	Male	45	65%
	Female	14	20%
	Users who did not specify gender	10	15%
Age groups	Young adults (18-35 y.o.)	43	62%
	Middle aged users (36-55 y.o.)	18	26%
	Older adults (>55 y.o.)	8	12%
Car ownership	Car	20	29%
	No car	49	71%

Transport Mode Choice Based on Preferences and Feedback

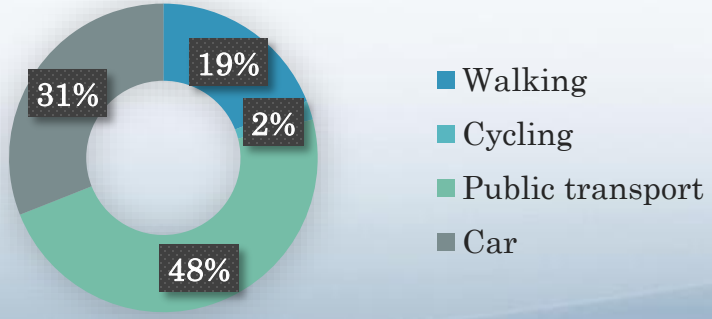
Frequency of the use of different transport modes based on preferences specified in the profiles



Transport mode choice based on feedback



Modal split in Budapest in 2016, %



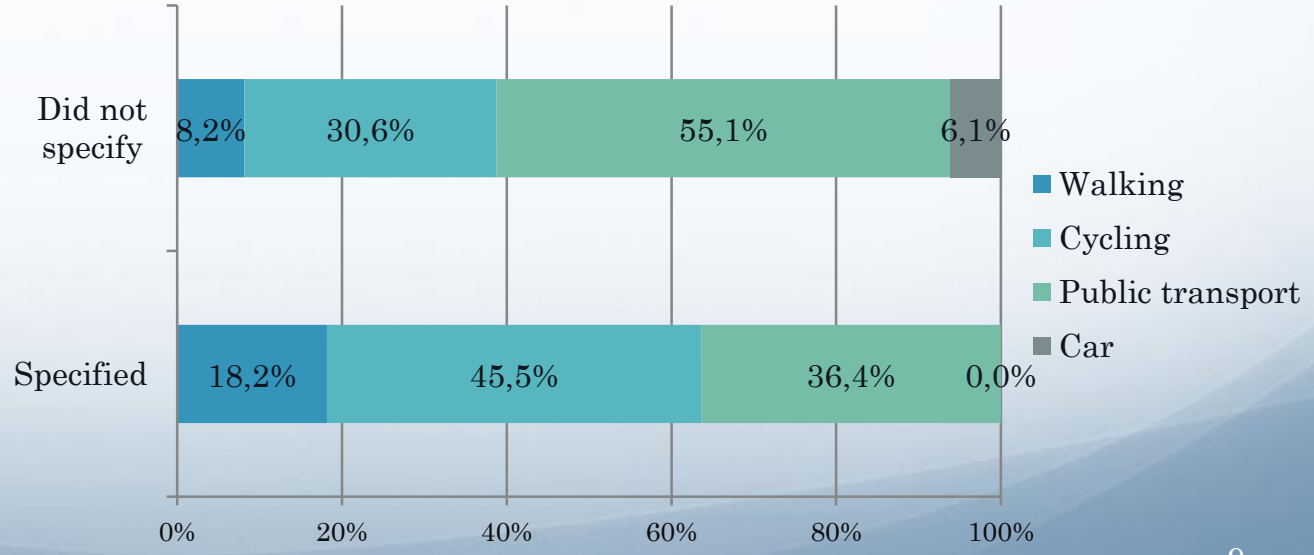
The Importance of the Factors Determining Transport Move Choice

Average weights for each factor presented in MoveCit based on feedback

Factor	Travel time	Emission	Travel cost	Health effect
Average weight	3.83	2.66	3.19	2.35

The share of MoveCit users who specified emission as the most important influencing parameter is **13.0%**

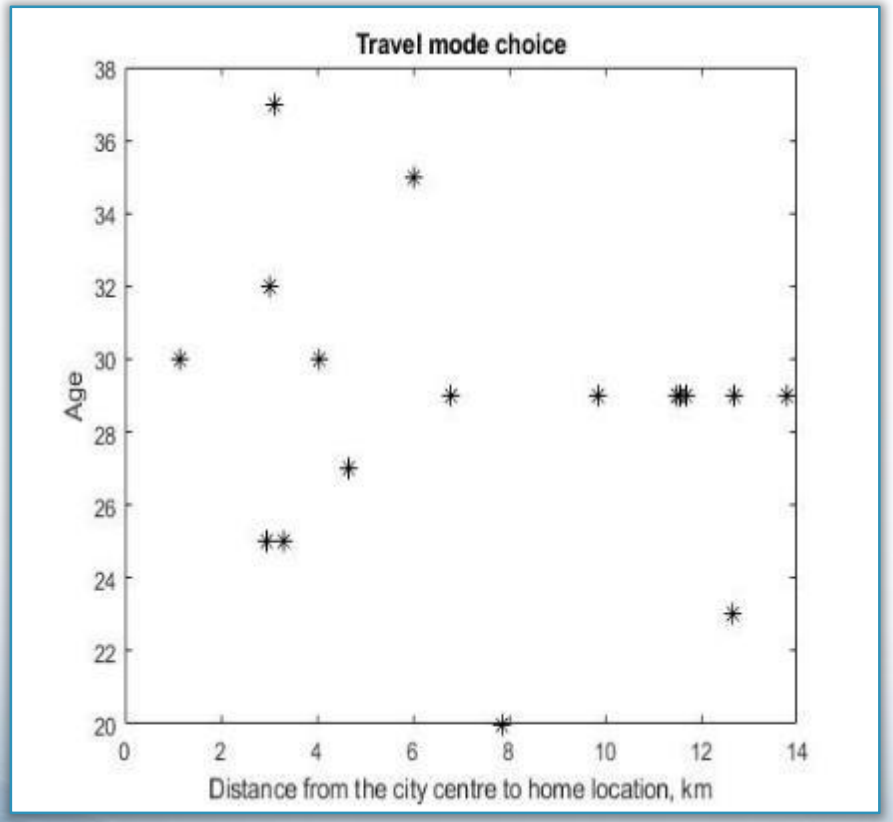
Mode choice of the users who specified and did not specify emission as the most important factor, %



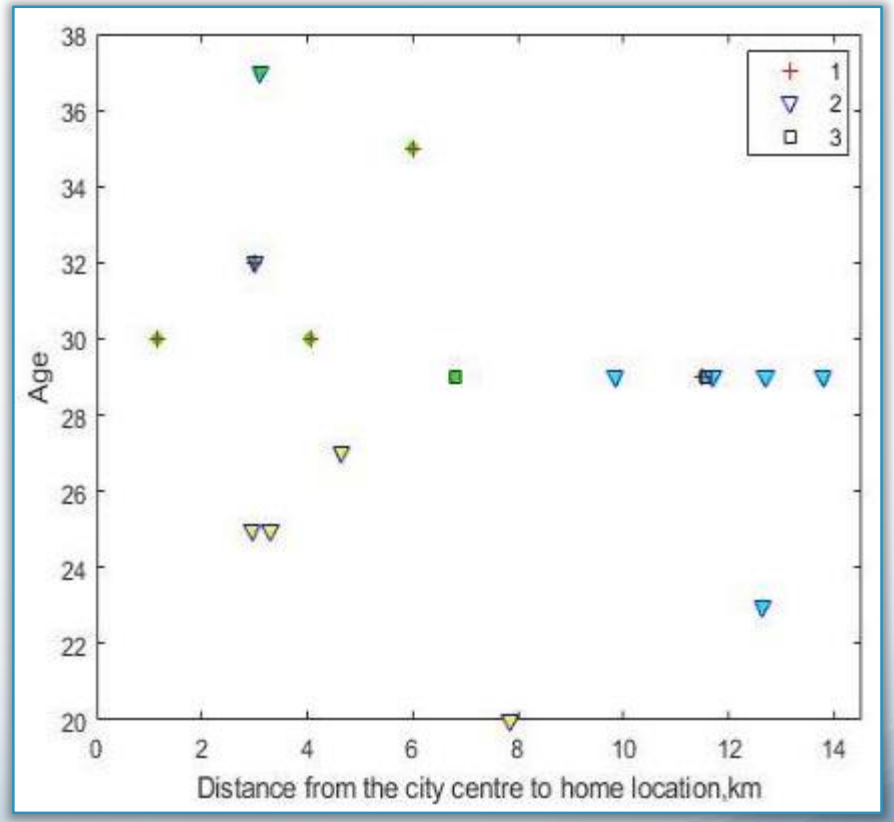
Clustering of MoveCit Users Based on Feedback

The number of feedback messages used for the analysis is only 20 (there are 23 feedback messages with known home addresses, and 3 of them are excluded for the analysis in order to avoid substantial biases in results)

Plot of the initial data



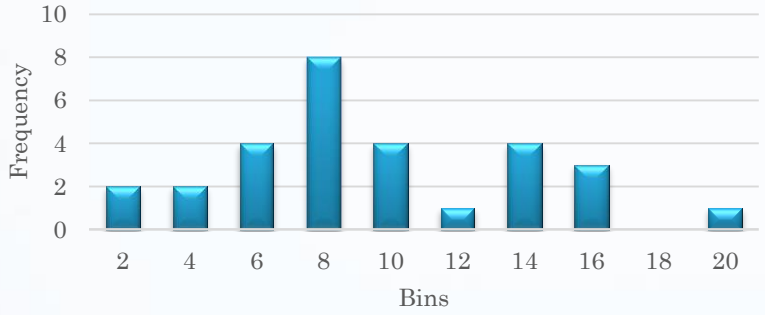
Results of k-means clustering



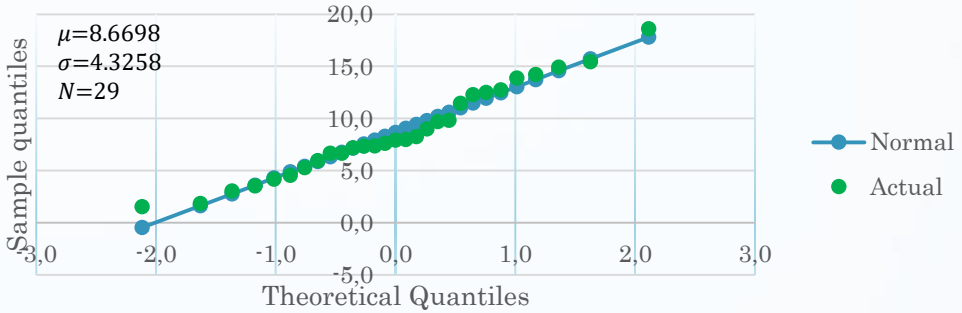
1 – Bicycle
2 – Public transport
3 – Private cars
The clusters are presented in different colours

Travel Distance Distribution

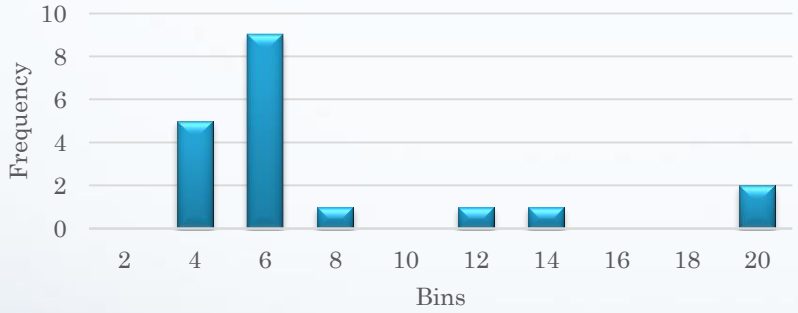
Public transport



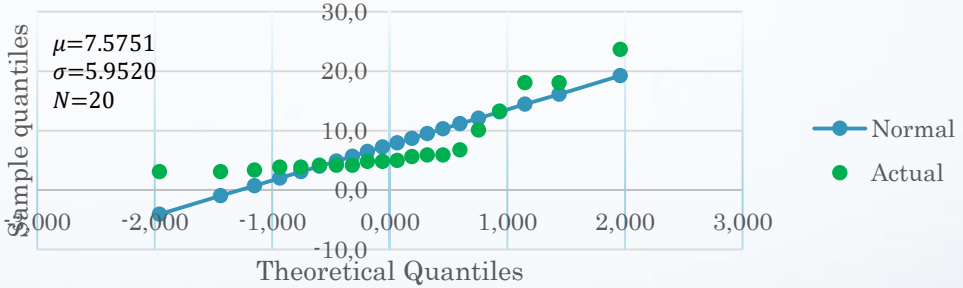
Q-Q plot (public transport)



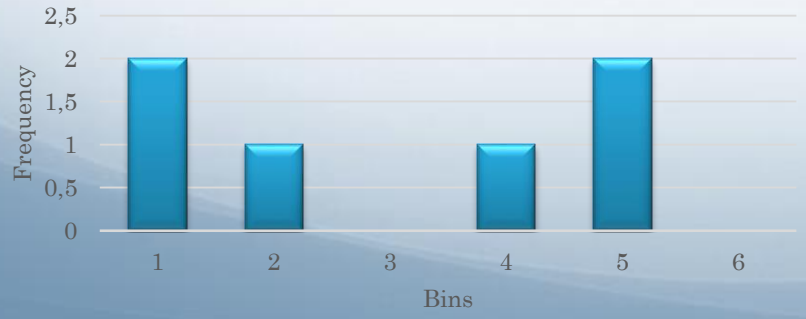
Cycling



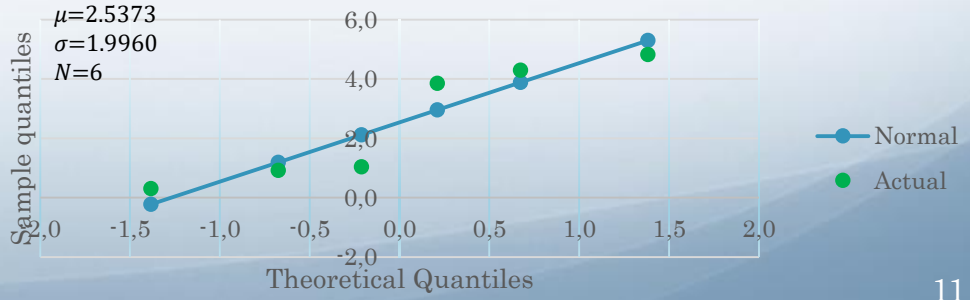
Q-Q plot (cycling)



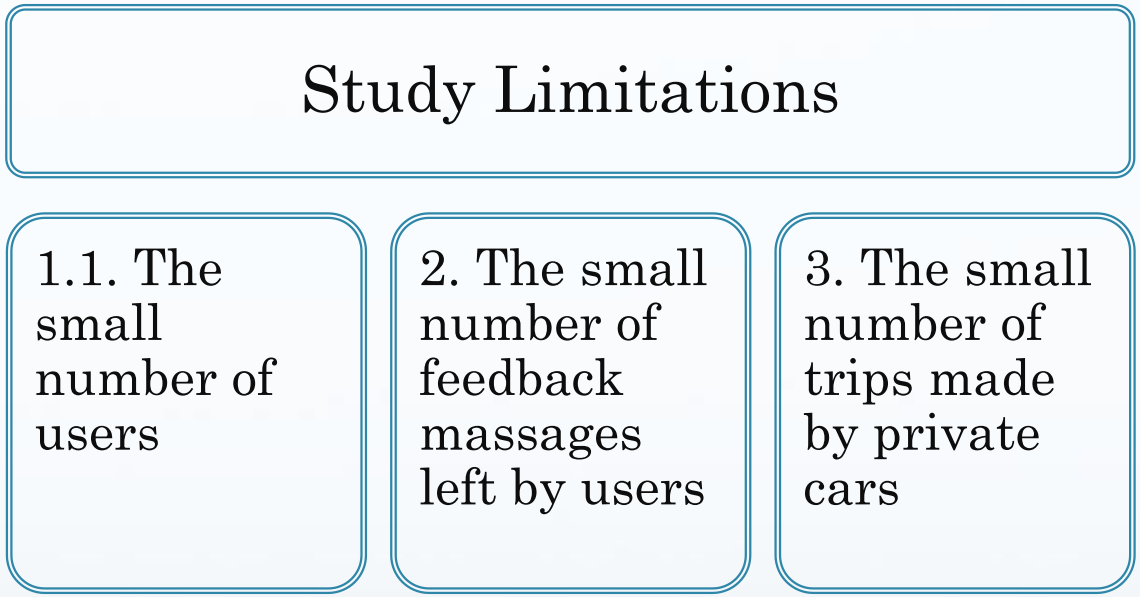
Walking



Q-Q plot (walking)



Limitations of the Study



Recommendations and Future Development Directions

- Implementation of additional persuasive techniques:
  - Gamification and rewards
  - Self-monitoring
  - Reminders through sending emails:
    - Emails with motivational context
    - Emails with encouraging context
- Launching an educational campaign to increase awareness of citizens about the negative impacts of unsustainable mode choices and highlight importance of healthy lifestyles
- Improving the application in terms of depicting the correct value of burned calories for private transport
- Add displaying the weather status
- Extending the application with car sharing as a transport mode
- Extending the transport mode choice model presented in MoveCit with more influencing factors (trip purpose and comfort)

THANK YOU FOR YOUR ATTENTION!