

Planning for Two Wheels: A Case Study of how Portland, Oregon
Created a Culture of Cycling Through Design

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ABSTRACT

PLANNING FOR TWO WHEELS: A CASE STUDY OF HOW PORTLAND, OREGON CREATED A CULTURE OF CYCLING THROUGH DESIGN

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As cities grow and the transportation needs of their population change, urban design has become increasingly crucial to a city's ability to flourish. This shift in the transportation needs of citizens is showing a movement towards bicycling as a form of everyday transportation. One of the cities on the forefront of designing for this transition is Portland, Oregon. The purpose of this study was to examine Portland, Oregon from the perspective of bicycle-friendly urban design. The researcher designed a case study guide to assess the city's strategies, and the results demonstrated that Portland was able to increase cycling among their residents through a combination of both traditional and pioneered design strategies. It is recommended that Portland continue to expand their efforts in bicycle-friendly urban design.

Keywords: Portland, Oregon, urban design, cycling, biking, infrastructure, transportation

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Chapter 1

INTRODUCTION AND REVIEW OF LITERATURE

Background of Study

The population of the United States is projected to surpass 400 million people by 2051 (Colby & Ortman, 2014). This growth will task cities and local governing bodies with the challenge of making urban areas navigable and comfortable places to live regardless of the increased population density. It is by no means an impossible feat, however, it will require a shift in transportation, urban design, and possibly a slight alteration of the American Dream. Individuals must get comfortable with the fact that the single-family automobile popularized in the 20th century is no longer the answer to efficient short-haul transportation in the 21st century.

Many United States residents are demonstrating a shift in their choice of transportation as cycling has become fastest growing segment of commuting (McKenzie, 2014). However, the number of daily bicycle commuters still dwindles compared to several other countries, particularly in Scandinavia, that have made accessible biking a priority for their residents. The average percentage of cyclists who commute to work in the 50 largest US cities is estimated at 1%, however in cities such as Portland, Oregon, who have attempted to implement much of the best practices found in the Scandinavian countries, the number of bicycle commuters is as high as 6.1 % (McKenzie).

If other cities look to industry best practices to incorporate cycling into their city, it may be the answer to many of the issues that cities face as populations continue to

grow. The purpose of this study was to examine the city of Portland, Oregon from the perspective of bicycle-friendly urban design.

Review of Literature

Research for this review of literature was conducted at Robert E. Kennedy Library on the campus of California Polytechnic State University, San Luis Obispo. In addition to books and other resources, the following online databases were utilized: ABI/INFORM, Academic Search Premier, ProQuest, and Google Scholar) This review of literature includes the following subsections: urban design, bicycle-friendly design, and motivating factors for cyclists.

Urban design exists to create cities where people can conveniently live, work, and play; ideally ones where the residents are also happy and healthy. However, many urban areas have not excelled at the latter task. McKenzie, Murray, and Booth (2013) cite that the urban residents of Scotland are more likely to seek care for anxiety, depression, and psychosis than their rural counterparts; a phenomenon that is echoed in urban areas around the world. Lambert, Nelson, Jovanovic, and Cerdá (2015) seconded this study by stating that humans living in urban areas are more likely to develop a variety of psychiatric disorders stemming from factors such as fear, light pollution, and social isolation. However, with thoughtful urban design, much of these results can be mitigated and the stigma of cities can be altered.

Cities should be dense, safe, visually appealing, walkable, and most importantly, livable (Echenique, Hargreaves, Mitchell, & Namdeo, 2012). These factors don't just create a desirable city for people to live and visit, but may, in fact, influence the behavior

of its residents. Montgomery (2017) states, “when we look at well-being in cities, we need to examine how the systems, the architecture, and the spaces influence how we regard and treat other people because they have a very strong influence” (p. 3).

Essentially, thoughtful urban design can be used not only change how a city presents itself but may have altering effects on the mood of residents. Montgomery frames these holistically designed cities as community builders where residents are increasingly likely to spend money at local storefronts and are more apt to commute using a mode of transportation other than a personal vehicle. This finding suggests the implications of thoughtful design extends far past the look and feel of a city, playing a key role in shaping the moods and habits of its residents.

Another urban design method to improve functional use of growing cities is the concept of smart cities. Caird & Hallett (2018) describe smart cities as “prioritizing human capital, using big data to tailor the experience of the city to its residents, and integrating ways to improve communal functions such as resource management, transportation, and neighborhood infrastructure” (p.2). This new way of looking at cities has been made available by recent developments in technology as well as by the emerging sharing economy. It could provide urban designers the ability to design their cities more sustainably by growing efficient transportation and other climate-friendly developments. Additionally, it could help designers better create a city that works specifically for its residents.

American cities were built primarily to accommodate transportation by automobile after it came into vogue as the main method of transportation of the 20th century. These developments included wide roads, ample parking, and little pedestrian

space. However, according to Sivak (2017) peak car ownership per household was reached in 2006, indicating a shift in social behavior as transportation alternatives in cities grow and behaviors change. Cities can help encourage the shift through urban design by following the advice of Simek (2018) who asserts that modern urban design needs to focus on creating spaces for the human, not just the automobile. They state, “cities built for people work for cars, buses, trolleys, streetcars, bikes, and our own two feet,” suggesting a multi-modal approach to transportation may benefit the most amount of people (p.33). Additionally, evidence suggests that the reduction of automobiles could be beneficial for the mental health of city residents. Miles, Coutts, and Mohamdi (2012) found that higher automobile traffic in urban areas was an indicator of more depressive symptoms in residents; leading to increased noise pollution and economic deprivation.

Despite the downward trend in car ownership, only 1% of total trips completed in the United States are completed on a bicycle (Pucher, Buehler, Merom, & Bauman, 2011). This number is higher in urban areas, however, it does not reach above 5% of total trips anywhere in the US. In countries that offer significant infrastructure for cyclists, such as The Netherlands and Denmark, rates of cycling drastically increase. In the Netherlands, 27% of total trips are completed by bicycle (Fishman, 2015). In Denmark, the number sits lower at 13%, however in Copenhagen, the capital city on the forefront of bicycle-friendly urban design, the number of trips completed on two wheels rises to 33 % (Cycling in Denmark, 2013) Although there are many factors that contribute to a large number of cyclists in the aforementioned areas, bicycle-focused design and infrastructure plays a vital role. However, not all design and infrastructure is created equal.

After implementing separated bicycle roadways in Copenhagen, the observed increase in cyclists was estimated to be between 15- 20% (Copenhagen City of Cyclists, 2017). More generally, Dill and Carr (2003) found that increasing the availability of bike lanes by 1 mile per square mile increased the number of cyclists by 1%. In a follow-up study of 90 American cities, Buehler and Pucher (2012) found that the availability of bike lanes and roadways make up for 33% of a city's variability of cycling, attributing a large portion of the reason for cyclists being on the road simply to having space on the road.

Bicycle infrastructure also has a measurable impact on the safety of cyclists. According to the Center for Disease Control, there were nearly 467,000 bicycle-related injuries in the United States in 2015 (Motor Vehicle Safety, 2017). This number is significantly higher than in most developed countries, especially when considering the small portion of trips that are made by bicycle. A proven place to start improving the safety of cyclistis is by installing bike lanes on major arterials. In a crash modification study that analyzed the effects of bike lanes on cyclist and vehicular accidents, it was found that a bike lane that is a minimum of 4-5ft wide measurably increased the safety compared with roadways with no bike lane or one that was narrower (Park, Abdel-Aty, Lee, & Lee, 2015).

Bike lanes are not the only modification that can be made to improve the safety of cyclists. Cohen (2013) points out that although riders are much safer in cities with standard bike lanes, they are the safest when provided access to a protected bicycle roadway that is separated from the travel of motor vehicles. The separation can be made using simple concrete barriers or it can be integrated into the rest of the space in a functional way, such as parking, tree planters, or seating for adjacent businesses

(Separated Bike Lanes, 2018). New York City has recognized this and is in the process of expanding its cycling network by installing bike lanes that are six feet wide protected by a barrier that is at least three feet wide, primarily using the space for parking and simple concrete barriers. In the areas, such as First Avenue, where this has been implemented they found that injuries involving cyclists reduced by 20% while ridership grew by 13% (1st Avenue Protected Bike Lane, 2016).

Although infrastructure and design have measurable effects on the proliferation of cycling as a method of transportation, not everyone is going to be a cyclist. Dill and McNeil (2016) divide the types of cyclists into four categories: “strong & fearless, enthused & confident, interested but concerned, and no way, no how” (p.1). The names of the groups correspond to the level of interest that the cyclist or potential cyclist display and what will motivate them to get on board with cycling. The top two groups are likely to ride their bikes regardless of infrastructure, however, the “interested, but concerned” group is estimated to be the majority of Americans, at 51%, is where the aforementioned infrastructure and design developments can play a large role in spreading cycling (Dill & McNeil). The researchers observed that a lack of bike lanes, the absence of bicycles, and long commuting distances were the primary reasons for potential cyclists to avoid riding, while health benefits and environmental stewardship were the top reasons for why people choose to ride. Making cycling easier via urban design could play a role in bridging the gap between the diverse group of cyclists cited in Dill & McNeil’s study. Residents in Vancouver, a city that is rapidly expanding bike roadways, reports that the ease of cycling on their new roadways has diversified their cyclists drastically. In one year

Vancouver saw a rise in bicycle trips by one third, increasingly made by seniors and families (Bracewell & Kreuger, 2016).

Purpose of the Study

The purpose of this study was to examine the city of Portland, Oregon from the perspective of bicycle-friendly urban design.

Research Questions

This study attempted to answer the following research questions:

1. What traditional strategies does Portland use to promote cycling in the city?
2. What strategies is Portland pioneering to promote cycling in the city?
3. How effective are Portland's traditional strategies to promote cycling?
4. How effective are Portland's pioneered strategies to promote cycling?

Chapter 2

METHODS

The purpose of this study was to examine the city of Portland, Oregon from the perspective of bicycle-friendly urban design. This chapter includes the following sections: description of organization, description of instrument, and description of procedures.

Description of Organization/s

A case study was conducted on Portland, Oregon. The city of Portland (2019) is a city of 647,000 people in a region known as the Pacific Northwest. It has undergone significant growth in the last decade and plans to address the growth via adapting its transportation and land use plans, and investment in parks, transit and bicycle and pedestrian networks. The city manages its transportation through the Portland Bureau of Transportation (PBOT), a division of the city government. The mission statement of PBOT is:

The City of Portland Bureau of Transportation is a community partner in shaping a livable city. We plan, build, manage and maintain an effective and safe transportation system that provides people and businesses access and mobility.

We keep Portland moving.

In addition, PBOT provides educational resources to the community including maps for biking and walking, classes, and guided walks through the city.

Description of Instrument

The instrument utilized in this study was case study guide developed by the researcher (see Appendix A). The instrument evaluates the areas that correlate to bicycle-friendly design includes a thorough description of each one that the city provides. After the researcher piloted the test, it was determined that the areas of study section needed to be more specific. It was also determined that each description needed a minimum of one qualitative and one quantitative source.

Description of Procedures

A case study was conducted on Portland, Oregon. The instrument utilized was a case study guide created by the researcher. Research for this study was conducted during a two week research period during February 2019. The researcher developed a guide to evaluate the efforts of Portland compared with what the current best practices are. Both qualitative and quantitative data were recorded and utilized to give a complete analysis. The primary method of research was conducted through the City of Portland's website, and more specifically the Portland Bureau of Transportation. The primary subsections utilized for research were "PDX on the Go" and "Vision Zero." In addition, other government sources such as census data and NGO sources such as the Portland Bike Coalition were used to gather data not found on the city website.

Chapter 3

PRESENTATION OF THE RESULTS

The purpose of this study was to examine the city of Portland, Oregon from the perspective of bicycle-friendly urban design. A case study was utilized to examine Portland, Oregon. This chapter includes the following sections: Traditional strategies to increase cycling and pioneered strategies to increase cycling.

Traditional Strategies to Increase Cycling

The City of Portland has implemented several tested strategies to encourage residents to make cycling their primary mode of transportation. Their traditional methods include education, outreach, and infrastructure.

The Portland Bureau of Transportation (PBOT) educates its users primarily through its website. PBOT provides the “Portland Biking Guide” that offers cyclists new to Portland with everything they need to get started in the city: the reason why one should cycle as their primary mode of transportation, recommendations for bike shops, and a DIY guide for basic bicycle mechanics. Additionally, the guide continually stresses that cycling is the quickest way to get around the city for those who are able to as most trips in Portland are under 2 miles or 10 minutes. The educational resources continue with PBOT’s interactive bike map. It offers users the ability to plan their route while displaying climbs, challenging intersections, designated bike routes, and bike shops that are located on the route in case a repair is needed. In addition to the website, PBOT also

hosts classes to improve the skills of budding riders. The classes intend to build basic bike skills in a fun setting, taking participants on a tour with Portland's best spots to ride.

Outreach is mainly focused on PBOT's Instagram and Twitter. Posts are made several times per week to update followers on developments that are happening within the city. These include road conditions being improved, new bike lanes being built, or highlighting PBOT workers and local community members who are aiming to "keep Portland moving." To increase involvement they host submission contests on their Instagram page. The most recent contest was to reinvent the bike logo that is painted in bike lanes. The winning pieces included Kermit the Frog and David Bowie and they were painted in neighborhood bike lanes this year. Outside of social media, PBOT offers the "Sunday Parkways" program to encourage community members to join the cycling cause. This program, sponsored by Kaiser Permanente, creates a network of roadways that is closed down on select Sundays to all motorized vehicles to give residents a space to cycle, walk, and live without fear of cars while also increasing awareness of the measures the city of Portland is taking.

Portland's infrastructure offers many developments such as parking, roadways, and a bike share program that improve the ease of cycling. Parking for bicycles is prioritized over cars through the city's free bicycle rack program. All new businesses can apply for one or two bicycle racks to be placed on the sidewalk outside of their business paid for by the city of Portland. Store owners can request to have more racks installed yearly as the business expands, or businesses can choose to have them installed for a flat rate of \$150 if more are desired immediately. The city also features several bike lane developments that give riders their own space on the road. These include painted green

lanes, bike-specific signal detectors, turn boxes that give cyclists room to wait while making unprotected left turns, and separated roadways in many areas. All of these developments equate to 319 miles of bikeways within the city.

Pioneered Strategies to Increase Cycling

In addition to the developments outlined above, Portland offers several other design innovations that focus on the proliferation of cycling in the city. The following methods are specific to Portland. These developments include BIKETOWN, the Vision Zero plan, and Tilikum Crossing.

BIKETOWN is Portland's version of the growing bike share movement. The program, which is sponsored by Nike, offers over 1000 bikes at over 100 stations around the city. The bicycles are fitted with cargo baskets, fenders, front and rear lights, and locks to assure safe riding in a variety of conditions. Users can use the bikes for one-way trips without having to worry about any of the costs that come with having one's own bike or any of the maintenance as city workers ensure that the bikes are maintained regularly. BIKETOWN encourages residents to sign up for the unlimited plan at \$19 per month or a fee by the minute program is available for those not ready to commit or for visitors who want to use BIKETOWN to see the city. Additionally, the service offers adaptive bikes that can accommodate users with a range of physical disabilities when personnel are alerted in advance.

The next design program pioneered in the city is the Portland Vision Zero plan which aims to reduce traffic fatalities and serious injuries as close to zero as possible by 2025. PBOT identified key areas that pose a high risk to drivers, cyclists, and pedestrians

and is implementing their action plan to move toward the goal. The plan includes improvements to several infrastructure points along these high-risk areas that include more protected bike lanes and a higher percentage of marked bicycle crossings at intersections. It also includes reduced traffic speed down to 20mph in residential areas accompanied by the marketing slogan “20 is Plenty” which can be found on bicycle jerseys and PBOT’s outreach materials. Lastly, the Vision Zero plan seeks to grow community awareness around biking by heading several programs. The Safe Route to School program encourages students and families consider utilizing Portland’s bike infrastructure to commute to school; the theory is that the more cyclists on the road, the safer all of the children heading to school will be.

The final pioneered development is Portland’s Tilikum Crossing: Bridge of the People. Named because it is the largest car-free bridge in the United States, it possesses colored lanes for cyclists, space for pedestrians, tracks for Portland’s light rail system, and a bus lane for the public bus system. Planning this bridge with diversity in mind, Portland focused their efforts to include all people during the bridges conception; inviting people with disabilities and their families to be some of the first people to step foot on the bridge after its completion in 2015. Portland considers this project as part of the Vision Zero goal and an answer to the growing number of people who call the city home.

Chapter 4

DISCUSSION AND CONCLUSIONS

Portland has implemented several improvements to increase cycling safety and promote biking culture in the city. This concluding chapter includes the following: a discussion of the major findings, limitations, conclusions, and recommendations for the organization, industry, and future research.

Discussion

Portland's location in the rainy Pacific Northwest is a particularly interesting case study to see the impact that urban design can have on the proliferation of cycling within a city. Portland is rainy, hilly, and is not as dense as many major cities in the United States. Despite this, it has been hailed as a mecca for cyclists for years and the number of daily riders continue to rise. Portland's efforts both traditional and pioneered have proven effective on proliferating cycling in the city.

Portland's traditional efforts, particularly in urban design, have increased the number of cyclists in the city. The network of roadways and bridges dedicated to cyclists highlight the city's efforts to change the culture of biking from the bottom up as it tackles the root cause of why many Americans choose another form of transportation; fear. The dedicated and safe roadways allow the city to tap into the "interested but concerned" group of riders that most potential cyclists fall into (Dill & McNeil, 2016). Once fear is largely out of the equation biking loses the elitism for the brave few or illusion that it is solely for the fitness junkie; instead, it becomes a viable mode of transport for the

masses. Portland continues to push the viability of cycling by making it the most practical choice for commuters seeking the most efficient form of transportation. The free bike parking provided by the city in front of small businesses and major points of interest save riders several minutes and dollars that they would normally spend on parking a motor vehicle. It is recommended that the city continue to expand their cycling infrastructure by implementing more separated roadways to further increase the safety of current cyclists and decrease perceived risk among potential riders. They should also continue to increase the availability of bicycle parking in front of popular areas.

Portland's pioneered cycling efforts also demonstrated themselves to be important assets to increasing the bicycle-friendly nature of Portland's streets. BIKETOWN is an excellent example of how technology can be used to implement community advancements and how "smart cities" are the answer to accommodate for growing transportation and community needs (Caird & Hallett, 2018). BIKETOWN lowers the barrier of entry for potential cyclists by decreasing the initial investment to only pennies per minute and utilizes the sharing economy to provide both residents and visitors with a reliable zero-emission ride that keeps the streets safer and less congested. Lastly, Portland's vision zero plan sheds light on the next phase of bicycle-friendly urban design. Decreasing speed-limits for motor vehicles and restricting their access to bridges like Tilikum crossing sends a powerful message to the community that motor vehicles are no longer king of the road and offers a glimpse into the mass form of transportation that cycling can become. It is recommended that Portland continue to pioneer new forms of urban design by finding ways to lower the barrier for potential cyclists and further prioritize their place on the road. The expansion of BIKETOWN would be the ideal place

to start; expanding on the booming sharing economy and building on a platform that already exists throughout the city.

The major findings related to bicycle infrastructure researched in this report also shed light on the ripple effect that comes with altering the design of a city. Creating a space for cyclists to ride safely brings more riders to the road, increasing the demand for more space for cyclists, therefore bringing more cyclists. This cycle can be seen to have created a thriving bicycling community in Portland, where people now gather to build, advocate for, and conduct business on two wheels. Looking forward, it also sets an example for other cities to follow. Perhaps the strategies that Portland has implemented in their urban design will be echoed in cities across America and will be an answer to some of the problems that growing cities face.

There were several limitations that impacted this study. First, the researcher may have expressed bias due to their stance as an avid cyclist. Next, the research for this study was conducted using online resources only. The researcher acknowledges that some qualitative data, such as attitudes of Portland residents could be better found through other means of research such as a survey or other first-person account. Additionally, several data points were collected from the City of Portland website which could have provided a biased viewpoint on the topic. Despite these limitations, the study shares the potential that urban design can have on cycling.

Portland has cultivated a culture of cycling through design; the city's use of both traditional methods and ones that were pioneered by the city to promote ridership has led to a large and continually growing community of riders. The community and the overall design for cyclists are still lagging behind more established cycling havens such as

Denmark, however, Portland's plans to keep focusing their design efforts on bicycle-friendly urban design should prove fruitful. Portland serves as a great example of how other US cities can start designing for bicycles and grow the community in their city.

Conclusions

Based on the findings of this study, the following conclusions are drawn:

1. Portland's traditional strategies to increase cycling include education, outreach, and infrastructure design such as bike lanes and ample parking.
2. Portland's pioneered efforts to increase cycling include their bike share program (BIKETOWN), Vision Zero plan, and pedestrian-specific roadways.
3. The traditional strategies implemented by Portland created a large increase in the number of cyclists on the road.
4. The pioneered strategies implemented by Portland further increased the number of cyclists on the road, lowered the barrier for entry, and demonstrated the city's commitment to a future of alternative transportation.

Recommendations

Based on the conclusions of this study, the following recommendations are made:

1. Other cities should follow Portland's path of prioritizing cycling design and promoting its culture.
2. Portland should continue to expand their dedicated roadways for cyclists, particularly those that offer separation from motor vehicles.
3. Portland should continue to prioritize cycling efficiency by expanding dedicated bridgeways and increasing bicycle parking.
4. Portland should continue to expand into the realm of a smart city by further connecting their residents to the sharing economy through their bike-share program, BIKETOWN.
5. Future research should investigate what other cities are doing to expand cycling on their roads and study how they compare in effectiveness to those of Portland.

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APPENDIXES

Appendix A

Instrument

INSTRUMENT

Area of Study	Description of Strategies	Additional Comments
Bicycle lanes		
Bicycle roadways (separated from motor vehicles)		
Vehicle interactions		
Education		
Outreach		
Accessibility		
Community development		
Increase in riders from 2000-2010		