

Designing Cityzonas: A Design Tool For The Creation Of City-Centered Mobility Strategies

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ABSTRACT

While most mobility providers likely have a sustainable or environmentally friendly goal at heart, a poor implementation strategy can do more harm than good within a city. The lack of awareness about the city's environmental, socio-demographic or socio-economic characteristics or the absence of a clear vision of the local government about how to deal with new mobility providers plays a crucial role in this. The design of a new tool called 'cityzona' can aid in creating a better connection between local government and mobility provider by making urban planners and/or designers more aware of the relations between variables influencing the modal split but also by improving the communication about the city between stakeholders. This paper aims to take the first steps in the development of the cityzona by designing early versions of the cityzona in an iterative process. For the design of the cityzona quantitative data is used in combination with semi-structured interviews. The results are qualitatively interpreted for the creation of the cityzona concept. Interviews showed that the cityzona has potential to function as a tool to align stakeholders for the design of a long-term mobility strategy as well as a tool for exploring and reinventing city level services for the implementation in different types of cities. Regardless of the function, the cityzona provided most useful in the early stages of a design process. However, more research is needed on the use of cityzonas in practice to further validate the fit with these potential functions.

Keywords: Mobility strategy; Persona Design; Modal shift

1

2 INTRODUCTION

3 The European green deal strives to achieve a 90% transport-related emission reduction and cities play
4 a big part in this [1]. Therefore, topics like ‘Mobility as a Service’ and ‘shared mobility’ have been
5 addressed frequently when talking about future mobility scenarios in urban areas [2]. Concepts like
6 these are a part of possible solutions that could contribute to future scenarios of sustainable urban
7 transport. While, for example, the implementation of bike sharing services in Amsterdam by the
8 Dutch Railway (NS) company was a relative success, China had a lot more issues [3]. A huge
9 oversupply of bikes resulted in vandalism and the so-called graveyard bikes. The mismatch between
10 the capacity of the existing infrastructure and the implementation of the bikes resulted in an
11 inundation of city centers with shareable bikes [3]. Moreover, the lack of vision and strategy from the
12 local government led to a missing regulatory framework. This made it possible for copy-cat
13 businesses to implement bikes as well. Creating an even bigger surplus of bikes. This problem
14 occurred due to a mismatch on different levels. The implementation strategy did not fit with the
15 government strategy, the existing infrastructure as well as the travel behavior of the citizens [3]. This
16 example argues for a tool to design strategies that includes a better connection between these aspects.
17 For both local governments as well as mobility service providers.

18 Klinger et al (2013) used the concept of urban mobility cultures to understand how factors like travel
19 behavior, government strategy and infrastructure can influence each other and the use of the available
20 modes of transport in cities, also known as the modal split [4]. These mobility cultures can be applied
21 to cities with similar characteristics to provide representative recommendations for a modal shift
22 towards sustainable transport. However, from a design perspective these mobility cultures lack a
23 narrative or inspiration to design new strategies. This paper therefore argues for a new concept that, to
24 an extent, builds upon the urban mobility cultures which we call a ‘cityzона’.

25 Derived from the concept of personas, **a cityzона will be a fictive city that represents cities with**
26 **similar mobility characteristics**. This actionable method should help practitioners (e.g., designers
27 and urban planners) increase the focus on the relation between the aspects that could influence or are
28 the result of the modal split of the city. Enabling designers and urban planners to create strategies that
29 fit the contextual environment of a city and will facilitate effective communication between
30 stakeholders about the target group(s). Moreover, these cityzonas should inspire them to envision
31 future mobility scenarios for the creation of user centered cities.

32 Designing Cityzона

33 This paper aims to take the first steps in the development of the cityzона by designing early versions
34 of the cityzона in an iterative process. For the design of the cityzона quantitative data is used and the
35 results are qualitatively interpreted for the creation of the cityzона concept. This data comes from 46
36 cities across the world. Based on the modal split of these cities [5] three clusters can already be made
37 in which one cluster represents cities with relatively high bike usage, one cluster represents the cities
38 with a high use of public transit (train, metro, tram, bus) and one cluster that contains the city with a
39 high use of private cars. These clusters will function as a starting point for the design of cityzonas (see
40 table 1).

41 While designing the cityzона three questions are addressed:

- 42 ● *Which variables are relevant to include in the cityzона design?*
- 43 ● *How should the visual form of a cityzона look like in order to be inspiring for designers and*
44 *urban planners?*
- 45 ● *In which use cases could the use of a cityzона potentially make a beneficial impact?*

1 The first question is answered by conducting literature review on the variables that have an impact on
 2 the modal split or are the result of the modal split. Next to identifying relevant variables it can provide
 3 insights into relations between variables. The second question and third question will be answered due
 4 to an iterative process. Conducting interviews with designers and urban planners to determine the
 5 requirements of the visual representation of the cityzона. Moreover, these interviews support in
 6 validating the identified variables used for the cityzonas.

7

8 *Table 1 Three clusters of cities based on the major modal split*

Modal split	
Bike cities	Beijing (China), Shanghai (China), Copenhagen (Denmark), Berlin (Germany), Frankfurt (Germany), Munich (Germany), Tel Aviv (Israel), Amsterdam (Netherlands)
Public transport cities	Vienna (Austria), Brussels (Belgium), Rio de Janeiro (Brazil), Sao Paulo (Brazil), Botoga (Columbia), Prague (Czech Republic), Tallinn (Estonia), Helsinki (Finland), Paris (France), Athens (Greece), Budapest (Hungary), Delhi (India), Mumbai (India), Milan (Italy), Tokyo (Japan), London (Great Britain), Vilnius (Lithuania), Oslo (Norway), Manilla (Philippines), Warsaw (Poland), Bratislava (Slovakia), Seoul (Korea), Barcelona (Spain), Stockholm (Sweden), Zürich (Switzerland), Taipei (Taiwan)
Private car cities	Sydney (Australia), Montreal (Canada), Toronto (Canada), Jakarta (Indonesia), Rome (Italy), Auckland (New Zealand), Dublin (Ireland), Madrid (Spain), Chicago (USA), Los Angeles (USA), Miami (USA), New York (USA)

9

10

11 **DETERMINANTS OF THE MODAL SPLIT: A LITERATURE REVIEW**

12 The literature review is conducted to identify characteristics of a city which influence the modal split,
 13 hence to answer the research question: ‘which variables are relevant to include in the cityzона
 14 design?’

15 The modal split is a distinct characteristic on its own and will be used in the development of the
 16 cityzона. However, there are underlying factors that influence the modal split and can tell us more
 17 about the characteristics of the city. These factors are divided between socio-demographic, planning
 18 and environmental factors

19 Socio-demographic factors contain characteristics of the population. Planning factors contain
 20 variables that can be controlled by the local government or other stakeholders (e.g., policies or
 21 interventions). Finally, the environmental characteristics illustrate the context of the city. Including
 22 the uncontrollable variables (e.g., average temperature, average rainfall and population density).

23 **Socio-demographic Factors**

24 Research shows that socio-demographic factors have a significant impact on the modal split. The
 25 average hourly earnings and employment rate play a big part in this. Santos G. et al’s (2013) paper
 26 showed that there is a positive relation between the GDP per capita and the share of cars in the city.
 27 Furthermore, Ko, J. et al (2019) explains that policies have different impacts based on the citizens’
 28 income [6,7]. High-income commuters showed a tendency to use a car more frequently. The same
 29 applies to people that have a self-assessed high social class. These groups can be considered as
 30 habitual car users and are therefore less sensitive for moderate interventions to shift the modal split [6,
 31 8]. On the other hand, middle-income commuters are much more receptive towards such interventions
 32 [6, 9]. Besides the hourly income, the elderly and young rate of the population has an impact on the

1 modal split as well. While the elderly population currently is more inclined to use public transit or
2 walking [10], it is expected that this will change in the future due to an increased mobility and trip
3 frequency of elderly [11]. This could lead to a higher use of private cars in the future [12]. Moreover,
4 a positive relation was found between the number of students in universities (and further education)
5 and the use of all modes of transport except car use [13]. These papers do not only show that socio-
6 demographic factors affect the modal split of a city, but it also shows that there is a close relation with
7 the successfulness of government policies and strategies for a modal shift and the socio-demographic
8 characteristics of the city [6, 14]. Government policies and strategies, from now on called planning
9 factors, can have a positive impact on the modal split but the effectiveness stands with the fit to the
10 socio-demographic character of the city. Hence, the impact of planning factors cannot be assessed
11 without context. Presumably showing the need for a concept such as a cityzona.

12 **Planning Factors**

13 Despite the previously mentioned relation we want to have a better understanding of what planning
14 factors can play a role in the modal split. These planning factors have a relatively wide scope.
15 Meaning that unlike the other dimensions, many variables can be assigned to planning factors.
16 Research showed that enhancing both quality and quantity of the infrastructure of a specific transport
17 can play a role in increasing the number of users. This applies to both public transit by adjusting the
18 built environment to improve accessibility [15, 16, 17] as well as for private car use by expanding the
19 road infrastructure [18]. Same applies to bike use where there is a positive relation between the
20 amount of bike lane network and bike use [19]. For this reason, we look at both the accessibility and
21 the capacity of the three different transport modes. This means that variables like the bike lane
22 network, road network and metro network in kilometer per square kilometer are used to define the
23 accessibility of transport. In order to include bike-sharing initiatives, the amount of bike sharing
24 stations per square kilometer is taken into account as well. The capacity on the other hand provides an
25 indication on whether the current infrastructure of each mode of transport is able to serve the
26 population. Therefore, for the capacity the amount of bike lane, metro and road network is divided
27 through the population. The variables for public transit are initially focused on the metro network
28 since this mode of transport is present within the 46 cities. However, public transit entails many more
29 modes of transport and the availability of these different options can provide resilience to the use of
30 public transit. Delivering a sense of security when the preferred mode has, for an example, a delay [4].

31 Finally, the government policies are taken into account. The government attitude can reveal how
32 involved the local government is in promoting a sustainable modal split. Buehler et al's (2011)
33 comparison between German and American cities on their citizens' travel behavior identified
34 variables that have an impact on the modal split. They identified factors that could explain the more
35 frequent use of motorized vehicles in American cities. What is found in Buehler, R et al's (2011)
36 paper is namely that the American tax rates on gasoline and Diesel are relatively lower. Same applies
37 to the price of parking fees [19]. Additionally, the price of monthly public transport fares has a
38 negative relation with the use of public transit [13].

39 **Environmental Factors**

40 The population density of a city can have a big influence on the modal split. The higher the population
41 density, the lower the average distance between residences and the downtown area and the center
42 [20]. This means that the average distance of trips is relatively short. Promoting walking, biking and
43 the use of public transport [6, 21]. Furthermore, in dense urban area's streets tend to be narrower with
44 less space for parking [22]. Next to this, the weather affects the modal split as well. Scholars
45 generally found that precipitation leads to an increased use of cars at the expense of other modes like
46 cycling [23]. The temperature, on the other hand, has some parabolic relation to the use of active
47 modes of transport [24]. Suggesting that a higher temperature increases the use of active modes of
48 transport at the expense of car use while barely affecting the public transport use [23]. However, when

1 the temperature exceeds a specific threshold of 25-30 degrees Celsius the use of active transport
2 modes tends to decline.

3 **Mobility Cultures**

4 For the design of cityzonas inspiration is taken from the concept of mobility cultures, which is the
5 concept first introduced in Klinger, T. et al's (2013) paper and can be understood as '*an integrative*
6 *approach incorporating both habitual practices, including underlying preferences and lifestyles, as*
7 *well as rather objective and structural components such as infrastructure and spatial characteristics*'
8 [4, 25]. Klinger et al. (2016) argue that for a proper understanding of the travel behavior and patterns
9 a combination between objective data and subjective data, like lifestyle and perceptions about
10 transport, is needed. Further research on the topic of mobility cultures found factors that contributed
11 to a change of transport mode after the relocation of residents to cities with different mobility cultures
12 [26]. This research compared the use of a private car, public transport and the use of bikes. Results
13 showed that car use is the only mode that is affected by urban form, socio-economic factors and
14 accessibility. Cycling on the contrary is related to the overall orientation of cycling and walking [27].
15 Meaning that if many residents already bike, the relocated resident is more likely to start biking as
16 well.

17 Even though the cityzona includes quantitative data, it is to some extent necessary to include citizens'
18 perception about certain modes of transport. However, since this paper is limited to quantitative data,
19 substitute variables need to be used that can tell us something about how these three modes are
20 perceived. Therefore, for biking the perceived danger of biking is used. While for public transit and
21 car use variables are used that explain the current situation of these modes. For the variables 'hours
22 lost in congestion' and 'the average commute time with public transit' is used.

23 **VARIABLE SELECTION**

24 The previously explained literature review provides an indication of how the modal split can be
25 influenced. Enabling us to create a selection of variables that can be used to identify different types of
26 cityzonas (see table 2).

27

28 *Table 2 Identified relations among the selected variables*

Type of factor	Variables
Socio-demographic	Percentage of elderly population Percentage of young population Average hourly income Employment rate

Planning	<p>Accessibility</p> <p>Metro station density per square kilometer</p> <p>Road network density per square kilometer</p> <p>Bike lane network per square kilometer</p> <p>Bike lane station density per area</p> <p>Push/Pull methods</p> <p>Public transit fare</p> <p>Tax on gasoline</p> <p>Parking fees</p> <p>Capacity</p> <p>Bike lane network per population</p> <p>Metro network density per population</p> <p>Road network density per population</p> <p>Resilience</p> <p>Other services than bus or metro</p>
Environmental	<p>Population density</p> <p>Average temperature</p>
Orientation	<p>Perceived danger of bike sharing</p> <p>Hours lost in congestion</p> <p>Average commute time public transit</p>

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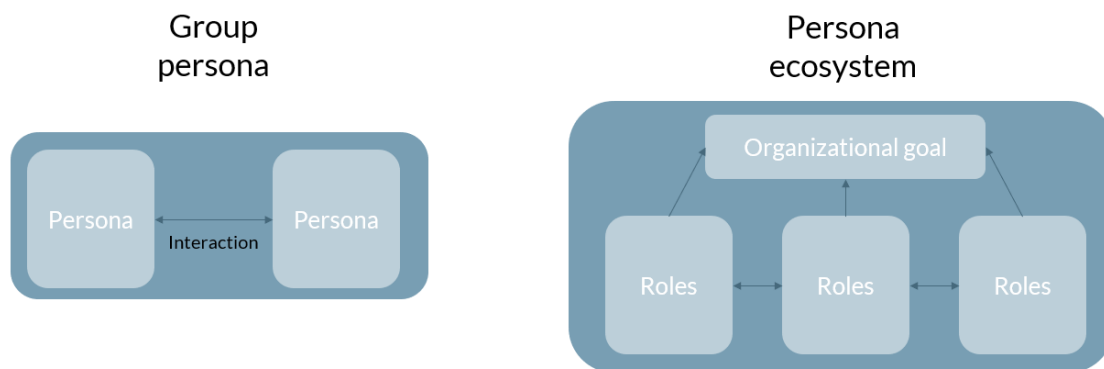
2 **CITYZONA LAYOUT**

3 After making a selection of the relevant variables and coming a step closer to answering the question:
4 ‘Which variables are relevant to include in the cityzона design?’ attention is spent on the second
5 question which will look into the visual form of a cityzона. For this section a literature review on
6 persona design is conducted which is being followed up by interviews. These interviews are used to
7 discuss early designs of a cityzона concept, identify cases in which a cityzона could be beneficial and
8 to further validate the variable selection with experts from different practice fields (scholars,
9 municipalities and mobility providers).

10

1 **Personas**

2 Since the cityzона concept is derived from the persona, a cityzона inherently fulfills the same functions
3 as a persona. Personas are a well-known design tool being used to get a detailed and as lively as
4 possible description of the target group [28]. This means that a persona should provide insight into
5 behavioral patterns that connect to behavioral variables. Meaning that these variables can be placed on
6 ranges or axis that segment the way a product/service is used [29]. However, creating a persona for a
7 city poses a challenge. It means that one must go from an individual persona to a cityzона that
8 contains many stakeholders that influence each other and other elements shaping the characteristics of
9 a city. Research has been done about the notion of both group personas as well as persona ecosystems
10 [30]. Considering the holistic nature of the cityzона the concept of a persona ecosystem would be a
11 better match. This is because a persona ecosystem would approach the city as one entity with a goal
12 that is being influenced by the characteristics and goals of the roles within that entity [28]. A group
13 persona on the other hand, approaches it by defining multiple individual personas. Focusing more on
14 the specific interaction between these individual personas (see figure 1).



15
16 *Figure 1 Difference between persona ecosystem and group persona— In our paper, we aimed at considering*
17 *the holistic nature of the cityzона the concept of a persona ecosystem.*

18 Besides this, the cityzона is designed using quantitative data. This brings advantages but also
19 downsides. The benefits are that quantitative data makes the designed persona more representative
20 while the downside is that a quantitative persona might lack the rich information that can inspire
21 designs [31]. Salminen et al., (2020) found that the quantitative persona templates with the richest
22 information had narratives intertwined with the data [31].

23 However, practitioners found these personas difficult to use. This evidences the importance of
24 considering the layout and categorization of information in accordance with the needs of the
25 researcher or practitioner [32]. Therefore, we hypothesize that the design of the layout of the cityzона
26 should be in close collaboration and interaction with both designers as well as urban planners.

27 **Interview Method**

28 We conducted 6 interviews with experts from different fields in mobility and city planning. Two
29 scholars specialized in mobility, urban planning and design, three urban planners or strategists from
30 local governments and one strategist from a service provider that is in the process of designing an
31 implementation strategy. The interviews had a semi-structured approach with a duration of around 30
32 minutes. The purpose of these interviews was to initially find where in the process of designing a
33 mobility strategy this cityzона could have the most potential and actionable impact. Furthermore, the
34 visual layout was discussed to see what kind of data visualization then was the most inspiring for
35 these participants. Finally, the proposed variables were reviewed by the participants, which functions
36 partly as validation. The other part involved exploration to see which kind of data these participants
37 would add if they were to use this cityzона in practice.

1 For these interviews' early versions of a cityzона are designed. Figure 3 shows a template that was
 2 designed for the interviews. The planning factors are represented by the graphs showing the level of
 3 accessibility, resilience and capacity of this cityzона. Next to that, the cityzона will be placed on a
 4 spectrum indicating how actively the local government is involved in creating policies to reach their
 5 goals. This spectrum is based on the push and pull methods that are used by the government. The right
 6 side explains the socio-demographic character of the city. It provides a title that represents the group
 7 and talks shortly about the needs of the travelers based on these socio-demographic characteristics.
 8 Furthermore, an axis is provided that indicates how this cityzона is positioned based on the overall
 9 age of the population and the average hourly income. Within these axis areas are marked that are
 10 linked with cities with a high modal share of a specific mode of transport (either bike use, public
 11 transit use or car use). In this way a level of comparison can be made between the particular cityzона
 12 and its position in relation to other cities. Finally, the bottom part of these cityzonas is used for the
 13 environmental factors. The cityzона template primarily focuses on the density and city area. The
 14 density is represented by the dots and the space beneath them. The lesser amount of space between the
 15 dots, the denser the cityzона is [20]. The right bottom provides an insight on the orientation and
 16 current situation of the three modes of transport.

17 For the interviews different versions are made based on this template to provide a more concrete image
 18 of how this cityzона could look like. The interviews included a 15 to 20 minutes talk about the
 19 participants process of designing a mobility strategy. Additionally, there was a discussion of around
 20 15 to 20 minutes about the cityzона.



Figure 3 early version of template for the cityzона

The interviews were held in Dutch and are transcribed manually. The quotes used in this section are therefore translated from Dutch. The transcriptions are analyzed using the grounded theory method

1 [33]. In this analysis transcriptions are coded based on returning topics. These codes are iterated with
 2 the analysis of the other transcripts. This results in a hierarchical analysis based on the topics that are
 3 mentioned the most during the interviews (see figure 4). In order to make a clear distinction between
 4 different perspectives, the interviews are divided by the background of the interviewed participants.
 5 The results below are discussed in a similar matter.



6
 7 *Figure 5 Analysis of the interviews with urban planners and the local government.*

8
 9 **Urban planners and the local government**

10 When discussing potential functions for the cityzona the topic of multi-stakeholder collaborations
 11 came to mind. As described by participant 1 collaborating with multiple stakeholders, specifically
 12 other municipalities, makes it difficult to align all stakeholders with the vision and solution direction:
 13 *'You need to have a common agreement to actually build something. You can write it in your agenda
 14 but that doesn't mean that it is guaranteed that it will be build'*. Understanding each other's
 15 perspective on the vision can be beneficial, participant 2 explained: *'You have to deal with the fact
 16 that some parties benefit more from a specific policy than others. In some cases, you need to make a
 17 consideration and a choice with which not every party is happy'*. Moreover, knowing the capabilities
 18 of the stakeholders you collaborate plays a big role in this. Not being able to agree on the defined
 19 vision with stakeholders can delay the process of executing the strategy. Participant 1 said: *'When we
 20 get stuck, we need to expand our scope again and re-determine our goal and see if it can be solved in
 21 another way'*. Also, the collaboration with mobility providers was discussed. Participant 3 mentioned
 22 that working with mobility providers is very much a learning process. It forced municipalities to
 23 imagine what goal they want to achieve with these mobility providers, participant 3: *We needed to
 24 think what purpose do we have with this. And how much (bike sharing programs) do we want and to
 25 which standards should they (mobility providers) live up to? That they make sure that the vehicles are
 26 not scattered around in the public space. That they will not hang next to a lamp post. That is when
 27 agreements or some borders were made for new entrees.*. The variables used in the cityzona showed
 28 resemblance with the variables used by the participants: *'The things that you now show in your visual
 29 (cityzona) are all aspects that we use as well to match our mobility strategy to. So, we also know very
 30 well what the modal split is and which modal split we would like for the future'*. An aspect to the
 31 cityzona that can be considered relatively new is the inclusion of socio-demographic factors.
 32 Participants elaborated that currently they look at travel behavior in the sense of how people move
 33 and to which places. To an extent neglecting the underlying reasons for their travel behavior, like for

1 example the socio-demographic characteristics. Furthermore, feedback was provided on the level of
2 abstraction of the cityzona.

3 **Service providers**

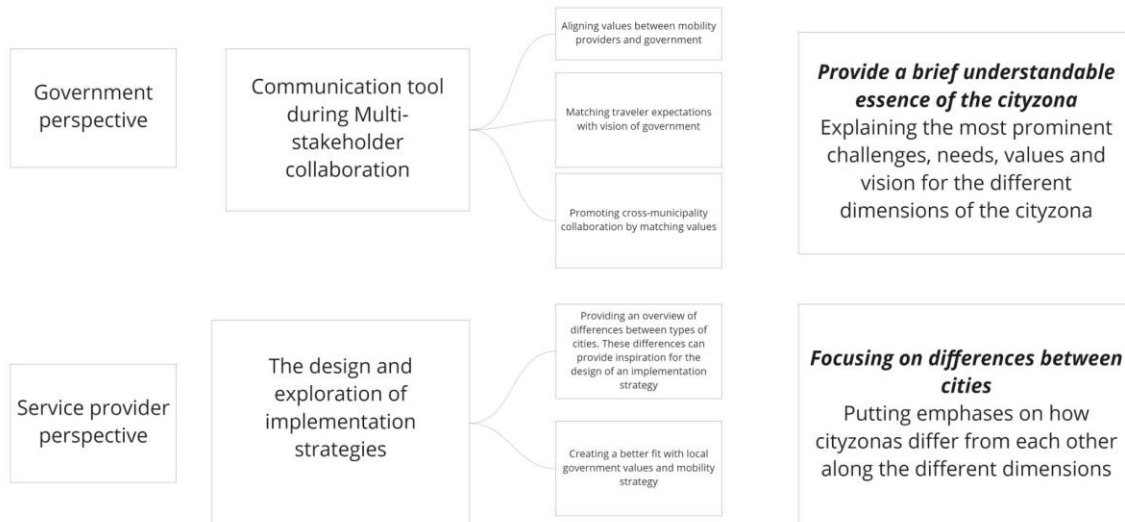
4 What became evident is that the implementation process is mainly driven by the potential market.
5 Participant 4 elaborated: *'It is actually that they first look at what is technologically feasible and what
6 is a little desirable, but they do not look at what the values or regulations of a specific city is.'*
7 Furthermore, it was discussed that they often make initial assumptions about the city on which the
8 service provider bases pilots on. When looking at the cityzona the most value is placed by the
9 participant on being able to clearly see differences between cityzonas. It can function as a tool that
10 helps service providers not to look at only one market to see if it fits, but instead help them to see how
11 their service could potentially fit in different types of cities: *'I think there is even more power in it for
12 an organization that wants to see how their product or service fits within a different kind of market'*.
13 For the same reason there was also a greater interest in variables like the perceived danger of biking.
14 These more 'qualitative' variables provided newer insights for the service provider. About this topic
15 participant 4 said. Finally, the option to see what the city's goals are and where this city is going in
16 the future was discussed as an interesting feature for service providers.

17 **Mobility and City design experts**

18 In comparison with the other interviews, these interviews focused above all on the inspiration aspect
19 of the cityzona. Often a comparison was made between personas and the current cityzona. This
20 resulted in the feedback that the current cityzona leans towards a mapping of the situation with a lack
21 of knowing why it happens. Furthermore, a discussion about the focus of the cityzona was held.
22 Currently, there is a focus on the modes of transport but this could be shifted towards the travelers.
23 Meaning that more qualitative data should be included. Participant 5 elaborated on this: *'You now
24 look from the perspective of the transport modes, which is good, but you could also translate it to the
25 user of those modes. So, who are those people and who are the people that decide that (which modes
26 are used)?'*

27 **Proposed functionalities**

28 The results of the interview provided two main functionalities (see figure 4). From the government
29 perspective the cityzona can be a communication tool with either other municipalities, or travelers.
30 The purpose of the cityzona would then be in the early phase of the design process of a mobility
31 strategy to communicate the current state of the city infrastructure to start a discussion with travelers
32 or other municipalities about possible solution directions for the future. Understanding each other's
33 perspective and coming to a shared understanding of a vision for the city infrastructure can provide a
34 smoother execution of the mobility strategy later on. The second functionality would be focused on
35 the service provider. In this case the cityzona's value is expressed in seeing the differences between
36 types of cityzonas. The purpose of the cityzona has an explorative nature. It could benefit service
37 providers in their exploration or brainstorm phase. Enabling them to imagine how the design of their
38 service should change if they were to implement it in different cityzonas.

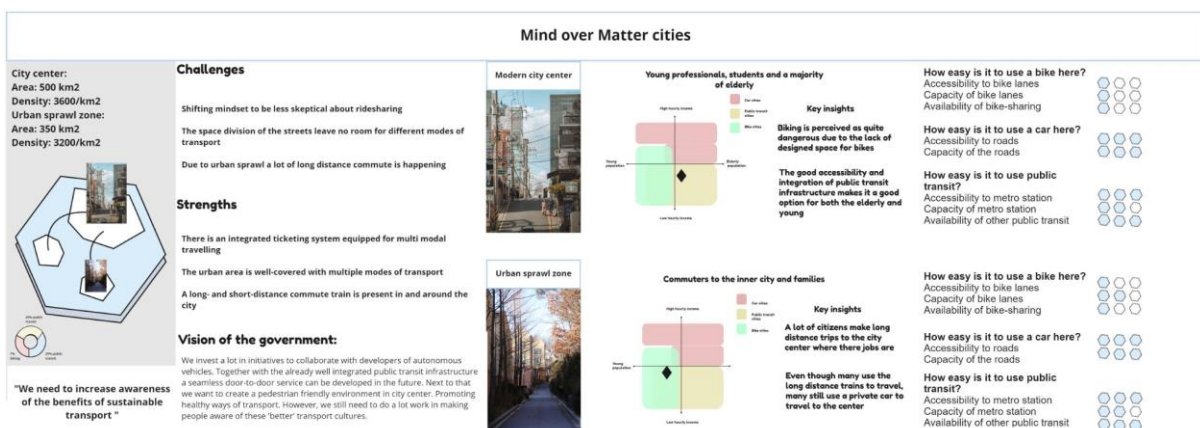


1

2 *Figure 5 Identified functionalities for the cityzona. One from the government perspective and the other from a*
 3 *service provider perspective*

4 **Refined cityzona**

5 Feedback about the cityzona was mainly directed towards the variable presentation and its
 6 quantitative nature. Presenting the whole city infrastructure as one type of city resulted in a too
 7 abstract image of the city. Recognizing different zones within the cityzona could help in creating
 8 more depth. Hence, the refined cityzona includes the most prominent zones of the cityzona (see figure
 9 5). For each zone, a representation of the socio-demographic characteristics and the availability,
 10 capacity and resilience of the transport is provided. Besides the level of abstraction, feedback was
 11 given about the quantitative nature of the cityzona. More depth and also potential for inspiration could
 12 be gained when qualitative data is visible. For this reason, more emphasis is placed on the government
 13 and the traveler perspective. In comparison to the previous version of the cityzona, more detail is
 14 provided about the government's perspective. A section that provides the challenges, strengths and
 15 vision for the future of this type of city is added. This information is collected by analyzing the
 16 available mobility strategies of the studied cities. These were collected from the government websites.
 17 Finally, the traveler's perspective is more elaborated with the section 'key insights. Here an overall
 18 description is given about the most prominent travel behavior and needs of the traveler.



19

20 *Figure 6 Example of refined version of the cityzona called 'mind over matter cities. The different sections from*
 21 *left to right: hollistic visual of city with density and area size, government perspective, the two most prominent*
 22 *zones, the socio-demographic and transport characteristics of each zone.*

1 DISCUSSION

2 The 6 interviews have indicated that the cityzона has potential for two different functions (see figure
3 5) that are focused on different users. However, more interviews are needed with both urban planners
4 as service providers to assure the cityzона's potential in these functions. Furthermore, research must
5 be done into the use of the cityzона in practice. Including the cityzона in sessions where participants
6 work on different use cases might be an effective next step in assessing which functionality is worth
7 pursuing. Moreover, these sessions can provide insights in how the cityzона can be specialized to
8 better accommodate the separate functions. Besides the functionality the interviews have shown that
9 there is a relevance to the selected variables. The addition of qualitative data provided more depth to
10 the cityzона. Potentially increasing the amount of inspiration, it can trigger for the designer or urban
11 planner that uses it [31]. Nevertheless, more research can be done about the qualitative aspects (e.g.,
12 culture and perception) that influence the modal split of cities. Being able to identify which of these
13 variables make an impact will contribute to improving the qualitative layer of the cityzона. Finally,
14 the visual aspect has been a returning topic in the design of the cityzона. Getting from a 'city data
15 dashboard' to a cityzона requires a delicate balance. The challenge lies here in making the cityzона
16 specific enough to spark inspiration while remaining holistic enough to be representative for multiple
17 cities. Adding the qualitative layer helped in this but further experimenting with the visual lay out is
18 recommended.

19

20 CONCLUSION

21 While most mobility providers likely have a sustainable or environmentally friendly goal at heart, a
22 poor implementation strategy can do more harm than good within a city. The lack of awareness about
23 the city's environmental, socio-demographic or socio-economic characteristics or the absence of a
24 clear vision of the local government about how to deal with new mobility providers plays a crucial
25 role in this [3]. The design of a new tool called 'cityzона' can aid in creating a better connection
26 between local government and mobility provider by making urban planners or designers more aware
27 of the relations between variables influencing the modal split but also by improving the
28 communication about the city between stakeholders. Making the involved parties aware of the
29 contextual environment. In this paper the first steps of designing the cityzона were taken by
30 answering the three following questions: '*Which variables are relevant to include in the cityzона
31 design?*', '*How should the visual form of a cityzона look like in order to be inspiring for designers
32 and urban planners?*', '*In which use cases could the use of a cityzона potentially make a beneficial
33 impact?*'. The first question was initially answered by doing a literature review (see table 2). Later,
34 the feedback during interviews resulted in the addition of qualitative factors like the travel behavior,
35 perception and the government challenges. These variables are to an extent validated but more
36 research can be done into qualitative aspect of the cityzона. Looking back at the question: '*How
37 should the visual form of a cityzона look like in order to be inspiring for designers and urban
38 planners?*' two points can be addressed. First of all, the cityzона can be of most value if it is able to
39 provide insight into the different perspectives of the most prominent stakeholders in the city. This
40 means the perspective of the local government and the different kinds of travelers. Next to the
41 previously discussed qualitative, cultural aspects could play a role in this as well [19]. However, more
42 research needs to be done into what cultural factors play a role in the travel mode choice before being
43 able to include this within the cityzона. Secondly, the interviews have shown that understanding the
44 differences between cityzonas can be a source of inspiration as well. Meaning that the individual
45 cityzона needs to emphasize its characteristics in an almost archetypical way. This enables designers
46 to explore directions that their service can go into if they would want to implement this service in
47 different types of cityzonas. The third question is answered by the identification of two functions for
48 the cityzона. On the one hand, the cityzона could be used as a tool by governments in the early phase

1 of the mobility strategy design process. It can be used to start a discussion with stakeholders (travelers
2 and other municipalities) about their perception of the current infrastructure of the city. Aligning
3 expectations and creating a shared vision for solutions. Next to that, the cityzona showed promise in
4 the exploration phase of service providers. Being able to recognize different types of cities and
5 understanding how their service needs to be changed in order to be successfully implemented.
6 Although the cityzona shows potential, the concept needs to be tested further in practice to get a better
7 idea of the impact this concept can make.

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