Finalizing the 20-Minute City in Tempe

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SOS 321: Policy
I. Introduction and Problem Analysis

The City of Tempe is undoubtedly a culprit of automobile-dependent development. Despite the city’s efforts to support the creation of a livable city by promoting transit-oriented growth, the City of Tempe continues to be dependent on private vehicles. Even with the incorporation of a light rail and bus system, the “Tempe Transportation Master Plan” emphasizes that the chief mode of transportation in Tempe remains private cars (City of Tempe, 2015, p. 21). While car ownership provides residents with ample freedom, mobility, and time-efficiency, their inherent dependency on cars also results in negative externalities for the city’s economy, environment, and human well-being.

Automobile dependent development exasperates barriers to creating a livable city that is both efficient and functional. In the book, Transforming Cities with Transit, authors Suzuki, Cerver, and Iuchi detail the negative externalities that cities are subject to when they are shaped around private vehicle ownership which include: unhealthy levels of air pollution, increased greenhouse gas emissions, social equity challenges, worsened traffic congestion, reduced accessibility, hindrances to economic competitiveness, and traffic safety concerns (2013, p. 22). Accordingly, reducing Tempe’s reliance on cars and transitioning to a transit-friendly environment is a critical step to help promote the development of a sustainable city.

Not only does transit-oriented development enhance city sustainability, it also enriches city livability. Authors in Transforming Cities with Transit, assert that transit friendly cities become exceedingly appealing destinations for people to live, have a career, engage, and play (p. 21). To help make this vision a reality, the City of Tempe has developed a goal to create a 20-minute city. The “Tempe Transportation Master Plan” defines a 20-minute city as one where city dwellers are able to commute to where they are going within either a 20-minute transit ride, four-
mile bike, or one-mile walk (p. 2). If a 20-minute city is developed successfully, private vehicle externalities can be minimized as a result. Therefore, in order to help the City of Tempe move away from automobile dependency, this report will analyze the research question: how can the City of Tempe foster the movement of people over the movement of cars?

For this report, bus route 48 was analyzed. Route 48 begins at Tempe Marketplace, rides along Rio Salado, goes down 52nd street to Broadway, takes 48th street, and ends at Baseline and Priest. The route 48 bus is in service seven days a week but has shorter hours on Sunday in comparison to Monday through Saturday. The route operates approximately every 30 minutes but this can fluctuate throughout the day due to varying traffic conditions. Riders are charged two dollars per ride with discount fares available for certain groups. Additionally, week and month long passes are offered but they can be pricey for users who do not utilize the bus on a daily basis.

The remainder of this report will: investigate related case studies of transit-oriented development in Albuquerque and Singapore, analyze participatory research findings from route-48 rider surveys, consider possible transition strategies for the City of Tempe, and acknowledge holistic findings and challenges.

II. Case Study: Domestic BRT

Like the City of Tempe, many local governments are working towards building efficient transportation systems. In November 2017 Albuquerque, New Mexico began running a $126,000,000 bus-rapid-transit system (BRT) that utilizes a bus-only lane to minimize headway times (Dovey, 2017). The system, Albuquerque Rapid Transit (ART), runs ten miles through the city center with stops at businesses, the hospital, and the University of New Mexico (AboutART, 2018). Stops sit on elevated platforms which make embarking the buses safer and faster. The
elevated platforms also house off-board ticket kiosks which reduce bus dwell-times to seconds. To make headways more consistent, the bus-only lanes have signal priority at stop lights. With these features, ART cuts bus headways in half, to about seven minutes.

Albuquerque is the ideal case study for Tempe to model its proposed BRT system. Both Albuquerque and Tempe are experiencing urban sprawl, which pushes more residents to use private transportation. As a result, private commuters add to the congestion which reduces bus efficiency. These private commuters were strongly against the notion of a bus-only lane in Albuquerque. Before ART construction began, Albuquerque residents filed a lawsuit demanding the city to abandon the bus-priority project (Thomas, 2016). However, the lawsuit failed, and construction began. Tempe should expect similar pushback from private commuters, but must not lose sight of its 20-minute city goal.

Rural Road, a six-lane roadway, is the prime corridor for the proposed BRT in Tempe. Rural Road connects Arizona State University campus, dozens of restaurants and businesses, and multiple neighborhoods in a 4-mile stretch from the Superstition to Red Mountain freeways. Implementing an Albuquerque-like BRT system through this corridor will expand the local fiscal market, increase accessibility for residents, and provide an alternative to ASU commuters.

III. Case Study: International BRT

The international case study chosen for this report is Singapore. In addition to a mass rapid transit system and light rapid transit system, Singapore also has a highly efficient bus system that would be advantageous to implement in a similar manner in Tempe. One of the keys to Singapore’s public transit system success is the splitting of different forms of transportation into a hierarchy.
Singapore’s mass rapid transit system is used to transport people between cities. Once in a particular city, the light rapid transit system is used to take riders into different parts of the city. The bus transit system is then used to get riders to specific locations within the different parts of the city. Separating and stratifying the different aspects of public transportation ensures that the system is running as quickly as possible and therefore prevents routes from getting too confusing (Mohring, et al, 1987). Another approach to facilitating this stratification is by making sure that each form of transit links up to each other form of transit. One of the common complaints stated during the route-48 surveys is that not all light rail stations are along the bus route. As a result, riders can only take bus routes to certain distances and must walk the remainder of their commute.

When looking at the bus system specifically, there are a few aspects that set the Singapore system apart from the City of Tempe transportation system. The first distinguishing characteristic is that Singapore has buses running 24/7. A few major bus companies run the buses throughout the majority of the day with smaller companies taking over at night (Goh, 2002). Another common complaint stated in the route-48 surveys, is that some riders do not get off of work until after the buses have stopped running. Ensuring that the City of Tempe has buses running all of the time would give these riders a cheaper, quicker, and more efficient alternative than an uber or just walking home.

The second unique transit system aspect is that Singapore has a hierarchy of bus routes. For example, some of the smaller buses operate solely in neighborhoods and living districts in order to provide easy transportation to the main bus routes. These two characteristics working together in theory would help with many of the issues currently present in Tempe’s bus system. However, Singapore does still suffer from some of the same issues that the City of Tempe does.
Buses in Singapore also often run late and are subject to overcrowding during peak hours. These are challenges that Tempe must be prepared to encounter.

The goal for this analysis is to increase bus ridership without breaking the bank. However, as ridership increases, more buses must be put into service. Implementing such improvements will inevitably result in raised costs. Like most sustainability challenges, Tempe may save money in the long run, but the immediate future will involve considerable investments to be made.

**IV. Research Methods and Findings**

The primary research method utilized for this study consisted of a 100-person qualitative and quantitative survey of Valley Metro transit users. Data was collected over the course of three survey sessions, each taking place during a transit “rush” hour: 4:30 - 5:30 p.m. Surveyors collected information from riders exiting and entering the Route 48 metro bus at Tempe Marketplace and traveling East/West along Rio Salado.

The demographic distribution of the survey results are illustrated in Figure 1. The primary age represented was 19-30 years (40.4% or two-fifths of those surveyed), with other age groups both younger and older making up ~20% segments.

*Figure 1: Ridership Age*
The riders surveyed also provided information regarding how often they utilized public transportation (Figure 2). Almost half of those surveyed (46.5%) claimed to ride public transportation everyday, whether for work, leisure, or other activities. One quarter (24.2%) use public transit for work five times per week. Together these two groups represent almost three quarters - about 70% - of Tempe transit ridership, specifically along the East/West Rio Salado Route 48.

*Figure 2: Ridership Frequency*

![Pie chart showing ridership frequency]

Together, the age and frequency demographics share a strong message regarding Tempe ridership. With almost three-fourths of riders using transit at least five times per week and a large group of riders between the ages of 19 and 30 (ages representative of students and young professionals), it can be inferred that many riders along Rio Salado are using transit to commute to work or complete daily activities and errands. Further, with only 10% of riders claiming themselves as anomalies (seldom using public transit), the survey results illustrate a consistent and loyal ridership that relies on public transit in Tempe to go about day-to-day activities.

Extending beyond basic demographics to more nuanced ridership, riders were also asked questions about their specific experiences riding public transit in Tempe. An overwhelming
majority of riders surveyed presented walking as their primary mode of transportation in getting to and from bus stops (81.6%). Another tenth of riders surveyed claimed to ride a bicycle to and from the bus stop (10.2%), and the rest of the distribution included varied responses including rideshare options or other wheeled transportation devices to fill in extraneous transportation needs.

*Figure 3: Alternate Forms of Transportation*

Acknowledging that oftentimes riders are travelling to and from more destinations than just bus stops, surveyors also asked riders about their other modes of transportation for non-public use. Only 24% of riders claimed having access to a car, while 37% shared that they relied on public transportation solely for all movement throughout their day. The responses collected from each of these questions highlights an important trait of many transit users: a large group of riders relies on public transit as their only mode of transportation.

Another unique experiential trait riders were surveyed on included the average wait time spent at the bus stop. The responses to this question were relatively evenly distributed across all answer options (5-20+ minutes spent waiting), illustrating great variance between rider experience.
The wide and even range of average wait times for transit riders demonstrates a significant opportunity for improvement of the rider experience: the current state suggests that when riders make a decision to use public transit, they are accepting the risk that their wait time could stretch anywhere between five and 20 (and oftentimes, more than 20) minutes. Utilizing this information to emphasize a priority on reducing wait times and increasing their consistency has the potential to greatly impact rider experience and could, consequently, promote more ridership among groups that aren’t currently using public transportation.

With the intent to summarize riders’ holistic rider experiences, a few “all things considered” questions were asked to gauge an overall impression from riders based on their interactions with public transportation in Tempe, and specifically along Bus Route 48. One of these questions asked riders if they felt that current bus routes were confusing: 60% of riders responded “No,” while the other 40% of respondents split their answers evenly between “Yes,” and “Somewhat.”

Figure 5: Are current bus routes confusing?
A significant amount of the qualitative feedback collected from respondents commented on confusion associated with bus routes. In many cases, riders shared that the source of route confusion was at the bus stops themselves: out-of-date, finely-printed bus schedules posted at bus stops serve little purpose to bus riders, shared many respondents. A clearer, more tailored route schedule and description unique to each route would provide greater value to riders, in turn increasing ridership throughout the city.

Much of the quantitative research collected in this study offered numerical proof of several of the qualitative themes collected from respondents, which will be addressed next as the study’s holistic findings, challenges, and strategies for transition are introduced.

V. Holistic Findings and Challenges

While making the transition to a 20-minute city is ideal in theory, this paper recognizes the inherent complexity and challenges associated with making this vision a reality. One of the most pressing obstacles hindering the successful creation of a 20-minute city are financial constraints. Developing, expanding, and improving the transit system involves substantial amounts of initial capital investment. As a result, this can make it difficult for the City of Tempe
to finance transit system infrastructure improvements. However, recognizing the long-term benefits associated with the development of a more sustainable, functional, and accessible city can help justify the investment for not only the City of Tempe but also for possible investors like surrounding businesses, corporations, and residents that would benefit from a more efficient transit system. The book, *Transforming Cities with Transit*, also suggests that with enough ridership, transit systems have the ability to generate a considerable amount of revenue through value capture that can help the city’s economy prosper (p. 33). However, despite the long-term benefits and potential for future revenue, the upfront cost remains an inevitable challenge associated with this project.

Another obstacle the City of Tempe faces is the lack of ridership. Due to the fact that the majority of Tempe’s population continues to be dependent on cars and are in possession of their own private vehicles, there is a lack of urgency for residents to take advantage of public transportation. Aside from the high cost of car ownership and having to deal with traffic congestion, there appears to be a lack of motivation for making the transition to a car-free lifestyle. Further research may need to be conducted in order to determine why residents reject public transportation outside of the route-48 bus riders that were surveyed for this project.

A possible contributor to this obstacle could be Tempe residents’ undesirable perception of the transit system. In the article, “Who’s Afraid of the Big Bad Bus?”, author Rose Weitz takes a closer look at the public perceptions of the Tempe transit system. Weitz asserts that Tempe residents have a shared negative perception that public transit can “bring in ‘undesirables’, increase crime, threaten health and quality of life, result in neighborhood deterioration, and…lower property values” (p. 2). Additionally, the route-48 rider interviews conducted indicate that riders are unsatisfied with: infrequent pickups, feeling unsafe, pricey
monthly ridership fares, long wait times, unreliability, confusing schedules, inaccurate online
tracking, spread out bus stop locations, and route disconnection. Therefore, transitioning into a
new paradigm where public transit is desirable and attractive to the public may take a
considerable amount of time. Also, expanding and improving the transit system will not be
possible without the needed demand from riders. As a result, the negative public perception of
the transit system can prevent the momentum from building to establish a 20-minute city.

VI. Transition Strategies

Transitioning into a 20-minute city will raise challenges for the City of Tempe. A
challenge this report focuses on is ridership levels. Tempe is seeing a constant decline in public
transportation users, a nationwide phenomenon plaguing local governments. There are a number
of solutions for this issue, including changes to bus routes and changes to the buses themselves.
One issue survey riders expressed was that the buses are uncomfortable. If a small amount of
investment is made in this area, the bus ride would be a more enjoyable experience overall. For
example, ensuring that the air conditioning is functioning efficiently and that the seats are
slightly more comfortable, will encourage riders to spend more time on the buses. This does not
imply that bus rides need to be first class and the best part of a rider’s day; rather, the City of
Tempe should make an effort to ensure that bus rides are not the worst part of riders’ day.
Another possible addition would be to expand the bus routes into more residential areas and
neighborhoods. The further the bus stop is from a rider’s house, the less likely they will want to
make the journey. If the commute can be shorted to a 5 minute walk from riders’ homes, riders
may be much more willing to put forth the effort into taking advantage of public transportation.

In order for the City of Tempe to increase ridership, Tempe must also retain the riders
that already use public transit. Any improvements to the comfort of the bus will help with this,
however some small changes could be made to the monetary aspects of the bus ride as well. Currently, the single ride cost and monthly ride cost do not seem to have enough of a price differential. In order for the monthly commitment to break even, riders would have to ride the bus more than once a day. While this does save some money if riders are utilizing the bus to get to and from work 5 days a week, it does not provide any extra incentive to someone who does not need to rely on the bus quite as much. Responses from surveys indicated that one of the most popular advantages about the bus system is that they are relatively affordable, with the exception of the monthly passes. Therefore, it is important that the City of Tempe maintain public transit affordability. Additionally, to optimize convenience, a bus card could be established that riders use instead of tickets. As a result, riders could transfer funds onto the bus card and simply swipe every time they ride the bus instead of having to purchase a ticket every time.

Lastly, the City of Tempe could enlist local businesses to provide incentives to employees that ride the public transit system. Some businesses already have programs like this, holding raffles for employees that commute via alternative modes, like buses or bikes. However, it can be difficult for employees to be willing change their schedule and patterns for something as intangible as a raffle. This incentive is nice for employees who already ride public transit, but it does very little to draw other people in. If businesses instead offered something more palpable and definite, people would be more likely to take an interest. Of course, in order for the businesses to provide incentives to their employees, the City of Tempe would have to offer incentives to the businesses. An example incentive could be small tax breaks based on public transit ridership levels.

At the end of the day, the main barrier to increasing ridership is that public transportation is simply not as convenient or effective as being in possession of a personal form of
transportation. Why would someone spend 5-10 minutes walking to the bus stop, 10-15 minutes waiting for the bus, 10-15 minutes on the bus, and another 5-10 minutes walking from the bus stop to their destination when they could drive themselves there in 20 minutes? For some, the bus is the only option as it is too expensive to buy a car, but these individuals are most likely already riding the bus. The City of Tempe must make efforts to reach individuals who do not own cars and choose not to ride the buses. A combination of all of these changes will be needed to provide any real incentive to stop the use of personal modes of transportation and switch to the bus.

VII. Conclusion

After conducting rider interviews, reviewing case studies, and producing extensive reports, this report formally recommends the implementation of a bus-rapid transit system through the Rural Road corridor. A BRT system is the most feasible option for Tempe to achieve its 20-minute city goals. With funding from Tempe Proposition 500 and assistance from federal DOT grants, the City of Tempe can implement a bus-rapid transit system similar to those in Albuquerque and Singapore. Running down Rural Road, this project would increase public transportation accessibility to ASU, neighborhoods, and businesses. It would also connect with the light rail, other bus routes, and the future streetcar that will traverse Apache Boulevard. If efficient enough, bus ridership would grow not only in the BRT corridor, but also on the bus routes connecting with the BRT. Increased car congestion will disincentive private commuters, possibly increasing bus ridership even further. While progressing towards the completion of the City of Tempe’s 20-minute city goal, a bus-rapid transit system will also foster economic development, local connectivity, and sustainable alternative accessibility.
References


