

**Results From a Survey of Transportation Professionals Regarding
the Return on Investment for Passenger Rail**

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Abstract

The factors that impact the return on investment for passenger rail are imperative for determining what types of investments have the most benefits, for which type of rail, and for what demographic. Therefore, this research aims to understand the impacts of passenger rail from multiple different dimensions with an eye towards developing an integrative framework. This research aims to build an understanding of the kinds of benefits that accrue from passenger rail investment. Passenger rail impacts were investigated by a (1) literature review on the return on investment for passenger rail, (2) analysis of survey data from transportation professionals and (3) a knowledge-intensive collection of data from interviews with transportation professionals. Based on these findings from this research an integrative theory-driven framework has been explored. The framework identifies key elements that can indicate the impacts of passenger rail. This research is presumed to create viable contributions to transportation industry leaders interested in developing new ways of creating public/private support and ways of obtaining funding for passenger rail projects that have been successful in other projects and are referenced in the insights and data provided.

Keywords: passenger rail, passenger rail benefits, literature review for passenger rail

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Executive Summary

As cities continue to grow and remained focused on reaching their optimum level of success, it is important that people understand the importance of a strong transportation infrastructure. Cities tend to be focused on ways to be competitive, attract capital, and to build a strong vibrant economy. The underlying factor to support the economy is mobility, which comes from a sustainable transportation network.

This paper aims to build an integrative understanding of the kinds of benefits that accrue from passenger rail investment. This research investigates by conducting a (1) literature review on the return on investment for passenger rail, (2) creates/analyzes survey data from transportation professionals and (3) builds a knowledge-intensive collection of data from interviews with transportation professionals. These 3 components indicate a positive return on investment for passenger rail. Although studies and literature show varying numerical values from their findings, they do indicate a positive return on investment. This research should be used by transportation industry leaders interested in developing new and/or increased service to learn ways of creating public/private support and ways of obtaining funding for passenger rail projects that have been successful in other projects and are referenced in the insights and data the paper provides.

The literature review was integrative because it had common themes from relevant literature. The evaluative framework used to gauge the returns on passenger rail focused on these categories:

- 1) Positive financial impacts
- 2) Time savings
- 3) Reduced capital, operating and maintenance costs on other transportation systems
- 4) Increased ridership and agency revenue
- 5) Increased property values
- 6) Business productivity and agglomeration
- 7) Safety benefits
- 8) Societal benefits

9) Environmental impacts

These chapters serve as the current literature review evaluative framework when assessing the benefits of investment in passenger rail. Each category showed a positive relationship with investments and economic benefits.

The survey examines the knowledge and attitudes of transportation professionals. The expert sampling of 66 transit professionals provides insight on the needs and impacts of passenger rail.

The survey had four main areas of inquiry:

- 1) The need for investment for passenger rail at each level (local, state, regional and national)
- 2) The benefits of passenger rail to society
- 3) Importance of economic development
- 4) Identifying the biggest barriers to development of adequate passenger rail service

The survey found that investments for passenger rail investments are highly needed at all levels. Financing was cited as the number one barrier to investment next to political opposition. Economic development is the most important benefit to society from passenger rail. However, 87% of respondents did not believe economic potential is factored into the systems planning, project development, and project selection for investments in passenger rail. As a result, a new forecasting model that can calculate the economic potential of passenger rail is recommended to be created. The new model would be able to calculate the various benefits and costs of passenger rail. To overcome financing obstacles, it is critical that the information about various returns from passenger rail investment is communicated with the public and citizenry. Economic potential and impacts need to be calculated in a systematic and integrative way. The last segment of this paper details the cost-benefit approach to gauge the benefits of passenger rail.

Introduction

In the mid twentieth century, there was a stage of investments made into the United States public infrastructure. These investments are now achieving the end of their utilization. The cost to adapt the modern habits and needs of public infrastructure in the United States would be an estimated \$2.3 trillion cost for the next decade. However, there is no current bill that would address these costs and currently public infrastructure does not gain enough revenue from investment from the Gross Domestic Product (GDP) at only 2.4%. As the population continues to swell, it is important for planners to incorporate transportation plans into cities' plans. According to the United States Census Bureau, the U.S. population currently stands at 321,362,789. The World Bank states the population is growing at a rate of 0.7% that quantifies to about 2,249,540 people a year in the United States. A 50 percent population increase is set to occur by 2050 for the United States. A bigger society causes an increased demand for goods and services. This will all directly be impacted by a transportation system. This causes travel to increase at a higher rate than the population (National Transportation Policy and Funding Commission Report, 2007). Not only is there a higher rate of people being born, people are living longer due to modern advances in medicine and technology. The first group of baby boomers turned 65 in 2011 (TRIP, 2012). Because longevity occupies more area, the utilization of land and travel is of utmost importance. Mobility will become increasingly important as the supply and demand rises. With more people, the demand for transportation infrastructure is more important than ever. As cities continue to expand and evolve, decision makers must understand the repercussions of said decisions to ensure overall security for the region. Transportation infrastructure plays a pivotal role in the identity and growth of a city. Mobility contributes to the socio-economic-political conditions for a city. People, goods, and information can be shared due to a strong transportation infrastructure. Quantitatively and qualitatively, transportation infrastructure is responsible for human capital in a city.

However, the United States transportation infrastructure is not well supported. By 2017, it is projected that there will be a \$66 billion deficit to maintain America's transportation infrastructure and \$133.9 billion deficit to improve it (American Public Transportation, 2007). Investing in transportation infrastructure now could save cities money and time. Evidence shows that for every additional 1% invested in transportation infrastructure, economic productivity increases from .05% to .21% (American Public Transportation, 2007). This small percentage boost gives tremendous economic gains when looking at the evidence on the larger scale. Passenger rail

reduces dependency on foreign oil, improves energy efficiency, and reduces air pollution. These benefits can be quantified in monetary value, standard of living value and by the impact it has on the public's general health. The return on passenger rail investments (ROI) can be visible in cities and regions across the United States in places such as Maine, North Carolina, Salt Lake City, the Northeast Corridor and others.

Transportation infrastructure impacts a nation's ability to be competitive. The economic impacts of increasing investment in passenger rail can come in a variety of different forms. These include time savings for passengers, increased ridership and revenue to the transit agencies, business productivity/agglomeration and increased land values. The purpose of this literature review is to look at the return on investment/benefits of investment in for passenger rail systems in the United States. Return on investment can be estimated by using economic analysis and a social impact analysis. In order to overcome barriers and achieve successful projects, local leadership and congressional delegation need to collaborate and become aware of the positive benefits of passenger rail in order to achieve transportation connectivity. Connectivity creates accessibility and opportunity to housing and jobs. Transportation investment should continue to be a constructive and collaborative endeavor. Resources to revamp the infrastructure but also integrate additional mobility options such as passenger rail should be an endeavor that brings people together to advance the quality of life for all.

This paper breaks down the positive impacts of passenger rail through a literature review, survey and interviews of transit professionals. Through these impacts, it is learned that the returns from passenger rail can come in different forms.

Evaluation of the literature review

The main question this paper investigates is the kinds of benefits passenger rail yields and how beneficial they have been as exhibited by actual project results from around the country. Different studies and literature demonstrate different numerical benefits, but the literature indicates quantifiable positive returns on investment for passenger rail. The relationship of investments and economic benefits tend to be positive. Transportation industry leaders interested in gaining funding for projects would gain insights by the knowledge-intensive literature provided and using it to further their projects.

This paper presents an integrative literature review with the most relevant and updated studies, models and case studies of major works. This integrative review found common ideas and themes from important works of literature. Most literature on passenger rail has focused on the following categories:

1. Financial Impacts
2. Time Savings
3. Reduced capital, operating and maintenance costs on other transportation systems
4. Increased ridership and agency revenue
5. Increased property values
6. Business productivity and agglomeration
7. Safety benefits
8. Societal benefits
9. Environmental impacts

These chapters serve as the current framework to evaluate passenger rail. The returns of passenger rail tend to come in categories 1 – 9. These categories were important to evaluate the return of investment for passenger rail.

Currently, there is not one universal framework that assesses all the impacts of passenger rail systematically. Passenger rail tends to utilize a framework that is comprised of chapters 1 – 9.

The factors that impact the return on investment for passenger rail is imperative for determining what types of investments have the most benefits, for which type of rail, and for what demographic. The evaluative framework was created based on existing literature, but it does not always measure what is important to decision makers (Transit Cooperative Research Program, 2002). Transportation professionals and analysts should look towards a framework that can predict all costs and potential revenues possible from completed/projected projects. Determining the best use of funds is important for transportation planners. As a result, see the last chapter on Cost-Benefit Analysis as a method to quantify (1) financial costs, (2) intangible costs and (3) the benefits of a project.

Methodology:

The approach for the study was based on a synthesis of prior studies and literature on passenger rail, a survey of transportation professionals, and interviews with transportation

professionals. The study considers (1) the economic impacts due to passenger rail; (2) societal impacts related to passenger rail; and (3) a benefit-cost analysis of passenger rail impacts.

It is important to note that according to the American Public Transportation Association (APTA) any methodology for calculating the impacts of passenger rail investment must include, at a minimum, the factors described by the Federal Railroad Administration (FRA). These include 1) improved safety, 2) travel time savings, 3) travel cost savings, 4) improved business productivity, 5) reduced energy consumption, 6) reduced capital, operating and maintenance costs on other transportation systems, 7) improvements to freight distribution systems, 8) increased property values and 9) environmental benefits. Other impacts, such as labor productivity, should be investigated and can be included as well. A consistent methodology can be developed that can be used to calculate the economic impact of changes in labor productivity that can be used across the various projects. Because the social impacts are often intangible it is important to develop a consistent methodology for estimating the impacts of passenger rail investments.

Literature Review

The literature review improves the understanding of passenger rail by bringing the reader up to date with the current impacts of passenger rail. The literature review synchronizes and summarizes existing publications to present facts and data on passenger rail. The literature review reflects the major concepts and relationships from existing literary works. The literature review had the following chapters:

- 1) Financial impacts
- 2) Time savings
- 3) Reduced capital, operating and maintenance costs on other transportation systems
- 4) Increased ridership and agency revenue
- 5) Increased property values
- 6) Business productivity and agglomeration
- 7) Safety benefits
- 8) Societal benefits
- 9) Environmental impacts

Financial Impacts

In order to evaluate the return on investment for passenger rail, it is imperative to examine the financial impacts of passenger rail. The literature shows that passenger rail can stimulate economies, raise property values, and provide jobs. The financial impacts category reviews and summarizes literature that examines the impacts of passenger rail on financial impacts. The literature supports passenger rail has a positive financial impact.

Passenger rail can provide economic vitality for cities. Passenger rail can provide jobs, agglomeration economics and an increase in property values. The population growth in the United States will continue to focus in areas that provide economic opportunities (APTA, 2011). Population clustering has transformed cities into megaregions. For example, the Northeast Corridor accounts for one in every seven Americans. This region is the most traveled national passenger rail in the United States and one of the most used rail networks in the entire world. That region accounts for \$1 out of every \$5 of economic activity in America (DeGood, 2015). If the Northeast was a country, it would be the fifth largest economy in the world (NEC Master Plan Working Group, 2010). One research group found that for every one tax dollar invested in transportation infrastructure generates an average of \$6 in returns (Cambridge Systematics and Economic Development Research Group, 1999). The commuter railroads for the Northeast Corridor serve 245 million annual passengers (NEC Master Plan Working Group, 2010). It is imperative that this passenger rail be working at optimal levels at all times to ensure maximum economic growth. However, the Northeast Alliance for Rail reports that the currently there is a backlog of \$8 billion to bring the corridor to a state of good repair (Northeast Alliance for Rail, 2016).

Rail stations act as hubs that connect modes of transit which improves efficiency and connectivity of the larger transportation network (NEC Master Plan Working Group, 2010). As a result, rail stations can be thought of as an attractive commodity in the sense that it can bring in private investments for commercial and residential facilities around rail stations which helps the economic growth of a region. In vacant land areas, when plans of passenger rail access points were planned to be built, land properties within .5 miles increased by 70% (Knaap, Ding & Hopkins, 2001). Demographic trends raise the value of multi-modal transit. 70% of millennials go multi-modal once or more during the week (American Public Transportation, 2013). An aging population

and millennials are increasingly using a multi-modal approach for mobility (American Public Transportation, 2013).

Well-designed passenger rail investments can have a long-term economic benefit and create jobs (American Public Transportation Association, 2013). The U.S. Department of Commerce, states that 20,000 new jobs are created for every \$1 billion invested into rail (APTA, 2011).

NARP (National Association of Railroad Passengers) states that implementing a high-speed and intercity rail network could create as many as 1.6 million construction and manufacturing jobs (NARP, 2015). Nearly 90% of jobs created by infrastructure are middle class jobs (Department of the Treasury, 2012).

Currently, passenger and freight rail support more than 300,000 jobs in America (NARP, 2015). The costs from construction and other costs related with building projects are very low in the current environment (Department of the Treasury, 2012).

High performance passenger rail is a type of intercity passenger rail service that conjoins with other transportation modes. If the high-speed performance passenger rails in Chicago, the northeast, California and Northwest are built, they can generate a benefit of \$660 million annually (American Public Transportation, 2012).

Commuter rail allows companies and organizations to have more sale opportunities and a higher skilled workforce (The Carmen Group, Inc., 1997). Passenger rail can create denser cities which make workers more productive because workers can perform more specialized assignments (Jenkins, Colella, & Salvucci, 2011). This allows businesses to agglomerate in an area which enables them to reap in benefits. Also, these businesses could take advantage of the extensive supply chain manufacturing that already exists and America has markets ready for these rail systems (American Public Transportation, 2011).

The shift from automobiles to HPPR could save \$2.2 billion annually in fuel (American Public Transportation, 2012).

Passenger rail is a critical anti-poverty measure to support all income and mobility levels. Physically and economically disadvantaged people can depend on passenger rail to gain access to employment, medical services, school, or food. Goods and services can be quickly transported at low costs. This helps the consumer by lower prices and helps the business increase profitability. There is evidence that large private sector productivity gains come from public infrastructure investments, much of the time there is a higher return than the private capital investment (Aschauer, 1989). Passenger rail can contribute to cleaner air and clean energy jobs (American Public Transportation, 2011). The rate of return for investing in America's transportation infrastructure is higher than the investment (American Public Transportation, 2007).

Time Savings

Major investment decisions tend to receive their justification from the time savings passenger rail provides (Lyons, 2007). The value of travel time is important to passengers. It can be a factor in passenger ridership. Any time saved can represent a conversion of unproductive time to productive time which translates to a positive economic benefit (DETR, 2000). Even if the time involved in a trip is the same or a bit longer, the fact that the passengers can be productive is very attractive to travelers.

Rail can create time savings and productivity. This is one of the most common factors used when attempting to justify an investment in transportation in general and passenger rail in particular. Americans wasted 5.5 billion hours in traffic in 2011 alone (NARP, 2015). Most of the time an investment in passenger rail will produce time savings for passengers. This time savings can apply to new passengers who switch to passenger rail as a result of the public investment, or to existing passengers. Rail passengers can save time through faster travel speeds, reduced waiting periods, and reduced transfer times (American Public Transportation Association, 2014). The perceived cost per hour tends to be lower than driving even if there is no time actually saved (Litman, 2006). The perceived costs can be based on factors such as: seat comfort, cleanliness of stations and vehicles which creates an environment where passengers are free to relax and work (Litman, 2006). The passenger's comfort enables them to perceive costs to be lower. Rail transit can enable automobile drivers to reach their destinations faster because of less congestion on the roads. Households reduce their vehicle travel significantly when they move to TOD's (Podobnik,

2002). This allows roads to have less VMT (vehicle miles traveled) which results in the slowing of deterioration on roads. This allows taxpayers to save money and for money to be utilized elsewhere. These savings in time can offset the travel time made by other modes of transit even if another mode reaches a destination first. Many times automobile drivers may reach a destination faster, but their total travel time can be offset by finding parking (American Public Transportation Association, 2009). And productivity during travel time is a very attractive factor with regard to traveler modal choice.

Apart from the obvious savings in time, there are also the benefits of increased productivity due to the increase in amount of useful/productive time while traveling. Specifically, 40% of millennials worked as they traveled (American Public Transportation Association, 2013). This productivity creates economic advantages. In comparison to the automobile mode of travel, passengers can utilize their hands and eyes to work rather than focusing on the road. Also, Federal Express and UPS have reported that five minutes in traffic costs their businesses \$40 million annually (The Carmen Group, Inc., 1997). Passenger rail can help mitigate this traffic so other businesses can prosper. The Department of Transportation projected that high performance passenger rail could redirect between 16% and 30.9% of airline ridership manufacturing total airport congestion delay savings of about \$19 billion annually in the four corridors that were examined (U.S. Department of Transportation, 1997). America has shifted from a society that had businesses holding goods to businesses that have their goods constantly on the move. Investing in rail transit can increase rail capacity that can support intermodal supply chains that would ultimately reduce transport delays (American Public Transportation, 2007). Intercity rail must become a priority for the United States (National Transportation Policy and Funding Commission Report, 2007). Diverse transit options allow Americans to save time and energy.

Road and airport congestion cost America over \$87 billion per year in wasted time and fuel (US High Speed Rail Association, 2015). High speed rail can beat air travel speed because of reductions in access, waiting times, and less security (Government Accountability Office, 2009).

Reduced Capital, Operating and Maintenance Costs on Other Transportation Systems

The literature behind reducing capital, operating costs, and external costs is critical to review to weigh the impacts of passenger rail (Lee Jr., 2000). These externalities can be critical in weighing the benefits of passenger rail or when deciding when to fund a passenger rail project.

Rail can reduce costs and maintains other transit modes. In economics, transportation facilities such as roads or rail are known as impure public goods. Many public goods suffer from the effects of congestion when too many consumers try to use them simultaneously. The effect of congestion is to reduce the benefit the public good yields to each user (Hindriks & Myles, 2013). In the case of transportation, the reduction of benefits as a result of congestion are often significant, not only to the individual users, but to the economy as a whole. According to the ASCE's 2013 infrastructure report card, deficiencies in the U.S. transit systems cost the U.S. economy \$90 billion per year in lost time and wasted fuel (American Society of Civil Engineers). The United States needs to address these deficits and prioritize transportation investments.

The other benefit of the switch in mode from automobile to transit is that there will likely be less wear and tear on the roads due to reduced VMT. This probably will extend the useful life of the asset as well as result in it being in an acceptable state of good repair. All of this in turn will result in reduced expenditure on the upkeep of these other asset categories.

By reducing capital operating and maintenance on other transportation systems, passenger rail can create time savings, reduce users and agency costs, improve safety, improve quality for passengers and non-passengers and reduce the cost of transportation as a whole (Lyons, 2007).

Increased Ridership and Agency Revenue

A transit's project effect on overall ridership is one of the main indicators of its success due to its ability in alleviating traffic congestion, reducing air pollution, and achieving a variety of other objectives sought by local officials (Pickrell, 1992).

The public is increasingly using passenger rail. Research has shown that reducing the time a trip takes on passenger rail can encourage more riders to use the service, increasing overall ridership. If this increase in ridership does not cause a need for an increase in trains or service the

additional passengers will provide needed revenue to a transit agency. If a passenger rail investment results in increased ridership it can provide a revenue boost to the transit agency that can be used in the cost-benefit analysis and offset the projects costs. Boosting ridership on existing, underutilized rail services can be a huge boost to a transit agency's bottom line (American Public Transportation Association, 2014).

Light rail, commuter rail and heavy rail ridership has seen an increase of 72 percent from 1995 to 2008 (American Public Transportation Association, 2011). In the United States, the passenger rail market has grown at a high rate, sustained by a multi-decade trend (American Public Transportation Association, 2011). Research has shown that people will utilize passenger rail if it is accessible. In France, air travel ridership was 31 percent of the market, but went to merely 7 percent after the high speed rail originated (Nash, 1996). Light rail transit has a higher ridership than bus transit because it yields a higher utility for a commuter's experience (Billings, 2011). In the case study analysis of the Santa Clara train, commuters saved about \$2500 annually versus the automobile (American Public Transportation, 2002). Amtrak hauled 31 million passengers in 2014 which was another ridership record (Kulm, 2014). This could be grounds for the \$52 billion investment Amtrak calls for in the northeast corridor because of a projected 60 percent ridership increase – the construction would cost about \$117 billion, but would increase ridership five-fold and have a high return on investment (American Public Transportation, 2011).

The Northeast Corridor allows more than 259 million passengers and 14 million car-miles of freight every year (NEC Master Plan Working Group, 2010). The commuter railroads for the Northeast Corridor serve 245 million annual passengers (NEC Master Plan Working Group, 2010).

From 2006 – 2011, ridership on state-supported Amtrak routes from Chicago to downstate Illinois grew 142 percent (CREATE, 2014).

Cities that provide high quality transit have higher transit ridership which results in the operating costs per passenger mile to be 33% lower and the rate of service cost recovery is almost 60 percent higher (Litman, 2004).

Property Values

A review of the literature shows a significant amount of research on passenger rail and its impacts on property values. It is critical to assess the property value impacts to gauge the net returns on passenger rail.

Passenger rail can raise property values and the quality of life. Research shows passenger rail can increase property values (Weyrich & Lind, 2003; A New Economic Analysis Infrastructure Investment, 2012; Knaap, Find, & Hopkins, 2001; Billings, 2011). A rise in property values tends to reflect a higher living standard. Passenger rail plays an instrumental role in influencing real estate development and urban development (Huang, 1996). These high quality standards help stimulate and stabilize local/regional economies. Passenger rail substantially adds to residential property values (Weyrich and Lind, 2003). Passenger rail brings in additional revenue from riders and property taxes (Huang, 1996). The Dallas DART rail system raised the value of residential prosperities 65 percent by the VA Hospital system (Cowley, 2001). Case study analysis of Chicago, St. Louis, Sacramento, Dallas, and San Diego demonstrated that property values had a premium effect when located near light rail stations (A New Economic Analysis of Infrastructure Investment, 2012). San Francisco's BART heavy rail system makes homes in Alameda County worth \$3700 less for every single mile away from a BART station (Wayrich and Lind, 2003). In a case study of light rail transportation impact on land values in Washington County, Oregon, participants in the land market deemed the light rail transit to have a better impact on land properties (Knaap, Ding, & Hopkins, 2001). Also, in vacant land areas, when plans of passenger rail access points were planned to be built, land properties within .5 miles increased by 70% (Knaap, Ding & Hopkins, 2001). Raising property values reflects an improvement in the quality of life for residents.

Billings (2011) argues that local land markets should see an increase in their property's worth in relation to the proximity of light rail access points. Land rents should be the beneficiary as a result of close proximity to LRT. Billings (2011) cites that Dueker and Bianco (1999) find LRT has a positive impact on property values in Portland, but there is no true methodology as to how to truly test their analysis. This is an example of how measuring the return on investment for property values when examining LRT can be pragmatic. Different external factors and variables

impact land values. For example, crime and noise can impact land values (Billings, 2011). People may be less likely to live in an area that is loud and has crime. However, recent trends show there is a significant movement of people moving to urban and downtown areas anyway.

Studies in Chicago, St. Louis, Sacramento, San Diego, and Dallas demonstrated that property values are impacted by their proximity to a public transit system (Department of the Treasury, 2012). Infrastructure investment that lowers transportation costs should increase access to homeownership (Center for Neighborhood Technology, 2012).

Business Productivity and Agglomeration

A principal objective for investing in passenger rail projects is quantifying the net return for business productivity and agglomeration economics (Shefer & Aviram, 2005). A firm's productivity can be enhanced by passenger rail. Agglomeration economics help expand the growth of cities (Murkami & Cervero, 2012).

Public transportation advancements can increase economic productivity if they enable the growth and densification of cities which by increases the external agglomeration economies (Chatman & Noland, 2011). Businesses benefit from transit infrastructure. Investment in passenger rail has been shown to positively impact business productivity as well. Businesses often benefit from better access to a broader and more diverse labor market which facilitates a competitive advantage and can assist with the expansion of the business and open up a business to a wider customer base, both of which enable economies of scale and agglomeration (American Public Transportation Association, 2014). This access to larger labor market provides businesses with more opportunities to find workers with the skills they desire by opening up a more diverse labor pool. Transit and commuter rail access can also reduce the wage premium needed to attract workers to congested areas that typically have higher travel times and costs (American Public Transportation Association, 2014). A city that expands passenger rail stands to gain more effective density because the city of a density can increase. It can increase accessibility. The Crossrail in London will give 1.5 million workers access to central London within 45 minutes (Jenkins, Colella, & Salvucci, 2011). This can facilitate job growth. About 27,000 jobs will not be lost because of crowding out due to Crossrail (Jenkins, Colella, & Salvucci, 2011).

Passenger rail also encourages the concentration of economic activity around passenger rail stops. In Chicago, passenger rail has seen agglomeration benefits. Passenger rail has led to greater business clustering and growth in the economy through manufacturing stations (A New Economic Analysis of Infrastructure Investment, 2012). Concentrated economic activity can provide increased efficiency through reduced labor costs, improved communication, lower infrastructure costs, and increased interaction with similar businesses. A concentration of similar business types also often attracts concentrations of specialized labor to support those businesses and passenger rail often plays an important role in these concentrations. It has been shown that because agglomeration benefits require adequate capacity to avoid degradation of accessibility by congestion, transit and commuter rail are more likely to provide long-term agglomeration and densification benefits than roads.

Rail transit service in cities attracts large meetings and events compared to cities that don't have rail transit. From 2006-2013, when rail cities were compared to non-rail cities, hotels performed almost 10.9% better in terms of revenue earned per available room (American Public Transportation, 2013). When hotels were within .25 miles of a rail station, hotels saw an increase of 48.6% of average daily room rates (American Public Transportation, 2013). Agglomeration economics is a force in the United States economy. Business travel generated \$258.6 billion and supported 2.2 million jobs in the United States in 2012 (American Public Transportation, 2013). Easy mobility options attract travelers. International travelers was responsible for 14.6% of total business travel spending in 2012 which supported 332,000 American jobs and generated \$38 billion (American Public Transportation 2013). Passenger rail connections enable people to connect with a region's amenities. Passenger rail infrastructure benefits the economy and creates jobs. It helps support the airport systems and mitigates traffic. Also, it allows hotels to prosper and have many more people travel for business.

Rail connections to airports enable choice for travelers. Availability of rail access to airport terminals can strengthen the attractiveness of destinations and the performance of properties near rail stations (American Public Transportation Association, 2013). When hotels were within .25 miles of a rail station, hotels saw an increase of 48.6% of average daily room rates (American Public Transportation, 2013). Chicago's agglomeration benefits have led to greater business clustering and economic growth (Department of Treasury, 2012).

MPOs

The intergovernmental management system involved with the dealings of passenger rail can be large and cumbersome. Metropolitan Planning Organizations (MPOs), under the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), should have a bigger role in regional policymaking. Intergovernmental management and long-range planning could have better impacts on transit issues when handled by MPOs (Gage and McDowell, 1995).

Inside and between Metropolitan areas, mobility needs to be reliable for movement of goods and people. Rail systems should be expanded to meet future growth (National Transportation Policy and Funding Commission Report, 2007). To meet the demand of future growth, travel modes need to be rebalanced to ensure travel options are plentiful and effective. Serving corridors by rail can encourage growth.

The Northeast Corridor would be the fifth largest country in the world. It is among one of the most traveled passenger trains in the world. Yet, it is still underfunded. Despite the evidence that this service is set to see an increase in ridership of nearly 60% by 2030.

Intercity passenger rail will need to have a larger role in mobility. Federal, state and local transportation policies should not merely accommodate local transportation policies/transportation investments, but encourage this development (National Transportation Policy and Funding Commission Report, 2007). Urban areas in the United States generate 60 percent of the value of U.S. goods and services (National Transportation Policy and Funding Commission Report, 2007). LOCUS, a national coalition for real estate developers and investors champions the fact that transportation drives development. LOCUS acknowledges that the market trends are currently going towards walkable urban areas. To meet this demand, more investments in transportation infrastructure can be deemed as necessary.

Safety

The population in the United States continues to grow. By 2030, 60% of the world's population is expected to live in an urban environment (Cox, Houdmont & Griffiths, 2006). The movement of goods and people in densely populated areas is a challenge. Literature suggests that

safety of the economy, people, and infrastructure is at risk if policymakers don't adapt to the current trends.

Highway travel accounts for 94 percent of fatalities on surface transportation systems in the United States (National Transportation Policy and Funding Commission Report, 2007). Without any action to the current transportation system, it can be assumed automobile casualties will increase. In 2006, 43,000 people died on U.S. Roads and 2.6 million were injured (National Transportation Policy and Funding Commission Report, 2007). Commuter rail saves Americans about \$1.7 billion annually in costs from auto traffic-related injuries and fatalities (The Carmen Group Inc., 1997). Rail reduces traffic crashes (Litman, 2004). Traffic casualty rates tend to decrease as public transit travel increases in an area (Litman, 2010).

If underinvested, passenger rail systems (as other infrastructure such as highway and bridges etc) can become a great danger. In New Jersey of August 2010 alone there were passenger rail systems that experienced problems due to fire, power failure, and outdated equipment (The Department of Treasury with the Council of Economic Advisors, 2012). These negative consequences of under investments put people's livelihood and their lives at risk. This would be true for any infrastructure such as highways, bridges, other combustible infrastructure such as involving oil / gas etc. Do you think that this paragraph will be taken by the reader as rail has a higher risk? Perhaps you should insert as above)

In emergency situations, stranded airline passengers utilize passenger rail systems. For example, after the terrorist attacks of 9/11, many passengers used passenger rail (American Public Transportation, 2012).

Funding

Infrastructure is the world as it appears around us. It can be expensive, dangerous and in some cases lethal. From shaky bridges to small potholes, these infrastructure issues present unsafe conditions. Investing in transportation infrastructure should become a priority. In fact, since 2000, more than 70% of transit initiative ballots have passed. In 2012, 79.3% of voters across the United States passed a transit initiative ballot. (American Public Transportation, 2012). The U.S Chamber of Commerce and the American Federation of Labor came before Congress to plea with Congress for more funding for infrastructure. These two organizations who tend to disagree on many issues, have reached the consensus that infrastructure is a priority.

On December 4, 2015, the Fixing America's Surface Transportation (FAST) Act was signed into law by President Obama ("The FAST Act", 2016). This bipartisan five-year legislation plan is designed to improve America's surface transportation infrastructure (roads, bridges, transit systems, passenger rail network, etc.). The FAST Act authorizes programs to revitalize infrastructure and aims to improve safety. This bill can provide the certainty for states and local governments to perform long infrastructure based projects (Fast Act, 2016). It allows them flexibility to address unique infrastructure problems.

The FAST Act restructures Amtrak and ensures the Northeast Corridor profits get redistributed to that corridor (Fast Act, 2016). States can monitor Amtrak's performance by a state-supported route committee. Also, the FAST Act provides opportunities for the private sector through station and right of way development (Fast Act, 2016).

Intercity rail programs are chosen on the basis of cost-benefit analysis principles (Fast Act, 2016). It provides opportunities for the enhancement and restoration of rail service as well. Also, the FAST act enhance rail safety by speed limit action plans. Bridges and tracks are now being reviewed by innovative technologies that allow states to closely monitor them (Fast Act, 2016). The FAST act allows for passenger rail to receive innovative financing options. Railroad Rehabilitation and Improvement Financing (RRIF) loan program is a way for passenger rail to receive more funding quickly (Fast Act, 2016).

In order to develop the nation's transportation infrastructure, there has to be adequate funding. Experts believe there must be performance objectives for Federal and Local agencies to receive funding (National Transportation Policy and Funding Commission Report, 2007). Experts also note the importance of private sector contributions to gain a better transportation infrastructure. Public-Private Partnerships are a tool planners can use to fund rail projects. More public and private investments in transportation infrastructure are necessary to keep America competitive (National Transportation Policy and Funding Commission Report, 2007). Maximizing public investment is a priority. Both parties are saying there needs to be more utilization of Public-Private Partnerships (P3's) for transit investments.

According to the Council of Foreign Affairs, President Obama encouraged idea of creating a national infrastructure bank. This would create influence for federal funds and encourage PPP's. Residents and commercial facilities certainly reap the benefits of a transit rail station because it raises the standard of living.

High-speed rail corridors that utilize a tax credit bond financing program could generate significant monetary gains. VantagePoint Associates, Inc. and Mercator Advisors, LLC conducted an analysis on using a potential tax credit bond financing program to facilitate investment in high-speed intercity passenger rail (American Public Transportation Association, 2008). VantagePoint created a fiscal impact model to estimate federal/state taxes for the construction of the Midwest Regional Rail Initiative (MWRRI). VantagePoint used the MWRRI because it had the most economic data available for high-speed rail corridors. The results from VantagePoint and Mercator indicated that regional rail corridors, like MWRRI, showed that such investment can generate income tax revenues that largely offset the cost of the proposed tax credit bond financing program (American Public Transportation Association, 2008). Investment in high-speed rail could cause significant fiscal benefits with the use of a tax credit bond financing.

Traditionally, passenger rail tends to have a mix of federal, state, local, private and transit agency sources for funding (American Public Transportation Association, 2013). Build America Bonds (BaBs) are a very successful tool that attracts private capital to finance infrastructure projects (Department of Treasury, 2012). Bonds were used to fund bridges, transit systems, and hospitals from 2009 through 2010 in the United States. They used over \$180 billion for these projects (Department of Treasury, 2012).

Public Impacts:

Environmental and Social

Public/social impacts come in two distinct forms: 1. Equity Impacts 2. Environmental impacts. Correcting transportation inequities is often cited as a potential benefit of passenger rail investments. This is because a new rail line may connect a previously unserved, or underserved, area to more job opportunities. Environmental benefits often come in the form of reduced congestion which results in reduced pollution. The reduction in pollution is also often hard to quantify and relay in terms that are easily understood. Improving transportation equity and reducing pollution are often cited as some of the most important reasons for investing in passenger rail, although these benefits tend to be difficult to quantify (Transit Cooperative Research Program, 2002). These impacts are typically difficult to quantify despite the fact that the impacts are very

real, and often times can be quite significant. Where the benefits are able to be quantified, the methodologies for doing so vary greatly.

Environmental Impacts

Passenger rail improves energy efficiency and reduces air pollution. Some Passenger rail runs on electricity so it has a lower carbon profile as compared to other forms of transit (Banister & Thurstain-Goodwin, 2011). Electric rails are six times more energy efficient than automobiles (Weyrich and Lind, 2003).

High speed rail is eight times more energy efficient for passenger travel than aircraft (American Public Transportation, 2011). Commuter rail mitigates environmental degradation costs by \$263 million annually (The Carmer Group, Inc., 1997).

High quality rail transit produces lower pollution emissions (Litman, 2010).

In Calgary, Canada, light rails get electricity to power trains from just windmills (Weyrich and Lind, 2003).

Cleaner air and reduced energy consumption are the result of passenger rail systems (Weyrich and Lind, 2003). Train travel is 17% more fuel efficient than airlines per-passenger-mile (American Public Transportation Association, 2012).

If a high performance passenger rail existed in the Northeast Corridor, it could save \$404 million a year in emissions based on the results in the Paris/Madrid corridor because riders switched to HPPR rather than air travel (American Public Transportation Association, 2012). It is also important to note that much of the time, many trips are completed by passengers even though the passenger rail is not high speed rail. Per passenger mile, commuter passenger rail is 21 percent more fuel efficient than auto travel (American Public Transportation Association, 2012). \$121 billion in annual cost to the U.S. economy due to congestion (NARP, 2015).Commuter rail mitigates environmental degradation costs by \$263 million annually (The Carmer Group, Inc., 1997). 2.9 billion gallon of fuel wasted in traffic each year (NARP, 2015). And commuter rail is safer than driving and provides more productive time to passengers.

Health Impacts

Areas around a transit station support a healthy lifestyle. Most public transportation passengers achieve the recommended amount of daily exercise from walking to and from transit stations/stops (Litman, 2010). Passenger rail can reduce healthcare costs. Passenger rail can promote a healthy lifestyle. 44% of millennials want exercise when traveling (American Public Transportation, 2013).

Other Factors That Affect the Return on Investment (Limitations):

According to a review of the existing literature, there are many different factors that can affect the outcome of the cost-benefits analysis. Because of this it is important to identify and create a consistent methodology for performing the cost-benefit analysis of each passenger rail project in order to accurately compare the projects against each other. The existing literature shows that project scale, type of investment, purpose of the investment, and the time horizon used in the calculation all can have dramatic impacts on the outcome of the cost-benefit analysis.

Time Horizon for Measuring Impacts

One crucial element for calculating the return on investment of a passenger rail project is the time horizon used to evaluate the project. Because benefits from passenger rail projects, such as reduced congestion and pollution, may take significant time to fully materialize a longer time horizon is often needed to properly perform a cost-benefit analysis for a passenger-rail project. If the time horizon selected is too short, the benefits may not be fully realized within the chosen time frame resulting in a lower benefits calculation than will actually be realized. On the other hand, if the time horizon that is selected is too long the forecasted costs and benefits may become unreliable reducing the legitimacy of the cost-benefit analysis.

Investment Scale

One factor that needs to be determined when conducting a cost-benefit analysis is the determination of the scale in which the project will be evaluated. Investments in passenger rail projects vary at the geographic and project levels. Neighborhood, city, metropolitan area, region,

national, are all examples of scales at which investments in passenger rail are made. Another scale that must be considered when conducting a cost-benefit analysis is the size of the project and the types of investments being made. Improvements to a station, or the addition of a new station will have different types of costs and benefits than the creation of a new rail line connecting two large metropolitan areas.

Investment Purpose

Another factor that can affect the return on investment of a passenger rail project is the basis behind why the project was built. Investments in passenger rail have been used for a variety of different functions by transportation agencies besides transportation, such as economic development. Tourism is also often a driving factor when cities decide to invest in a passenger rail project. These include light-rail or streetcar projects in downtown areas that function as downtown circulators to connect tourists with many different attractions to investments in connecting a region's airport to its downtown to facilitate the movement of tourists through the region without adding to car congestion. While it is likely that all of these projects would benefit residents as well, the important factor is that the basis behind the investment will impact the return on investment for a project and how it should be measured.

Investment Type

The type of investment that is made will also significantly impact a project's return on investment. Generally, the type of investment can be broken down into two different categories, capital investments and service investments. Capital investments can include upgrades to existing infrastructure, or the creation of new infrastructure where none existed previously. This includes the construction of new stations and rail lines and the rehabilitation of existing stations and rail lines. It also includes project design, land acquisition, purchase of equipment and new vehicles, and supporting operating equipment. Investments in passenger rail service can come in many forms and can include increased frequency on an existing line, the addition of off-peak services, additional cars to reduce overcrowding, among others.

Conclusion

The difficulty in measuring the impacts of passenger rail has created problems for transportation professionals. In order to obtain funding, transportation professionals need proof that passenger rail is beneficial. There needs to be a method to capture the economic potential of passenger rail. This can overcome the barrier to investment(s) and funding for passenger rail and explain the benefits of passenger rail. This can lead to a better connected transportation network in which passenger rail will be an integral part to ensure economic growth and mobility.

Surveys and Interviews

A survey and series of interviews from transportation professionals were utilized to gain a qualitative and quantitative understanding of passenger rail. The data provided from these data-collection methods provide valuable insights and information on the evolving productivity and efficiency of passenger rail. The findings from these data-collection methods should be used by anyone trying to gauge the attitude of passenger rail by transportation professionals. The transit professionals' names are withheld in the paper to elicit objectively accurate responses.

Survey

A survey of transportation industry leaders was used to create a broader understanding on the return on investment for passenger rail. A systematic review of published internet-based surveys on passenger rail was conducted to assess missing information on the topic of passenger rail. Then the research team identified questions that would help provide an accurate snapshot of how transit professionals currently view the importance of passenger rail. The expert sampling of these 66 transit professionals provide an accurate snapshot of how they view passenger rail. The survey questions were developed by Senior Advisor Jolene Molitoris and Dr. P.S. Sriraj.

This survey uses transportation professionals to learn the needs and impacts of passenger rail to society. The premise of this survey was to learn the needs and impacts of passenger rail to society from transportation professionals.

The survey included the following four main topics:

- 1) The need for investment for passenger rail at each level (local, state, regional and national)
- 2) The benefits of passenger rail to society
- 3) Importance of economic development
- 4) Identifying the biggest barriers to development of adequate passenger rail service

This survey challenges people's knowledge and attitude on passenger rail through an evaluation of the status quo through the answers of experienced transportation professionals.

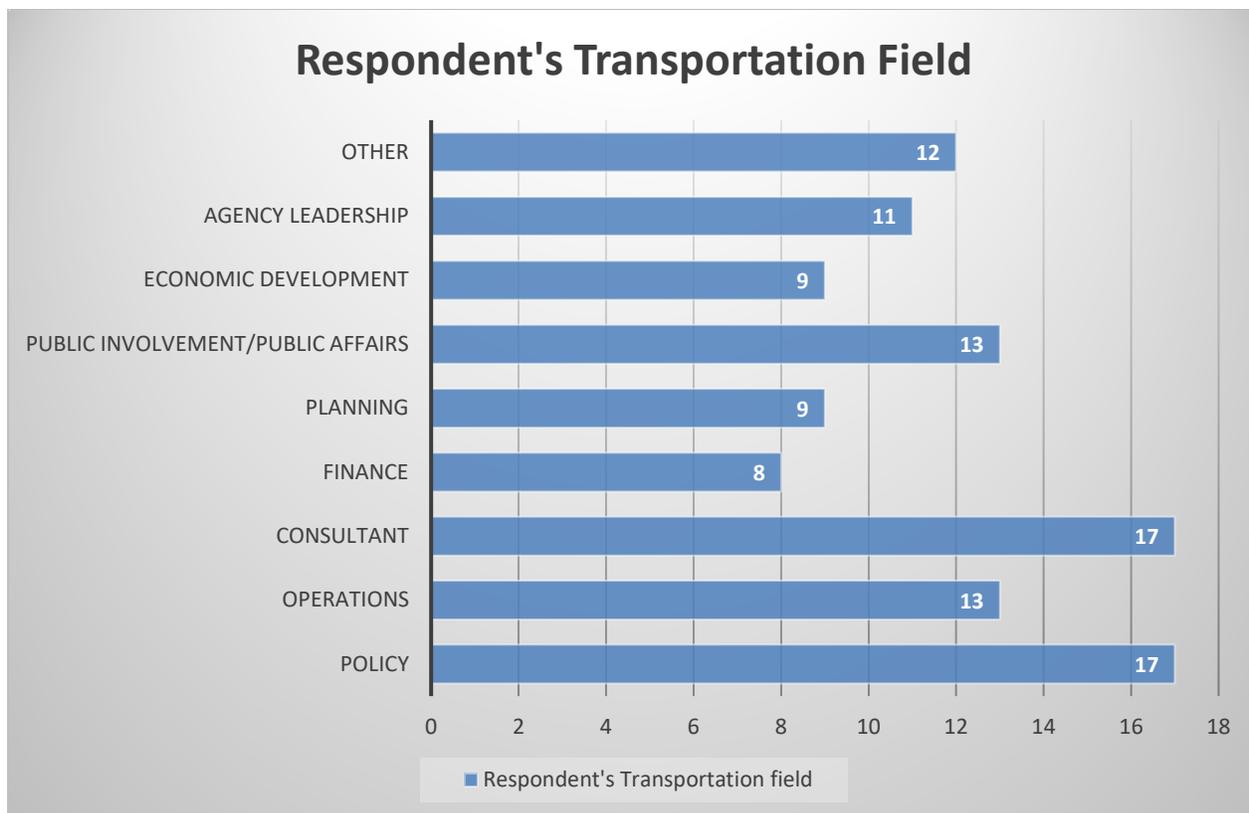
Methodology:

The respondents were selected based on their expertise in the transportation field. This sampling method is as known as expert sampling. Expert sampling is an assessment or opinions of people with a high level of knowledge. The survey was designed similarly to a community needs assessment. It asks respondents to rate items, indicate their attitudes about certain topics and some open-ended questions that require more thought.

The data for this research was collected via an online survey, SurveyMonkey. Senior Advisor, Jolene Molitoris led the selection of the respondents for this survey. The respondents were given a link to the survey to participate. There are no existing survey tools to measure the connection between how transportation professionals gauge the return on investment for passenger rail. The respondents' identities will remain confidential. The concealment of their identity helped elicit objectively accurate responses. The same questions were asked to all the respondents. The results were analyzed using SPSS (statistical package for the social sciences).

Survey Results and Analysis:

The following portion of this paper details the answers from the transportation professionals.



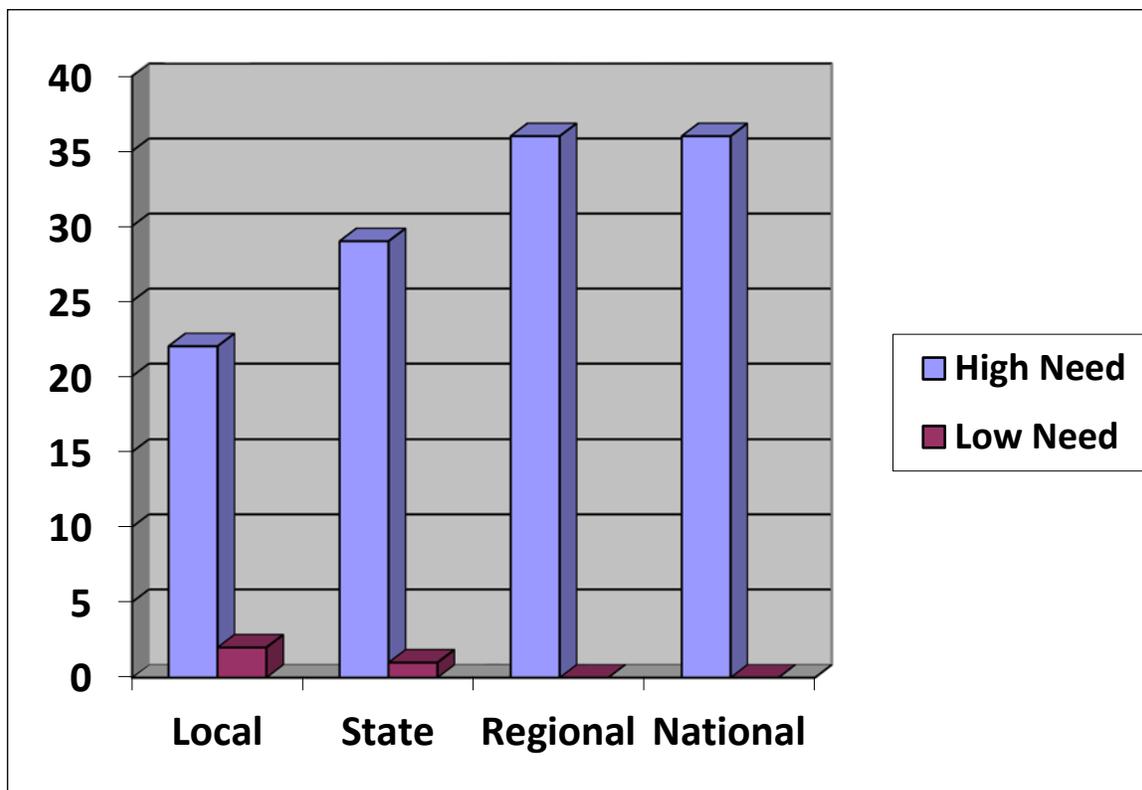
*Note some transit professionals answered with more than one response.

To begin, the main transportation field the respondents' work in is shown above. The variety of transportation professionals giving different perspectives creates more validity for the study.

- 1) **Research Topic:** The need for investment for passenger rail at each level (local, state, regional and national)

The visual shown below depicts the respondents' answers:

What are the needs for investments in all types of passenger rail at the various geographical levels across the U.S?



Analysis:

The transportation professionals overwhelmingly agree that passenger rail needs more investments on all levels of the United States. The notion of passenger rail being heavily underfunded was not only clear from the survey, but from the interviews with transit professionals. These notions are founded upon fact. As the Council on Foreign Nations reported, public infrastructure is 2.4% of the U.S. GDP. The public infrastructure GDP is merely half of what it was 50 years ago. By 2017, it is projected that there will be a \$66 billion deficit to maintain America's transportation infrastructure and \$133.9 billion deficit to improve it (American Public Transportation, 2007). With a growing population and economy, it is critical that infrastructure becomes a priority with a strong steady funding stream.

Investing in transportation infrastructure now could save cities money and time. Evidence shows investing in public infrastructure and passenger rail can create economic development. It

creates a mobile society. Passenger rail creates a true multi-modal transportation system which can improve safety. The benefits of passenger rail are important for a society to be multi-modal and mobile.

Cross-tabulations

The following cross-tabulations breaks down the respondents answers (Private sector employee versus Public Employee) to the following question:

In your opinion, what are the needs for investments in all types of passenger rail at the various geographical levels across the U.S? A scale of High Need versus No need was used.

Local Level* Sector Cross-tabulation

Count

	Sector			Total
	Local Level	Private Sector Employee (business)	Public Employee	
Local	High Need	12	10	22
	No Need	1	1	2
Total		28	20	24

State Level* Sector Cross-tabulation

Count

	Sector			Total
	State Level	Private Sector Employee (business)	Public Employee	
State	High Need	16	13	29
	No Need	1	0	1
Total		17	13	30

Regional Level * Sector Cross-tabulation

Count

	Sector			Total
	Regional level	Private Sector Employee (business)	Public Employee	
Regional	High Need	20	16	36
Total		20	16	36

National Level * Sector Crosstabulation

Count

	Sector			Total
	National Level	Private Sector Employee (business)	Public Employee	
National	High Need	21	15	36
Total		21	15	36

Then respondents were asked the following:

“Please describe your answer above, especially if you selected "No Need" or "High Need" in any particular geographic area. Is there any area more important than the others, in your opinion?”

Here is a snapshot of their answers:

“There are a number of mega regions in the United States that are emerging, that are not adequately served by passenger rail services. With air service declining in many small market cities, passenger rail (especially high-speed rail) needs to fill this void.”

“As air travel becomes more constrained by searches and as the skies become more clogged with activity with no improvement in the technology that guides our planes, then alternatives are needed.”

“We need rail to relieve freeways and to some extent airports. The need is greatest outside of the Northeastern corridor. There are public transit options at the local level, but not really between cities.”

“Areas with greater population density, such as Chicago, have a greater need for passenger rail at the local level. State and Regional service are needed for transportation from outlying areas to population centers but can run on a less frequent schedule.”

“We need to be investing in rail instead of building more roads and constantly repairing them. Rail would be quicker, safer, and more comfortable. Relying totally on cars is a disadvantage for many people.”

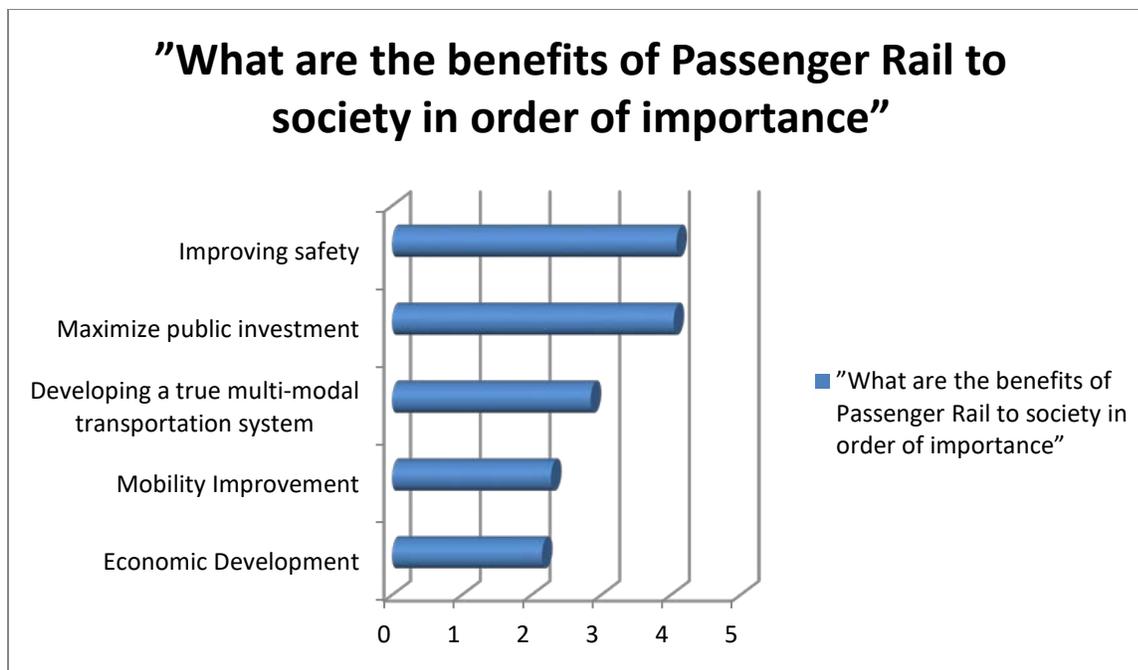
“There has not been enough investment in passenger rail at any level.”

“National policy should focus on regional or mega-regional rail strategies.”

“Public transportation has long been neglected in terms of planning and constructing integrated and connected systems. Moving forward with projects that will provide efficient rail systems is needed in all major cities and regional areas.”

2) Research Topic: The benefits of passenger rail to society

The following question asked respondents to rank economic development, mobility improvement, developing a true multi-modal transportation system, maximizing public investment, improving safety, and other to find the passenger rail benefits to society. A ranking system of 1 – 6 was used to assess the most important benefit passenger rail brings to society (1 being the highest).



1-5 scale with 1 being the highest and 5 being the lowest

Economic development: 2.15

Mobility improvement: 2.28

Developing a true multi-modal transportation system: 2.85

Maximize public investment: 4.04

Improving safety: 4.08

Analysis:

Transportation professionals recognized economic development as the most important benefit of passenger rail. A review of the literature demonstrated the positive financial impacts passenger rail can have. It is important for transit industry leaders to examine the economic returns from passenger rail to assess the benefits. As the literature reflected, passenger rail can benefit economic development through business productivity and agglomeration, increased property values, environmentally, benefits associated with safety, and reduced capital, operating and maintenance costs on other transportation systems. All these categories reflect economic development due to passenger rail.

Cross-tabulations of results

The following cross-tabulations shows all of the results (Private sector employee versus Public Employee) to the following question:

What are the benefits of passenger rail to society? Rank in order of importance (Rank 1 is the highest, 6 is the lowest):

Economic Development

	Sector			Total
	No Response	Private Sector (business)	Public	
Economic Development	0	2	1	3
1	0	8	8	16
2	1	9	5	15
3	0	6	3	9
4	0	2	3	5
6	0	1	0	1
Total	1	28	20	49

Mobility Improvement

	Sector			Total
	No Response	Private Sector (business)	Public	
Mobility Improvement	1	2	1	4
1	0	8	4	12
2	0	10	9	19
3	0	3	4	7
4	0	1	0	1
5	0	4	2	6
Total	1	28	20	49

Multi-Modal System

		Sector			Total
		No Response	Private Sector (business)	Public	
Multi-Modal system		0	2	1	3
	1	0	6	5	11
	2	0	3	2	5
	3	1	9	7	17
	4	0	3	3	6
	5	0	5	2	7
Total		1	28	20	49

Maximizing Public Investment

		Sector			Total
		No Response	Private Sector (business)	Public	
Maximizing Public Investment		0	2	1	3
	1	0	1	0	1
	2	0	3	1	4
	3	0	1	3	4
	4	1	12	9	22
	5	0	8	5	13
	6	0	1	1	2
Total		1	28	20	49

Improving Safety

	Sector			Total
	No Response	Private Sector (business)	Public	
Improving safety	0	2	1	3
1	0	1	2	3
2	0	0	2	2
3	0	6	2	8
4	0	8	3	11
5	1	8	10	19
6	0	3	0	3
Total	1	28	20	49

3) Research Topic: Importance of economic development

- **63% of respondents believe it is currently an accepted practice to base the impact of infrastructure investments (transportation or otherwise) on the maximization of economic benefits.**
- **However, 87% of respondents do not believe economic potential is factored into the systems planning, project development, and project selection for investments in passenger rail.**

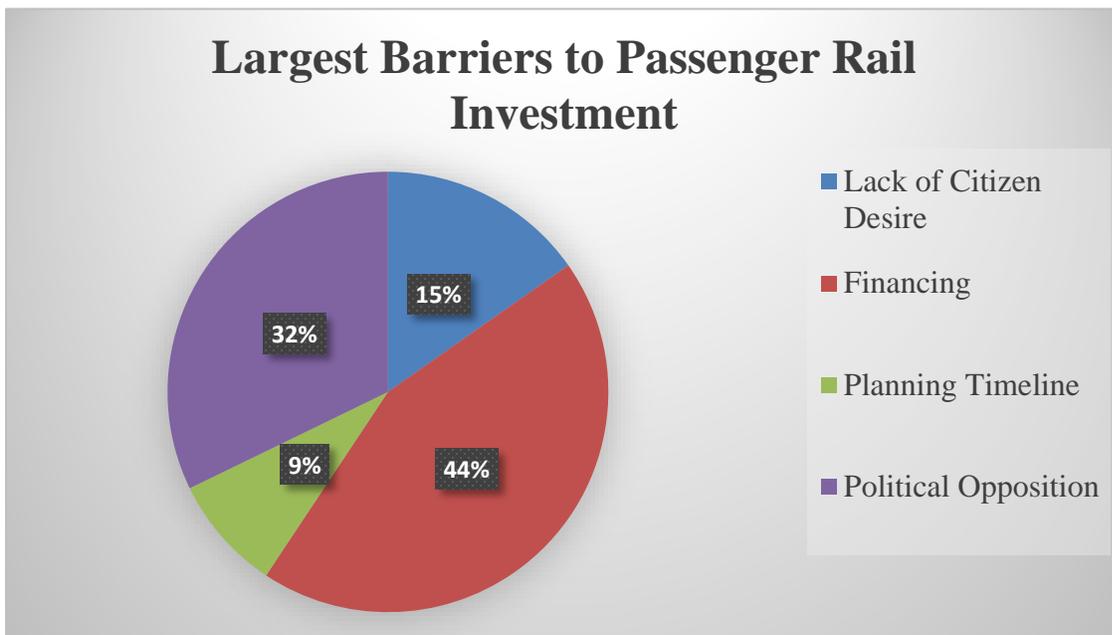
Analysis:

As the respondents answers and literature review reflect, there is no universal method to gauge the economic benefits passenger rail has. This indicates that more evidence and models should be developed to fully assess and comprehend the economic benefits of passenger rail. According to the transportation professionals, economic potential is not considered when planning, developing and selecting passenger rail projects. This means the economic opportunities are not understood and/or being assessed properly. It is important for advocates to assess the economic benefits properly to receive proper funding and investments. This can be accomplished if an economic model is developed to assess benefits of passenger rail.

4) Research Topic: Identifying the biggest barriers to development of adequate passenger rail service

44% of respondents indicated that financing was the largest barrier to passenger rail investment.

See the visual shown below:



Biggest barriers to developing adequate passenger rail services of all types.

89% of respondents indicated that they feel innovative types of financing options should be explored because it would be beneficial for increasing/improving investments in passenger rail.

Analysis:

It is no surprise that the respondents concluded that financing and political opposition serve as the largest barriers to passenger rail investment. Passenger rail has been well underfunded. Even a review of the literature demonstrated how passenger rail and public transit is underfunded. By 2017, it is projected that there will be a \$66 billion deficit to maintain America's transportation infrastructure and \$133.9 billion deficit to improve it (American Public Transportation, 2007). The U.S.'s GDP allocation to public infrastructure is half the rate of what it was 50 years ago. To overcome these barriers, it is important for the public to influence policymakers and lawmakers. It is important to highlight that 71% of pro-transit ballot initiatives were passed in November 2015 (APTA, 2015). With the public's demand for pro-transit initiatives, politicians and Congressional leaders should invest in public transportation.

Survey Conclusion

The survey found that investments for passenger rail investments is highly needed at all levels. Financing was cited as the number one barrier to investment next to political opposition. Economic development is the most important benefit to society from passenger rail. However, 87% of respondents did not believe economic potential is factored into the systems planning, project development, and project selection for investments in passenger rail. As a result, a new forecasting model that can calculate the economic potential of passenger rail is recommended to be created. The new model would be able to calculate the various benefits and costs of passenger rail.

Interviews

A series of interviews of transportation professionals was conducted to explore the views, attitudes and perceptions of passenger rail in the industry. The series of interviews had a wide variety of professionals in the transportation industry. These interviews are meant to provide a

more in depth understanding of the current transportation status quo. These detailed insights provide strong authentic participant perspectives that can act as a cultural catalyst in the world of transportation.

The main topics in the interviews were the following:

- 1) Multi-Modal Connectivity
- 2) Passenger rail demographics
- 3) Economic development
- 4) Importance of human interaction
- 5) Passenger rail elements to success
- 6) Various forms of timesaving
- 7) Passenger rail raises property values
- 8) Passenger rail increases safety
- 9) Environmental benefits
- 10) Passenger rail obstacles

These main topics should reflect the knowledge and attitudes of the respondents. From their answers, it is apparent that passenger rail has various forms of return on investment. The impacts of passenger rail can be better understood through the integrative approach.

Methodology:

The answers from the respondents will be included using an integrative approach. Due to the ambiguous nature of open-ended questions, the answers from the respondents will be included using an integrative approach. The intent of using an integrative approach is to unify separate answers that are delivering the same message. An integrative approach is necessary to systematically synthesize the results. The hope of using the integrative method is to create synthesis and conclusions from the results.

The respondents were chosen by the research team. The research team made considerations of power, rank, geographical location and experience when selecting interview participants. Each respondent was asked the same questions to create a degree of standardization. Follow-up questions were relative based on the answers given by respondents. Names of the respondents will be withheld so the answers can be objectively accurate.

Discussion: 1) Multi-Modal Connectivity

The connectivity of passenger rail to create a multi-modal transit system increases mobility and connectivity. Connectivity and mobility enables investments to occur in a predictable way for all parties (citizens, companies, government). Reliable mobility is a boon to commerce which boosts the community health and property values. People cannot be myopic about building a transportation infrastructure that enables society to be connected. Transportation nodes should all fit together and not have one mode of transit as the only solution.

Connectivity is a critical anti-poverty measure to support all income and mobility levels. Relieving individuals of the burden of auto ownership can allow people the opportunity to upgrade their quality of life by purchasing a more expensive home or moving into a more desirable neighborhood or covering healthcare and education costs with less burden. The opportunity costs of alternative lifestyles can outweigh that of an automobile driven society if public transit's connectivity is reliable. The economic benefits presented from a connected society enable the allocation of scarce resources to be more fair and just. Also, passenger rail provides freedom to every citizen to go and do and participate in society. Quality of life improves in direct proportion to freedom of mobility. A connected and mobile region is desirable to all walks of people and types of companies. It enables more opportunities for people.

Economically, epidemiologically and environmentally, cities and regions are the best way of organizing human settlements. Rail can help to pull development in orientation around transit stops, making them more prosperous and vibrant. And it can usefully connect these cities and regions so they can further benefit from one another via tourism, business travel and goods movement. In this sense, rail is a key tool for boosting the national economy by boosting the prospects and future of our strongest assets: Our cities and regions. Passenger rail increases access to other regions and cities for both mobility-limited and choice riders. Simply having transportation choices improves the desirability of a region and attracts those looking to move.

Discussion: 2) Passenger Rail Demographics

Due to passenger rail being an impure public good, and thereby being excludable both by cost and congestion, demographics are an important indicator of the need for investments in

passenger rail. Different demographics have varying needs for passenger rail services and thus benefit differently from investments in those services.

Many times low-income individuals cannot afford to own a personal vehicle or it can be a significant burden for them to do so. As a result, they will need investment in local rail rapid transit that can get them from their homes to their place of employment reliably. They also need these services to be affordable to them, and so the investment must be made in a way that does not require the fares to be too high, thus excluding them from the public good. Perhaps buses could be used to fill this transportation gap as well.

Investment in rapid transit will also attract, and benefit users who choose to not own a personal vehicle. Demographic changes and personal choices in younger generations have resulted in growing numbers of young adults deciding not to own a personal vehicle by choice and this shift is expected to have the largest impact on demand for rail rapid transit services. Significant time has been spent researching this generational shift as they move into adulthood, including their attitudes towards public transportation. As a group they have also been spurring a larger “back to the city movement” with many young adults preferring to live in dense urban areas with more transportation options, such as walking, biking, and rapid transit (American Public Transportation Association, 2013).

According to a study conducted by the American Public Transportation Association (APTA) these new demographics are drawn to public transportation for a variety of reasons. They feel that transit allows them to work as they travel and is best for digital socializing and connecting with their community (American Public Transportation Association, 2013). It has been shown that they prefer public transportation and favor investments in rapid transit. From 2001 to 2009 the number of passenger-miles traveled per capita by 16 to 34 year-olds on public transit increased by 40% (American Public Transportation Association, 2013). With these younger generations seeming to prefer public transportation options over driving, advocates believe that this should be taken into account when making funding decisions regarding passenger rail investments (American Public Transportation Association, 2013). Investing in transit has been shown to attract these demographics to a city, which is believed to be key to adding to the vibrancy and economic health of a city (American Public Transportation Association, 2014).

Investments in commuter rail will benefit middle to high-middle income demographics who commute to central cities from suburban communities for their employment, a group that is largely made up of white collar professionals over the age of 35. Many have the choice to commute using their personal vehicle or rail, and investments in commuter rail will attract more rail riders, reducing congestion on parallel roadways. Baby boomers who are aging in place in suburban areas served by commuter rail are also producing increased demand on transportation services (American Public Transportation Association, 2013). Investments in commuter rail services will allow rail to capture more of these demographics.

Seniors and Millennials are driving transportation trends that include less driving and more reliance on passenger trains and transit. On top of that, a substantial portion of the population can't afford to drive or are physically unable to drive. Their needs are not being met by our focus on highways.

Significant demographic growth in both young adult and senior populations are happening at the same time as a demand for additional transportation options that require less attention due to mobile devices and/or cost of transportation. Rail systems enhance the desirability of urban areas and their attractiveness particularly to seniors and young people.

Studies and surveys show that nationally younger generations are postponing or declining getting drivers' licenses. Young people are moving back/into cities. The millennial generation continues to utilize passenger rail as a mode of transit. And the older generation of Baby Boomers will increasingly have difficulty driving and benefit from new choices. There are an increasing number of Baby Boomers entering retirement age, and many of them will no longer be able to drive. The rail option is essential to mobility, and freedom of movement. It is critical for these demographics to have a preferred mode of transit to encourage economic growth.

Regardless of demographics, moving people is just as economically important as moving goods.

Discussion: 3) Economic Development

The Downeaster rail corridor Boston-Portland Maine, now extended to Brunswick, Maine, has created hundreds of millions of dollars in development in smaller Maine towns along its route that had been in slow economic decline, but now are reviving because they are accessible again

via rail. The Downeaster service in Maine has connected small urban centers and rural-like lifestyles in Maine to a major city like Boston. One transit professional interviewee indicated 85% of commuters who use Downeaster are students and workers'. The Downeaster is projected to create over 17,800 jobs by 2030. Passenger rail is creating capital.

The relatively new passenger train service connecting Boston and Portland ME (with extensions east thereof) restored passenger service to a route after a fifty-year absence and the immediate and rising ridership is proof that induced demand is real. Almost any adequate route passenger service that is in place is seeing ridership gains. Through fast, frequent and dependable service, studies show agglomeration benefits associated with passenger rail linking larger cities together.

The development of businesses and residential areas are thriving because of the convenience of passenger rail. Washington DC, Boston, and Chicago show the benefits of passenger rail.

In order to boost the chances that the growing number of millions in poverty can lift themselves out of it, low-income citizens deserve more access to lower-cost mobility choices such as rail.

Passenger rail is one of the largest anti-poverty investments that can be made. Relieving individuals of the burden of auto ownership allows them to buy a more expensive home perhaps in a more desirable neighborhood or cover health care or education costs.

Rail jobs are good paying, non-exportable jobs. Rebuilding the United States industrial base by developing a healthy rail construction and equipment supply industry would lead to more economic development.

Rail Oriented Development projects should be looked at as a means to foster economic development. Trains have been shown to be a catalyst that makes development possible and this would bring in new tax revenue that would help support the trains.

Economic impact is a critical component to the health of a transportation corridor and region. It also should be included because it could open up more funding options via value capture.

Discussion: 4) Importance of human interaction

Simply more human interaction with a variety/diversity of person(s) from different cultures create a more educated and connected society. For example, the elderly, young, and mobile

impaired individuals benefit from a connected society by creating more autonomy across the social spectrum which enables more productive age groups (18 – 65 year olds) to continue in commerce.

More human interaction among a variety of folks from different walks of life create a better more connected society. Passenger trips also mean humans are walking and actively participating in the built environment - health reasons and more opportunities for commerce to occur.

Discussion: 5) Passenger Rail Elements of Success

As frequency, reliability, punctuality (on-time performance) and speed increase, more people choose the convenience of train travel. Empirical evidence within the United States, such as Capitol, Cascade, Empire, Hiawatha and LOSSAN corridors, show clearly there is a substantial increase in the number of people using trains demonstrating latent demand for train travel.

This interviewee pointed out the “Health Line” in Cleveland connected places like Tower City downtown to Case Western Reserve University and the Cleveland Clinic (University Circle). The density in Cleveland was right. This Health line had good lighting, pedestrian access, and bicycle access, signage and walking access. According to the interviewee, 62% of passengers went to work and 23% of passengers went to school.

Discussion: 6) Various Forms of Timesaving

Human productivity increases especially on longer trips as commerce can be conducted while riding. For the single business traveler, traveling by rail can be a huge cost savings based on destination and travel time available.

The interstate highway system was originally evaluated on the narrow basis of travel time savings. But the interstate highway system fundamentally altered the national economy allowing more commerce to flow among regions of the countries stimulating economic activity and allowing GDP to grow exponentially. High-speed rail and commuter rail will alter how people travel freeing airlines to serve long haul markets allowing trains to serve the less than 500-mile markets.

There are many benefits either not quantifiable (e.g., air quality) or not economically measurable (converting unproductive time driving into productive time riding a train reading, working on a laptop, talking, or, yes, just sleeping). If the decision was made to count all of these "hard dollar" and "soft dollar" items rail passenger would be a winner "hands down" in modal selection.

Discussion: 7) Passenger Rail Raises Property Values

Land costs and values of homes near the station increase with the development of passenger use of public transport and rail links. Just like an interchange, stations can spur economic growth when combined with land use policies that encourage station-oriented development.

Passenger rail has been proven to have the ability to revitalize communities through development, both residential and commercial. Transportation investment is essential to raise underdeveloped areas to where they can be self-sustaining.

Federal Government programs should reward projects and systems that use value capture techniques to finance themselves. Doing so would motivate and cause localities to adopt development policies that maximize the benefits of a project.

Discussion: 8) Passenger Rail Increases Safety

More users of public transport create a safer overall transport system. Rail should be available to more people as an option so we can travel more safely if we so choose. Train travel is the safest form of transportation on earth, especially high-speed rail on dedicated right-of-way free from freight railroad congestion and associated risks.

Discussion: 9) Environmental Benefits

The reduction of pollution, lower individual costs of transportation, convenience of time available to travel, reduced fuel demands from overseas sources, and improved living conditions with cleaner environment are clear benefits of passenger rail. Passenger rail construction and operation leaves a light footprint on land. It is one of the most environmentally-friendly methods of transit. Plus, the infrastructure of rail and multi-passenger transportation units are long lasting, very cost effective and can also provide routes for other freight, mail, express and food delivery as needed even in an emergency weather related situation.

Discussion: 10) Passenger Rail Obstacles

Financing options and a steady funding stream are the biggest barriers to passenger rail. Finding ways to create private investment with an adequate return on that investment should become a more important tool in the toolbox. Since grants are becoming increasingly difficult to obtain, the provision of more public-backed loans, loan guarantees and tax credits based on strict

criteria should be considered to engage the private sector in freeing up capital and operating support. Tax credits are probably something that needs to be given greater consideration since railroads are the only mode of transportation which owns and maintains its own right of way. This can be a great opportunity for them as governmental grants become more difficult to obtain. Tax credits may be a way to unlock rights of way and adjacent real estate as resources for capital generation and operating support.

Public private partnerships need to be developed as an alternative to tax-dependent financing for rail projects and equipment purchases. This can be a way to create financing and a steady funding source.

Partisan politics need to be eliminated or at least minimized in talks about passenger rail. The facts show passenger rail has a big net benefit. Transit-pro initiative ballots can be used as an indicator to show the high demand for passenger rail. The benefits of leverage and stability of government finance backed by the faith and individual commitment of citizens should be turned into a financing instrument.

Conclusion:

Development can't happen alone or have one individual element. Success has to come from a good a market, trip time, travel demand, and commitment from the political structure and business community. Passenger rail needs the right equipment, level of service and has to be responsive to the market.

It is important to create a multi-modal transit system to ensure economic growth and mobility. Passenger rail provides economic development. The whole area becomes more attractive. People have a better life style, jobs, and accessibility to places and activities. Transit is an economic engine. The process to create/develop passenger rail has become politicized unnecessarily. There needs to be more done to fund passenger rail projects. Businesses should be included in the planning process to get passenger rail.

Passenger rail creates a realm of connectivity. People can live one place and work in another. Longer distances need investments. As do shorter commuter corridors. Connectivity doesn't happen if there is only one way in and one way out. Land use and transportation should work together to create connections.

A Recommendation to transportation planners:

Cost-Benefit Analysis:

As the evaluation of literature review determined, there is no universal evaluative framework to determine what types of investments have the most benefits. Transportation planners need to develop an analysis method that better demonstrates the benefits of passenger rail to decision makers. The FAST Act was a critical step for America's entire infrastructure and specifically, passenger rail. The FAST Act improves passenger rail infrastructure and safety programs, reduces costs, leverages private sector resources, creates greater accountability and transparency for Amtrak, and accelerates project delivery (Fast Act, 2016). As the FAST Act details, project selection is based on the principles of a cost-benefit analysis. As a result, it is important for transportation industry leaders to calculate the costs and benefits when applying for funding or project selection.

With the various impacts of passenger rail investments broken down into two distinct categories, a cost-benefits analysis is necessary to analyze proposed passenger rail investments. Any time a large investment is going to be made, there are questions and discussions regarding the investment's costs and expected benefits. In many business settings these communications are used to determine whether an investment should or should not be made. If it cannot be shown that the benefits will outweigh the costs, than the investment may be scrapped for an investment that may provide a better return on their investment dollars. Such a determination is useful for ensuring that an entity is spending its available resources in the best way possible. But if the evaluation does not include all the elements truly impacting passenger rail's benefits, wrong decisions could be made.

Because of this, a more detailed analysis is often performed and is one of the most common tools used when making business decisions. This analysis is known as a Cost-Benefit Analysis (CBA) or alternatively a Benefit-Cost Analysis (BCA). The purpose of the cost-benefit analysis is to determine and evaluate all of the potential costs and any potential revenues that may be generated from the completion of the project. Such an analysis will show the financial feasibility of a project and is often used to evaluate one project against another in order to determine the best

use of limited funds (Transit Cooperative Research Program, 2002). As has been shown, often significant benefits are not adequately included in existing models. Therefore, cost / benefit analyses models need to be upgraded to assure that all benefits are adequately represented.

In addition, analysts who are conducting a cost-benefit analysis should build varying models to quantify in dollar terms intangible costs and benefits of the project. A cost-benefit analysis often includes the opportunity cost of the investment as well (Transit Cooperative Research Program, 2002). This approach is often used to determine the strengths and weaknesses of a specific project. Unfortunately, this same type of analysis is not always performed for large infrastructure investments made by the public sector. However, attempts are being made to push for the use of these types of analyses by the public sector when making decisions on where to invest scarce taxpayer resources. One area that has had significant research on this topic is investments in passenger rail. Around the world researchers have spent significant time attempting to determine the economic impacts of passenger rail investments. This research has been performed to detail the various costs and benefits of passenger rail projects. Not surprisingly, there are many different opinions about the costs and benefits of passenger rail and on whether further investments in passenger rail should or should not be made.

While, much of this research indicates, and agrees, that investment in passenger rail has significant economic impacts, the research varies on the types and degrees of these economic impacts. The reasoning behind this disagreement is largely due to the ways in which the economic impact of passenger rail investment is measured. The most commonly used method for determining the value of a passenger rail project is through a cost-benefit analysis. However, while this method is the most commonly used, it takes many different form factors based on who is performing the analysis. There is largely no “standard” cost-benefit calculation for passenger rail investments and there are arguments about whether this type of analysis fully encompasses all of the costs and benefits of investment in passenger rail, and whether other factors should be included or used to supplement the analysis.

Much of the literature currently available focuses on the different economic impacts that result from passenger rail investments, rather than an all-encompassing look at the entire cost-benefit analysis. For example, the sole focus of a research project may be on the impacts of a

specific passenger rail investment on surrounding property values. Another research project may look solely at a passenger rail investment's impacts on congestion/pollution. Such examples indicate that research has been conducted for the numerous types of economic impacts that may occur as a result of passenger rail investments. In fact, many studies have looked at the same factors and often found different results. Some studies find that the benefits are not as significant as a different study found, or that unintended costs outweighed the perceived benefits. Due to the often ambiguous nature of the impacts being studied, the variations in the results are often caused by differing methodologies for not only quantifying the costs and benefits but also because it is difficult to isolate the economic impacts directly attributable to the passenger rail investment. Also, because many of the benefits are not directly quantifiable it is up to each analyst to attempt to convert benefits into a dollar value and provide the methodology behind their result.

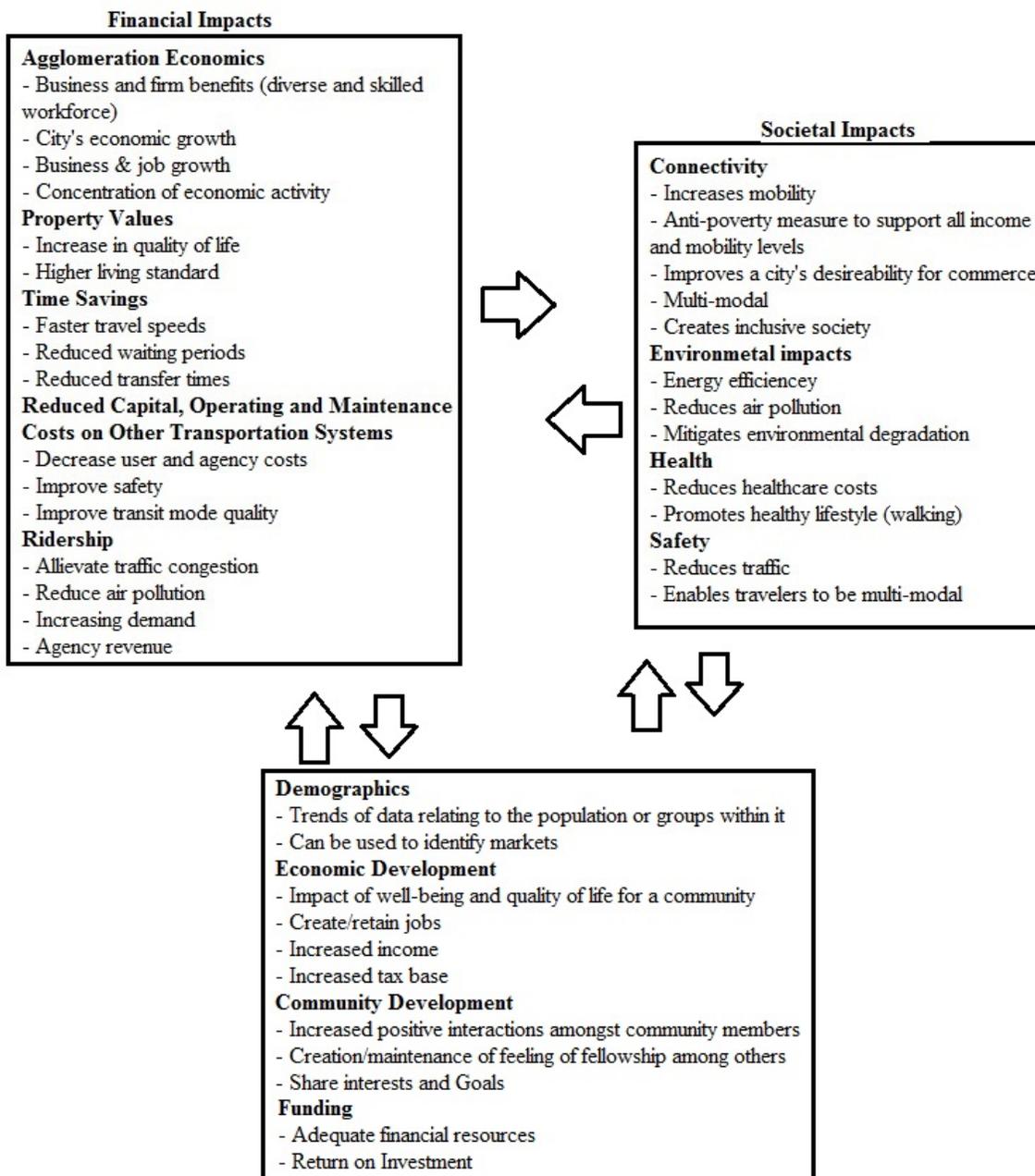
Besides the differing methods for calculating the costs and benefits, there is also disagreement on what can be considered a cost or a benefit or when certain costs and benefits should or should not be included and in what cases. These disagreements lead to dramatically different calculations for the return on investment of a passenger rail projects, even when the same project is evaluated by different parties. At times, these variations can also be attributed to who performed the research or who commissioned the research. Institutional biases often seem to permeate the cost-benefit analyses, both in what should be included and the methodology for calculating the costs and benefits. For example, the "dollar value" of a benefit that had to be quantified (i.e. reduced pollution) is often disputed by an opposing party as being overstated. Such biases, real or perceived, can negatively affect the legitimacy of the cost-benefit analysis for a project.

A review of the literature on the topic has shown a significant number of ways to determine the return on investment for a passenger rail project. Many of these factors are not immediately quantifiable or there is not one universally accepted way in determining a numeric value for certain factors. The ambiguous nature and variations in calculations can cast doubt against spending on passenger rail projects in the U.S. To reduce this doubt the public sector should move towards a more standardized cost-benefit analysis that can be applied to all passenger rail investments in the U.S. This standardization should also include an agreed upon methodology for converting into dollar terms factors that are not immediately quantifiable, such as congestion or pollution

reduction. Such standardizations will go a long way in adding to the reliability and legitimacy of the cost-benefit analyses performed and encourage more public agencies to use the practice when evaluating passenger rail investments.

The cost-benefit analysis is not without its detractors. One of the main arguments against the use of the cost-benefit analysis in regards to passenger rail projects is that it does not, and *cannot*, measure everything of importance to decision makers (Transit Cooperative Research Program, 2002). In addition, the distribution of benefits may matter as much, or more, than the total outcome of the cost benefit analysis, such as the improved mobility of low-income individuals versus aggregate time-savings (Transit Cooperative Research Program, 2002). Also, another way to evaluate benefit/success is to have a strong review done of all passenger rail investment in the US since nothing is more powerful than real examples of success in operation nationally.

Figure 1. An Integrative Framework to assess the impacts of Passenger Rail Investment



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