Designing a Dashboard Visualization Tool for Urban Planners to Assess the Completeness of Streets

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iCity-ORF

Urban Informatics for Sustainable Metropolitan Growth

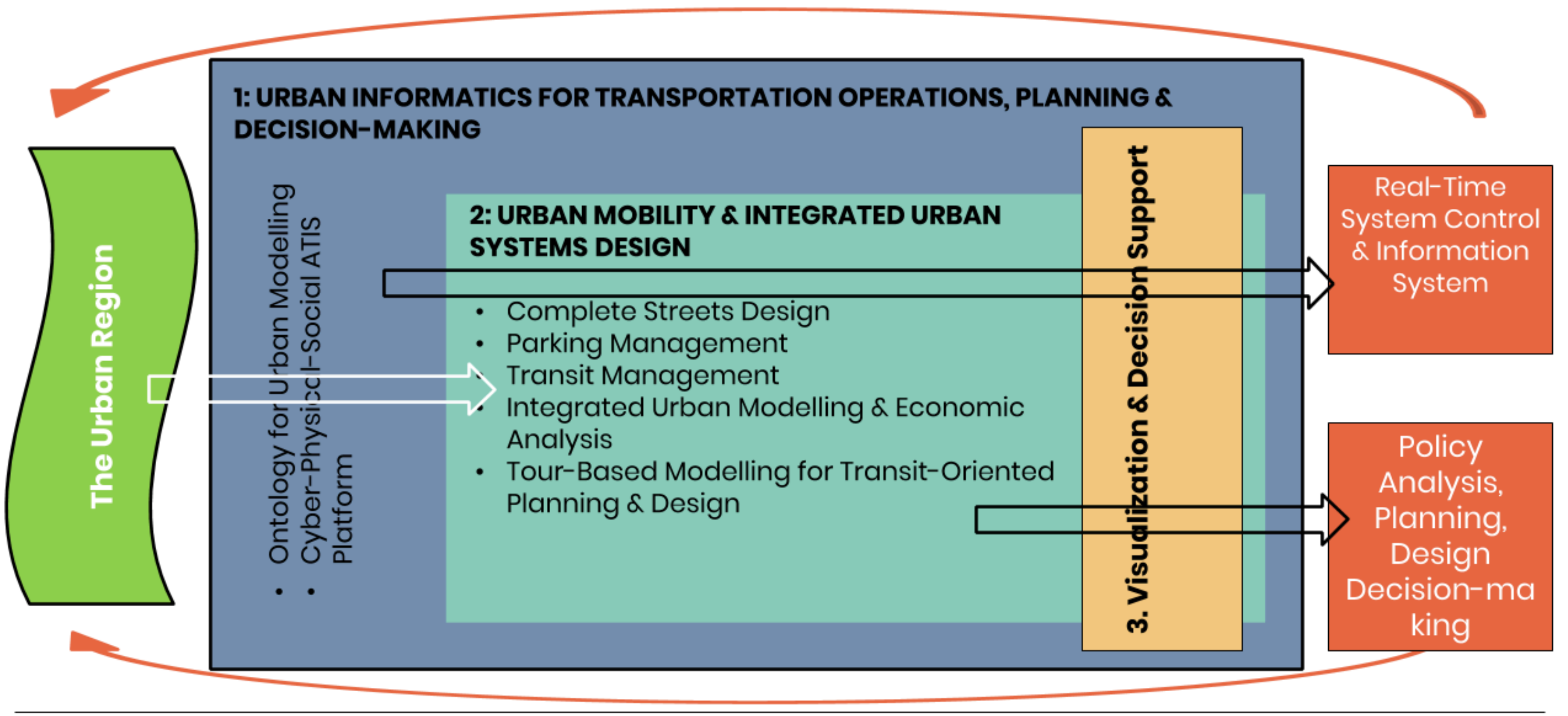

IMAGE: Katsumi, M. & Fox, M. (2020)

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Agenda

INTRODUCTION

CONTEXT

DESIGN

DEMO

CONCLUSIONS

NEXT STEPS

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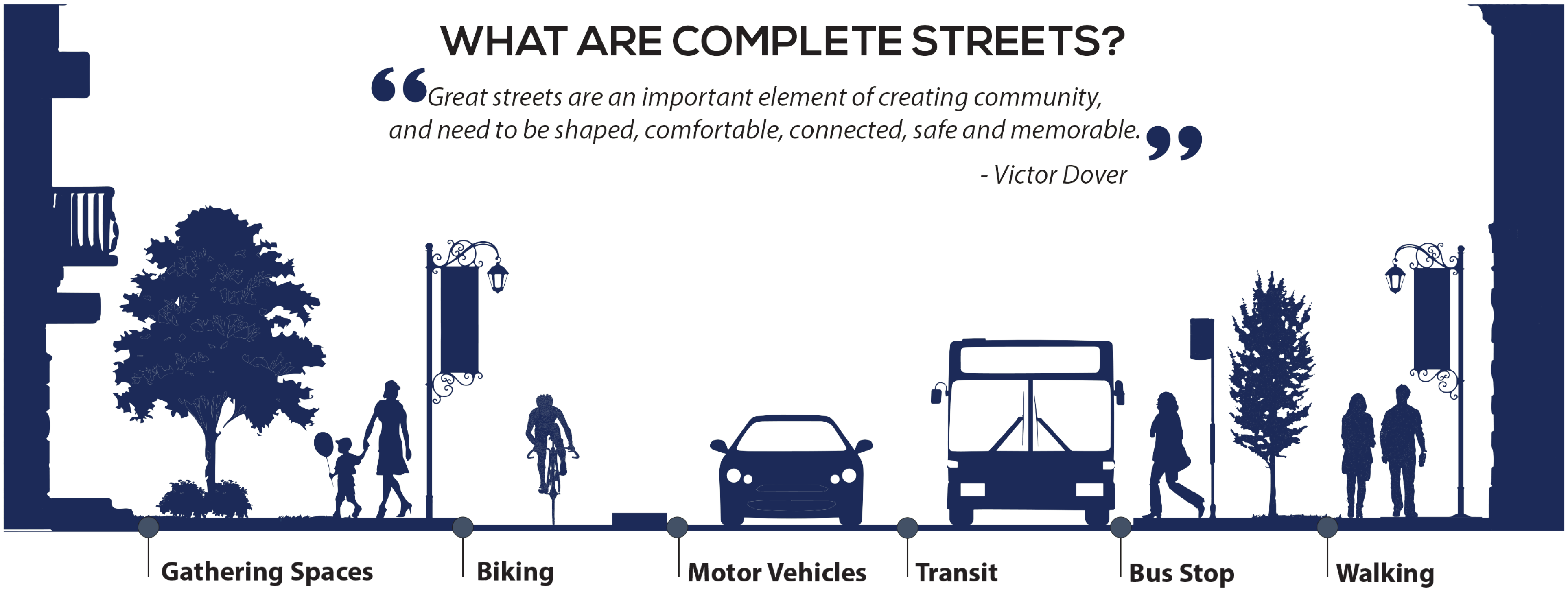
Introduction

- No Sidewalks
- Too dangerous to cross on foot
- Uninviting for bus riders
- Inaccessible for wheelchair users
- Inadequate

Introduction



Source: City of Boulder Colorado

Complete Street Elements

IMAGE: King Street Pilot, Toronto, ON, Canada
Visual Analytics Lab On Street, iCity Team

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Complete Street Elements

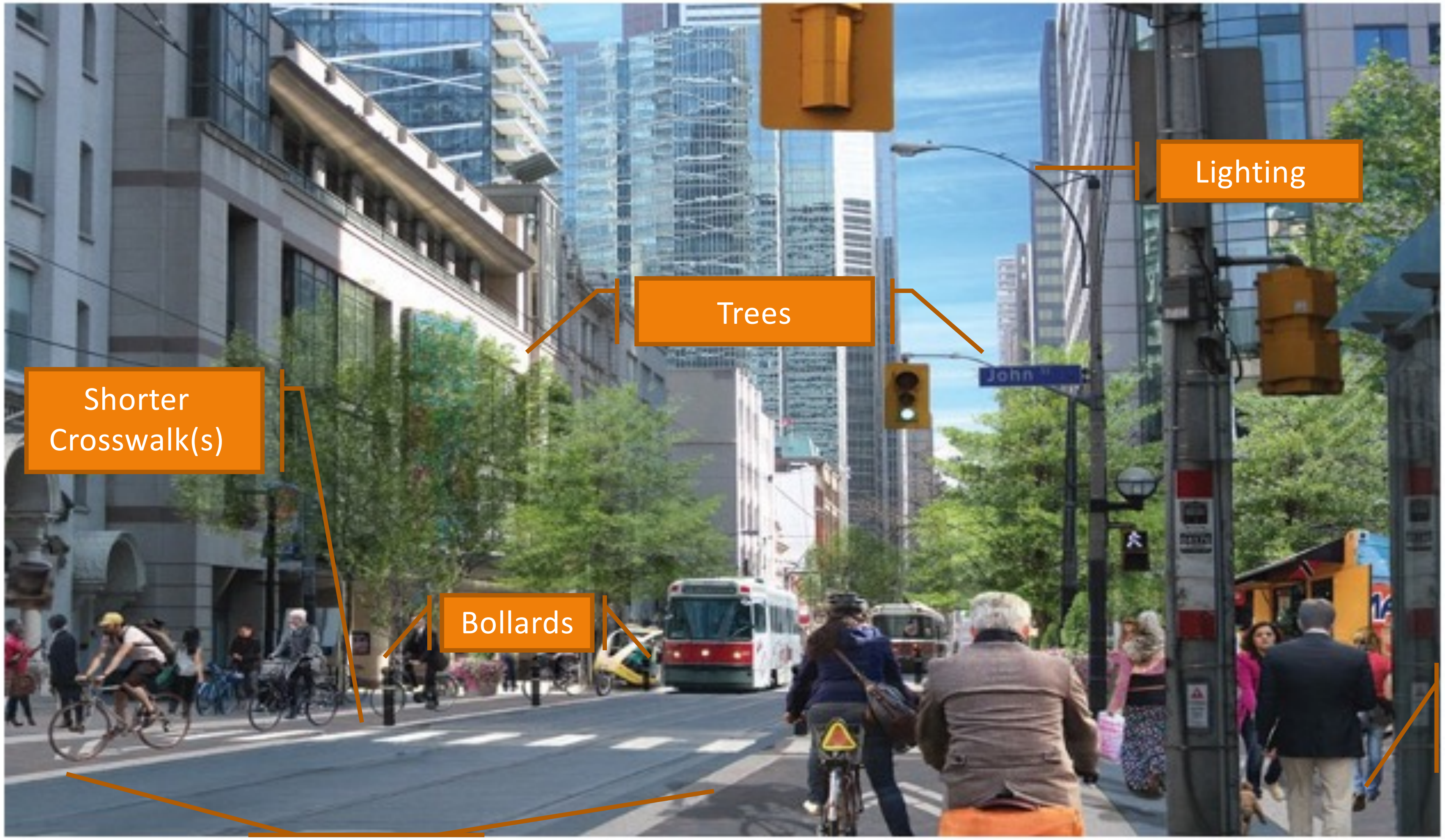

IMAGE: King Street Pilot, Toronto, ON, Canada
Visual Analytics Lab On Street, iCity Team

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Complete Streets Examples


John Street


McNicoll Ave in Scarborough.


Queensway


Union Station


College Street


Suburban Street in Port Union


Simcoe Street

IMAGES: City of Toronto

Completeness Tool

Overview:

- Developed by University of Toronto Team to measure the completeness of Complete Streets according to the concept presented by Hui et al. (2017)

Objective:

- Evaluation of a specific street segment based on Level of Service (LOS) model equations and criteria

Used for:

- Support the development of policies and guidelines
- Prioritize areas for infrastructure investment for a network
- Solve the right-of-way allocation problem for individual streets

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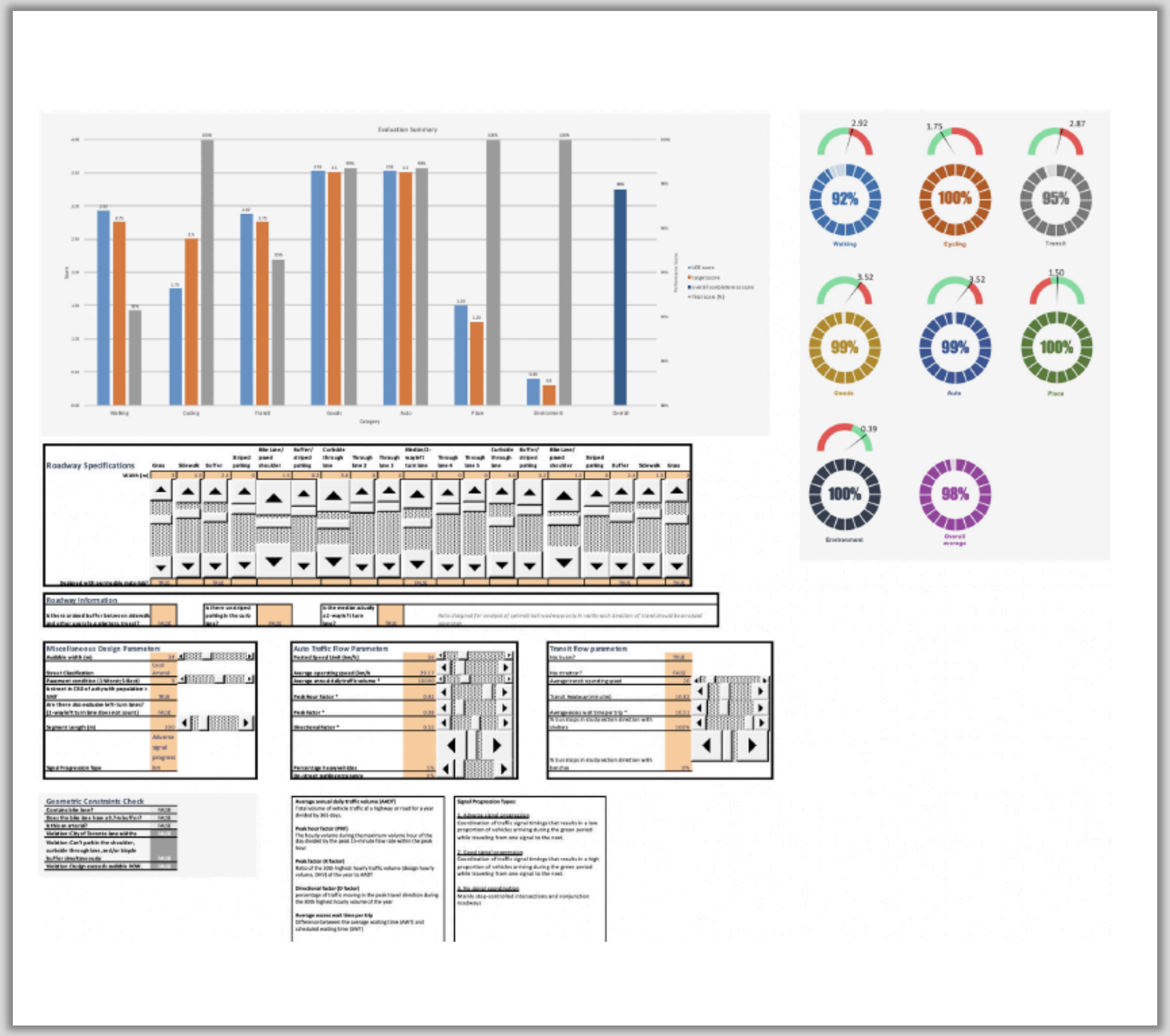
Completeness Tool

Rich Excel display with:

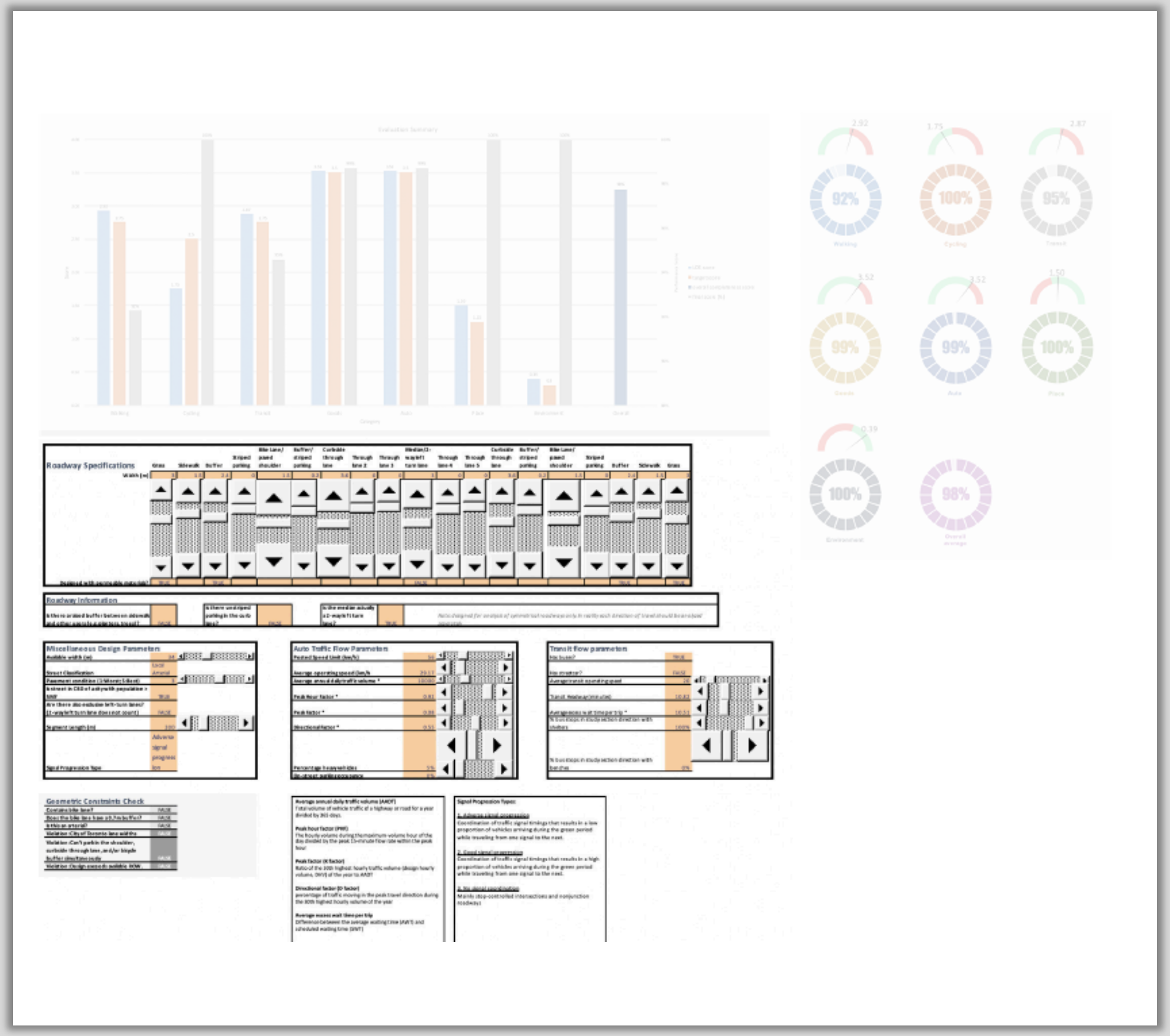
- A data sample in array for six categories: Walking, Cycling, Transit, Goods, Place, and Environment
- Visualizations in order to help individuals design a complete street



Completeness Tool

INPUTS (Parameters):

- Roadway Specifications:
  - Example: width of sidewalk, width of bike lane
- Design:
  - Example: type of street, if there is bike lane
- Traffic and Transit Flow:
  - Example: if has buses, streetcars, average operation speed (Km/h)



Completeness Tool

OUTPUTS (Charts):

- Bars
  - Shows and compares the LOS and target scores for each category
  - Has an extra bar for overall performance

- Gauge
  - Green and Red areas are defined by the target scores
  - If the computed scores falls into the green area it means that LOS score meets the target.

Design Considerations

Challenges posed with the use of spreadsheet format:

- Usability
- Interoperability
- Scalability
- Visualization

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Complete Streets Dashboard Design

OBJECTIVE OF THIS STUDY

Design a dashboard tool that provides a model to **test prototypical Complete Streets combinations**, and to **support urban design and transportation planning** decision making.

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Design Thinking

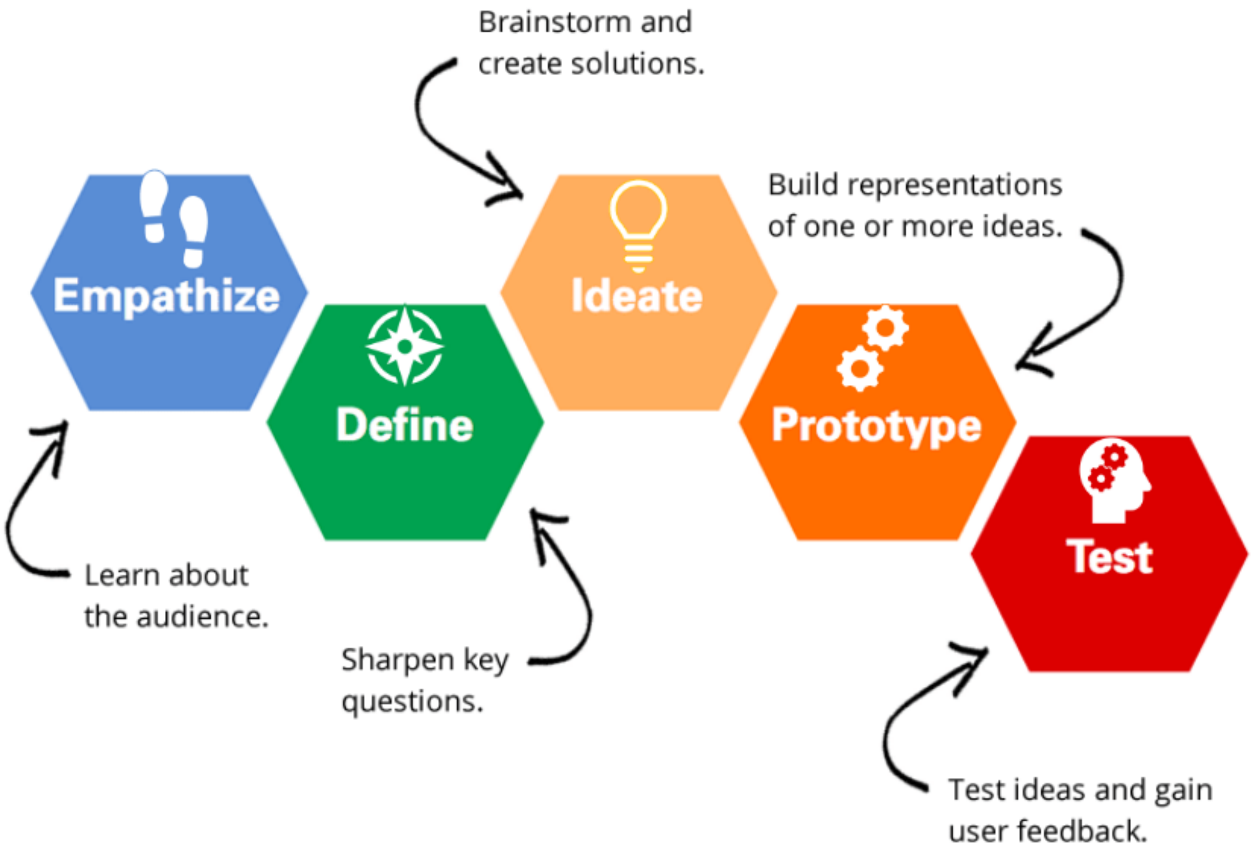
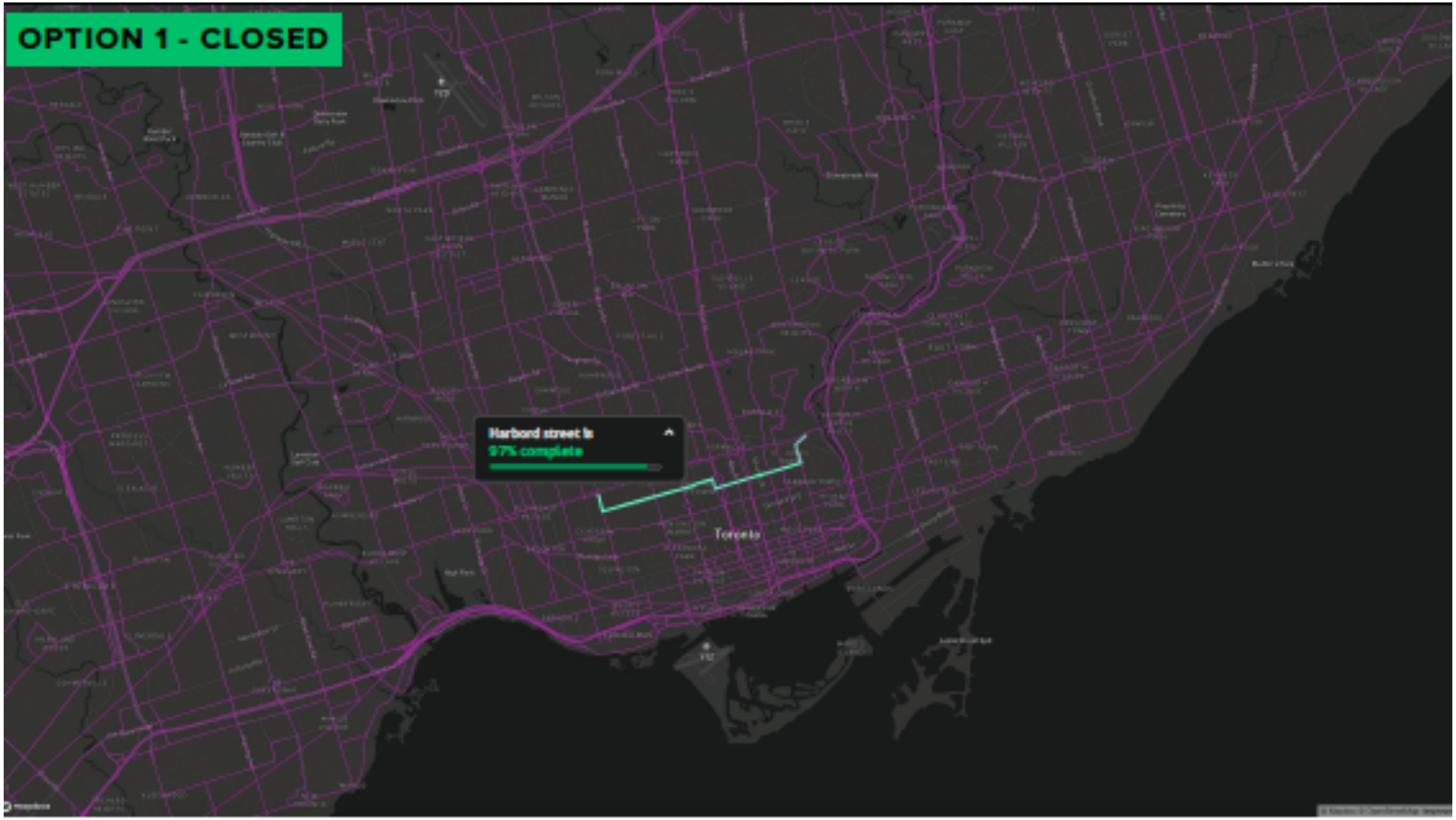


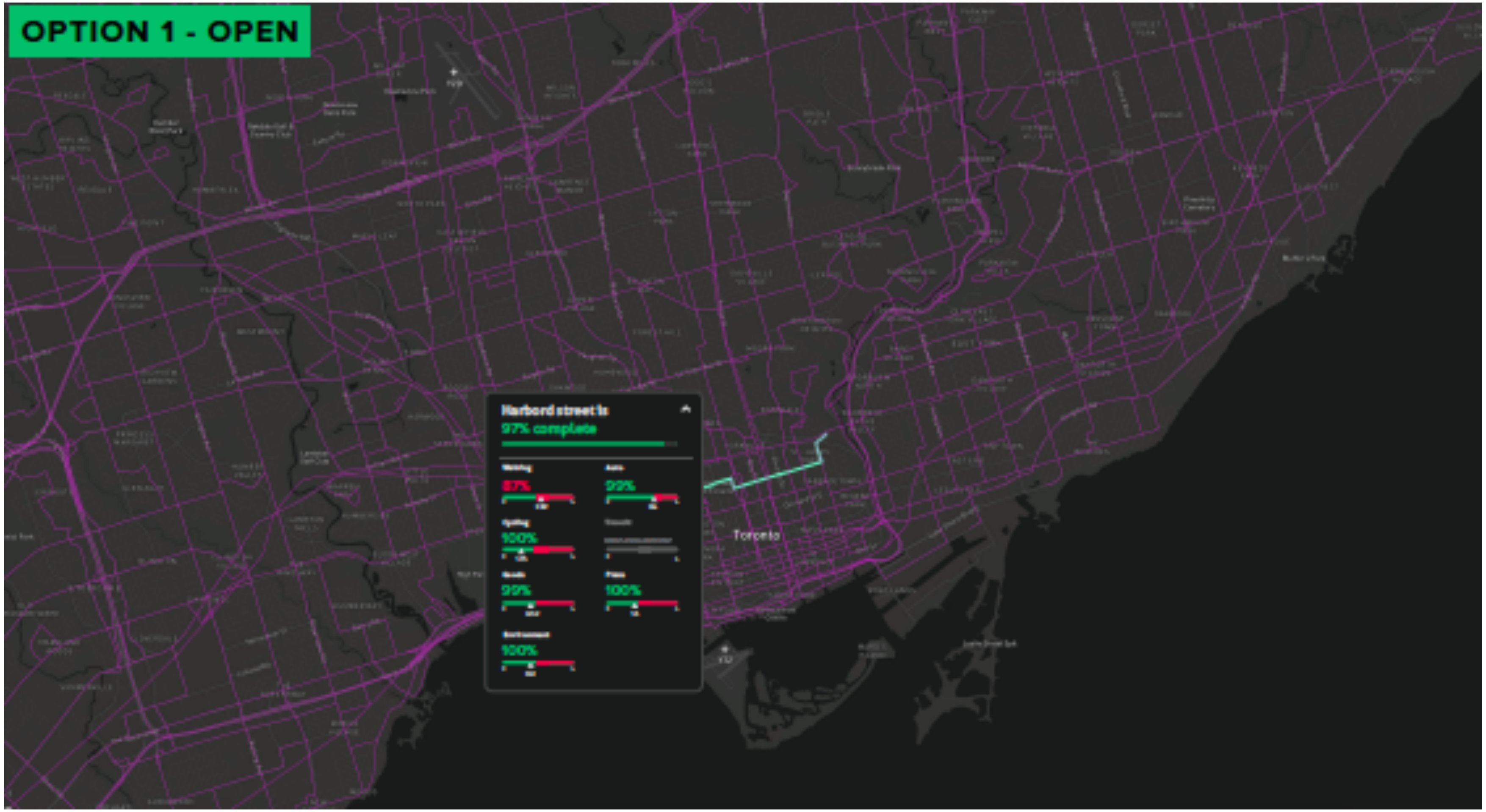
IMAGE: MOVINGWORLDS Blog

[Brown, 2009; IDEO, 2020]

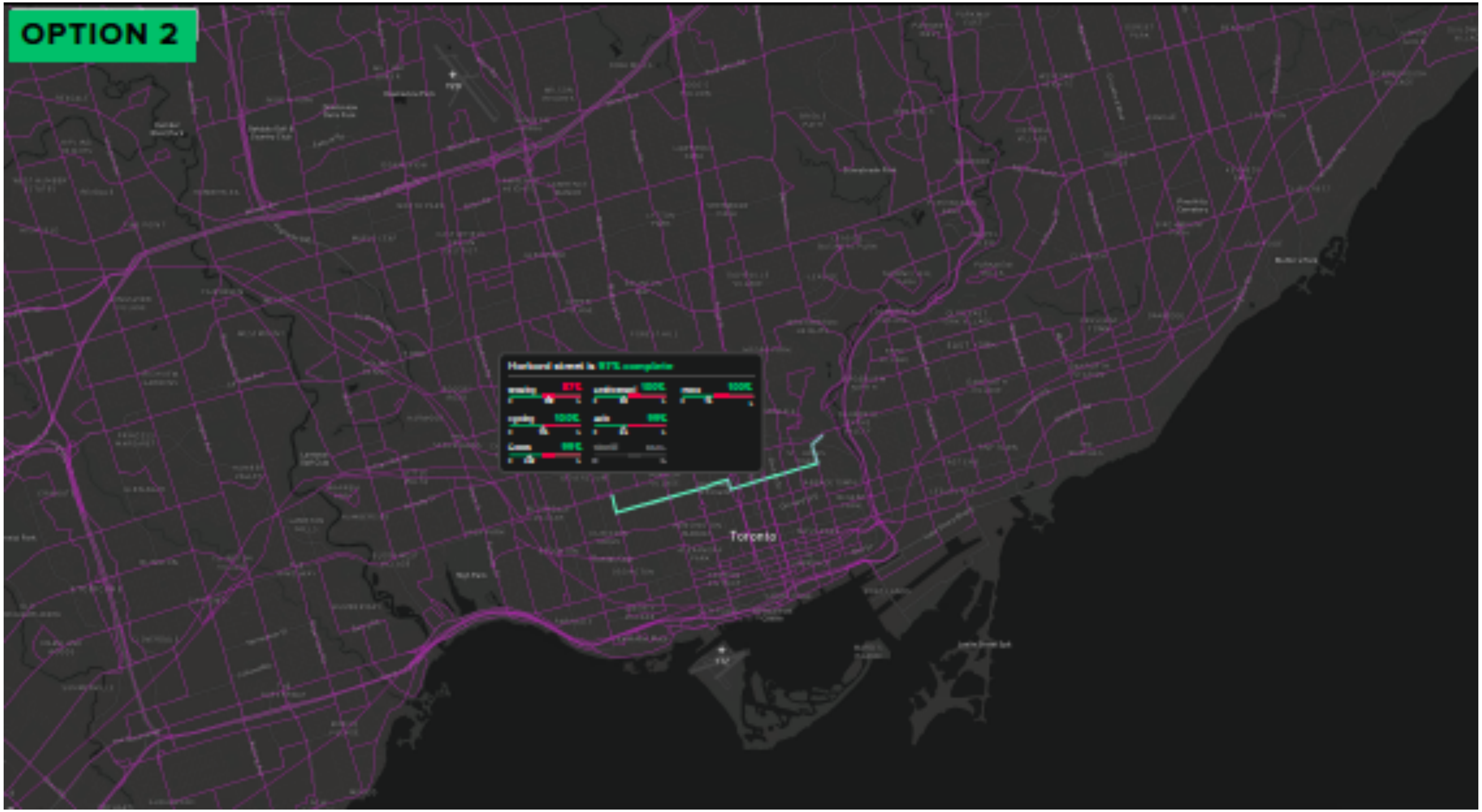
Low Fidelity Prototype



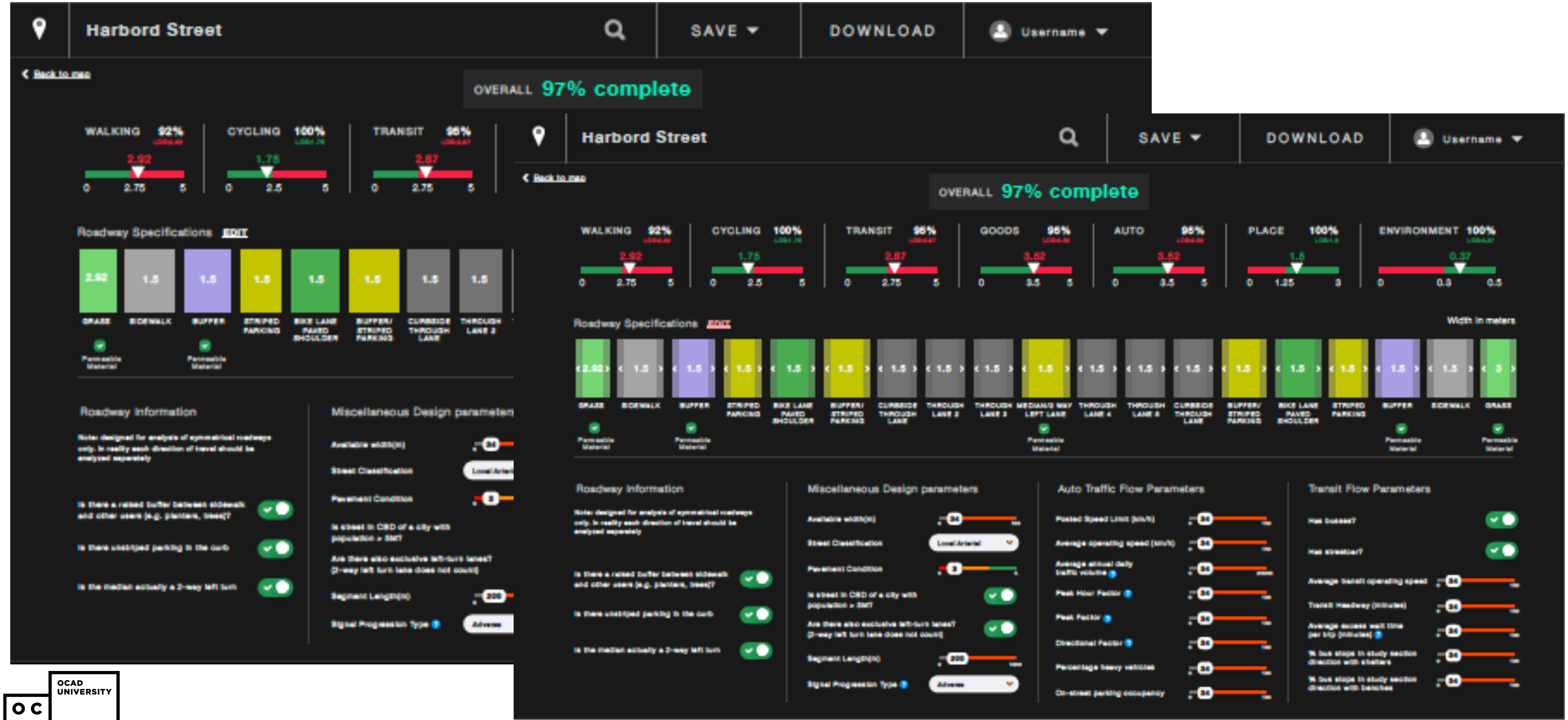
Low Fidelity Prototype



Low Fidelity Prototype



Low Fidelity Prototype



Principles of Usability

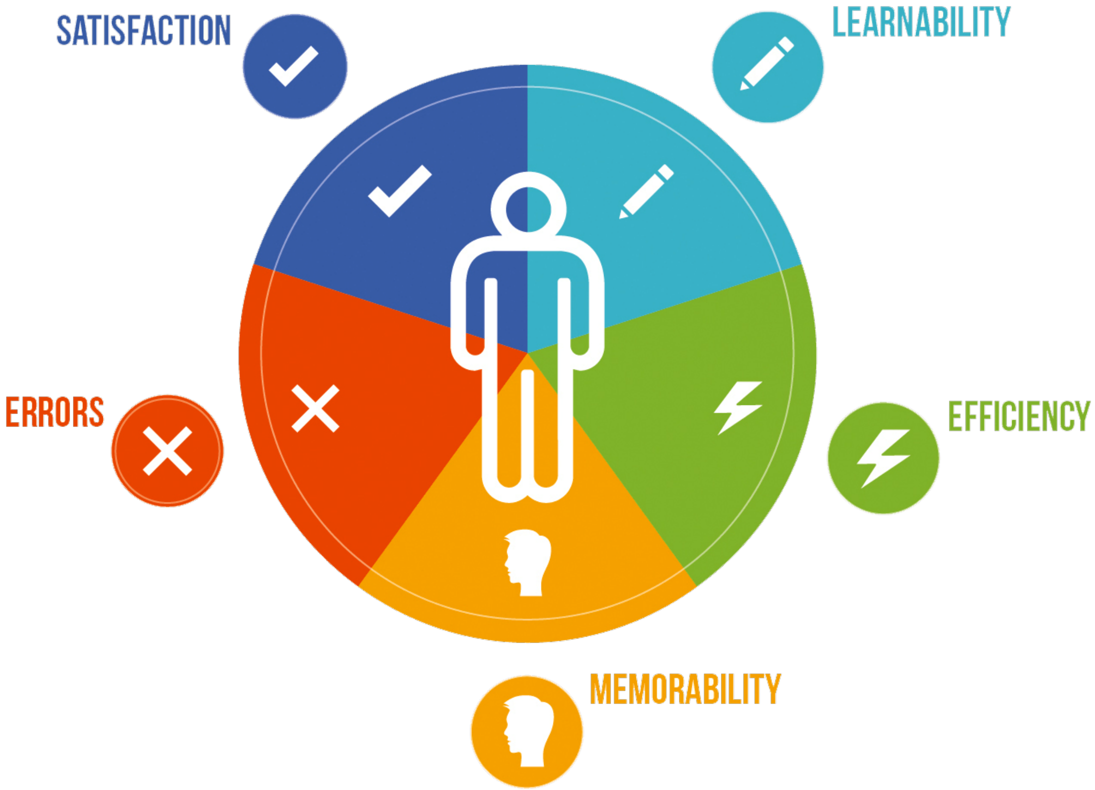
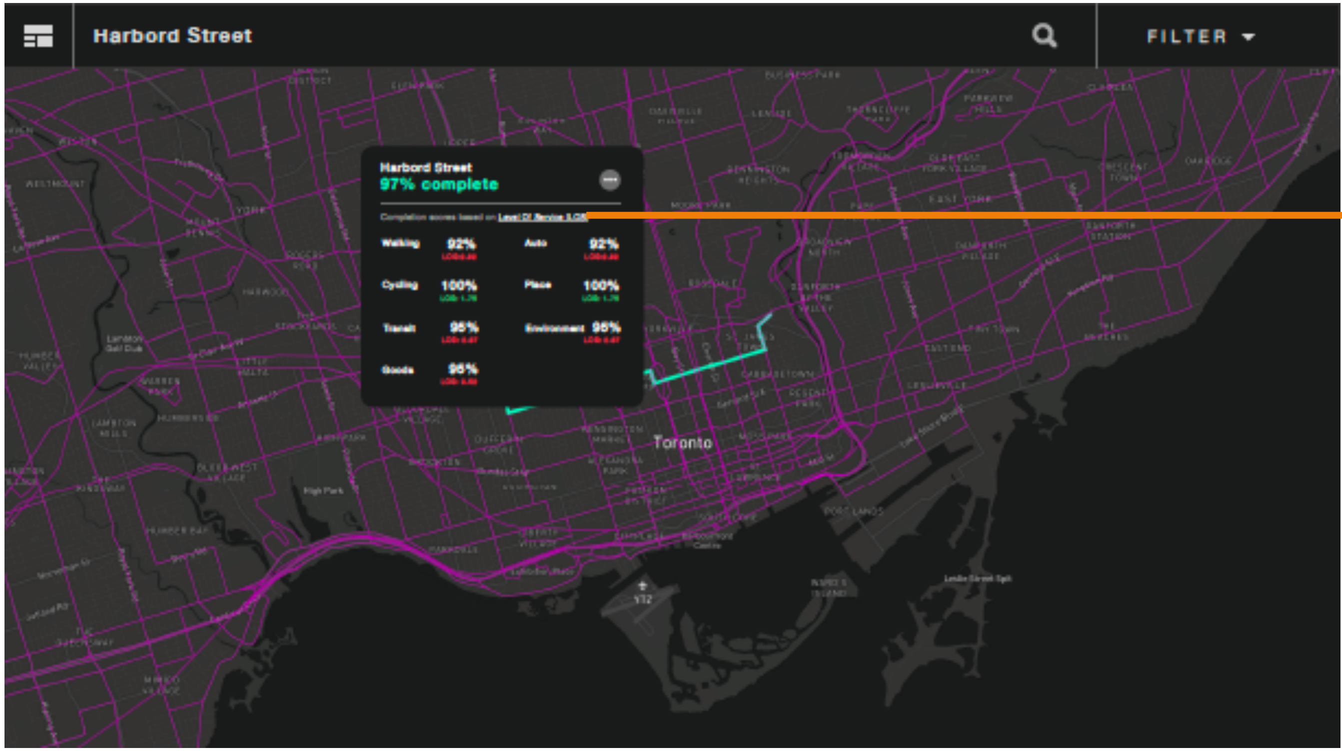


IMAGE: CLIPARTMAX

[Nielsen, 2012]

Principles of Usability



Level of Service Score (LOS)

NCHRP Project 3-70 developed and calibrated a method for evaluating the multimodal level of service (MMLOS) provided by different urban street designs and operations. This MMLOS method is designed for evaluating "complete streets," context-sensitive design alternatives, and smart growth from the perspective of all users of the street. The analyst can use the MMLOS method to evaluate the tradeoffs of various street designs in terms of their effects on the auto driver's, transit passenger's, bicyclist's, and pedestrian's perceptions of the quality of service provided by the street.

The MMLOS method estimates the auto, bus, bicycle, and pedestrian level of service on an urban street using a combination of readily available data and data normally gathered by an agency to assess auto and transit level of service. The data requirements of the MMLOS method include geometric cross-section, signal timing, the posted speed limit, bus headways, traffic volumes, transit patronage, and pedestrian volumes.

Learn more through the NCHRP Report 616

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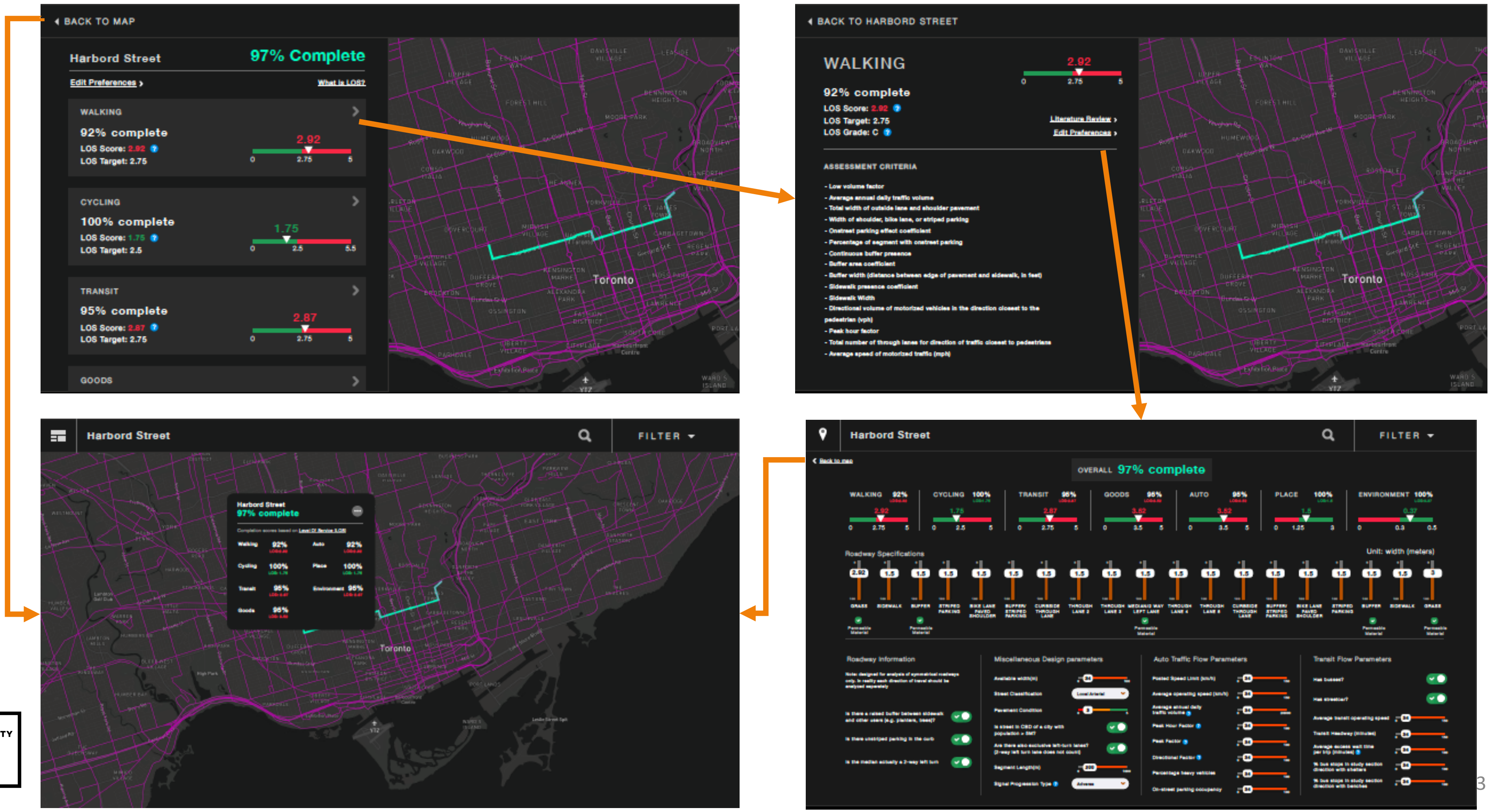
Principles of Usability



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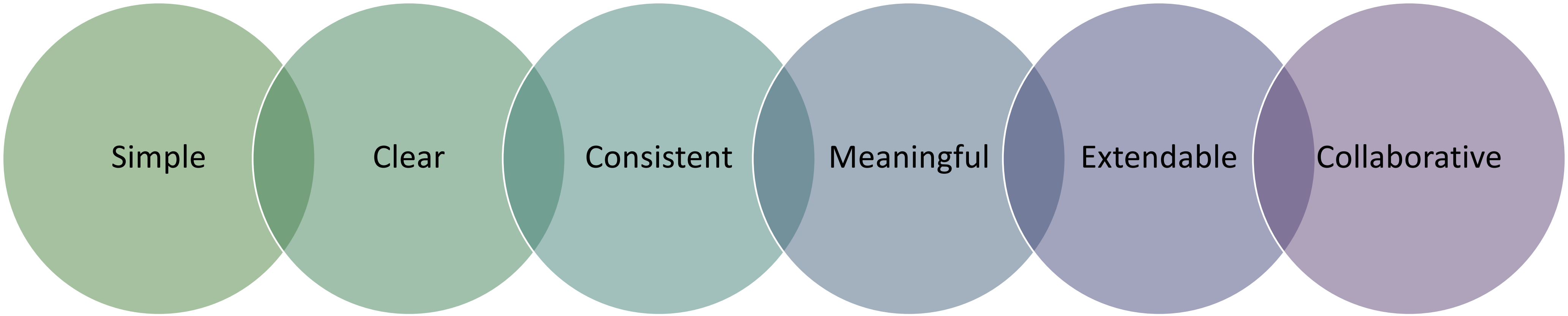
User-Centered Design



[Reynolds, 2014; Shneiderman, 2016]

User-Centered Design

Simple, Clear, Consistent: Function first focus

- Convert complex formulas for urban planning into a simplified engaging user experience
  - Two views: map-based and dashboard
  - Colour use is minimal
  - Interface in black to minimize the load on the eyes
    - Red and green are easily recognizable have been used to denote positive and negative actions.
  - Clean sans-serif fonts have been used
    - Provide visual relief and make it easy to read at all sizes.
  - Common User Interface elements where used
    - Buttons, dropdowns, sliders and checkbox, easily found on most web and mobile interfaces.

- Display information with one touch links with key explanations for theoritcal concepts that seem new or unique to a user.

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User-Centered Design

Meaningful: Flexibility to browse through streets and draw comparisons between them across areas, before moving into a detailed street redesign or designing a new street

Extendable: Flexibility to add and remove parameters in the future, to adapt to changing laws and amendments

- Ability to be applied across different cities to ensure its future usability

Collaborative: collaborative street design

- Ability to save files and download the data or images from the charts
- Ability to share the saved or downloaded files with other users of the system
- Flexibility to get the data and visualize using other visualization tool
- Future interaction will include collaborative design inside the tool

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Complete Streets Dashboard

Demonstration

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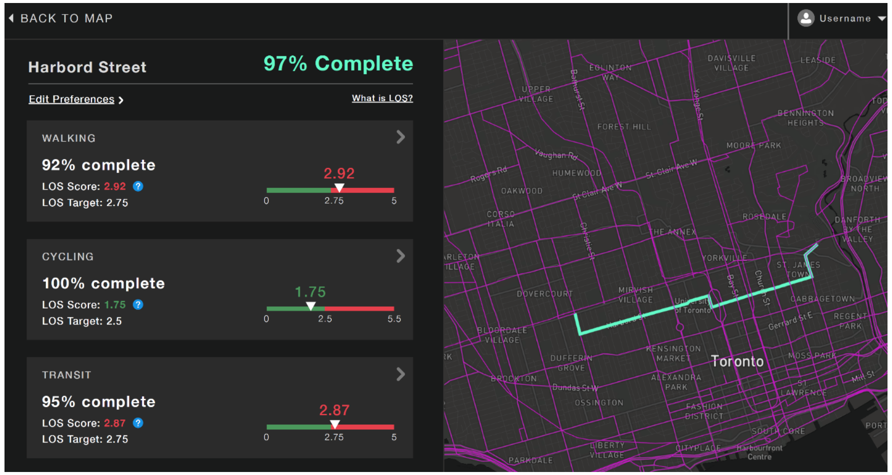
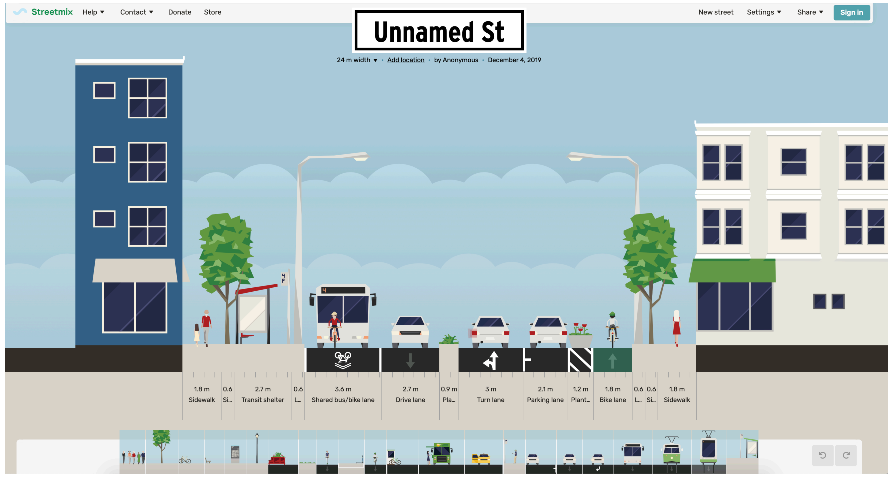
Conclusions

- Kept the initial proposal of the dashboard, improving:
  - Application:
    - Changed from spreadsheet to an web application
    - Created a map-based visualization tool with a dashboard view
    - Inclusion of users interactions
    - Consistent and cleaning navigation
    - Kept the spreadsheet data format to be adapted to other cities in the future
  - User Experience:
    - Inclusion of interactions both in map-level and visualization level
    - Inclusion of references to understand the data
    - Possibility to create different scenarios and save to future evaluation or to share with other stackholders
    - Possibility to save and download data or image to share with stackholders
    - Possibility to compare different scenarios for a same street or between streets from same neighbourhood
    - Clean visualization

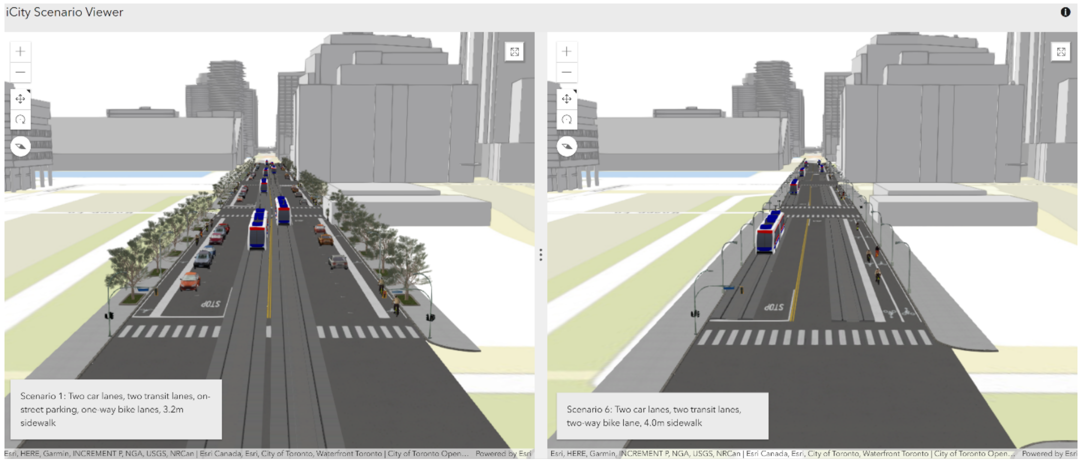
Next Steps



Current Prototype developed by OCAD team



Streetmix 2D cross-sectional complete streets tool



A 3D webscene of complete street options generated in CityEngine.

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Thank You!

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- More references are available in our paper.