Benefit Cost Analysis Methodology

At the request of the City of Wichita, the Center for Economic Development and Business Research, part of the W. Frank Barton School of Business at Wichita State University, has completed the following benefit cost analysis. The purpose of this analysis was to determine the possible benefit cost ratios of proposed transit and complete street improvements around the expansions of the University's Innovation Campus.

The cost benefit analysis is based on the difference between two scenarios. The baseline projections are estimated with the expansion to the University and without improvements to the existing transit system and complete streets around the University. The projections were then re-estimated to include the proposed improvements the transit system and complete streets around the University. The difference between these two scenarios is the basis for the estimated benefits of the improvements.

The input data for the cost benefit analysis primarily came from three sources.[1] Wichita Area Metropolitan Planning Organization Regional Travel Model (WAMPO Model) was used to determine the change in vehicle miles traveled and vehicle hours traveled as the result of improvements in the roadway and transit system. The City of Wichita – Wichita Transit provided data on the projected changes in transit vehicle miles traveled, ridership, passenger hours, passenger miles and transit costs. The City of Wichita Department of Public Works provided data on the cost of the complete street bicycle and pedestrian improvements. In addition to the input data provided, assumptions were made to estimate the overall effect of the infrastructure improvements. A detailed list of these assumptions is included in the attached spreadsheet.

The Wichita Area Metropolitan Planning Organization (WAMPO) and member jurisdictions use the WAMPO Model as a tool to forecast traffic and travel in Sedgwick County and portions of Sumner and Butler Counties. The primary purpose of the travel model is to support the metropolitan transportation plan. In addition, the model can support evaluation of proposed transportation projects, help evaluate potential impacts of proposed development projects, and support various other studies of the region, subareas, corridors, and other planning activities. The Kansas Department of Transportation makes use of the travel model to support studies related to improvements on the state highway system. The model has been calibrated to reflect a base year of 2010 and contains future year data reflecting forecast 2040 conditions.[2]

The WAMPO Model projections show real improvements in both travel time and miles traveled, as a result of the infrastructure improvements. However, the projections show very little difference between the two scenarios after 2025. This can be attributed to normalizing traffic patterns after the initial expansions. The proposed improvements will help the localized issues at the campus. Other

[1] In the preparation of this report, the Center for Economic Development and Business Research assumed that all information and data provided by others is accurate and reliable. CEDBR did not take extraordinary steps to verify or audit such information, but relied on such information and data as provided for purposes of the project.
[2] WAMPO Regional Travel Model Technical Documentation, October 23, 2014

streets will gain traffic lost on these near-campus streets, as drivers not related to the campus expansion adjust their routes. This shifting of traffic to other routes is projected to increase vehicle hours and miles over time. However, the later increases are more than offset by the initial decreases, providing significant real benefits over the 20-year analysis period.

Annual Average Reduction 2015-2035	
Daily Vehicle Hours Traveled	2,749
Daily Vehicle Miles Traveled	79,425

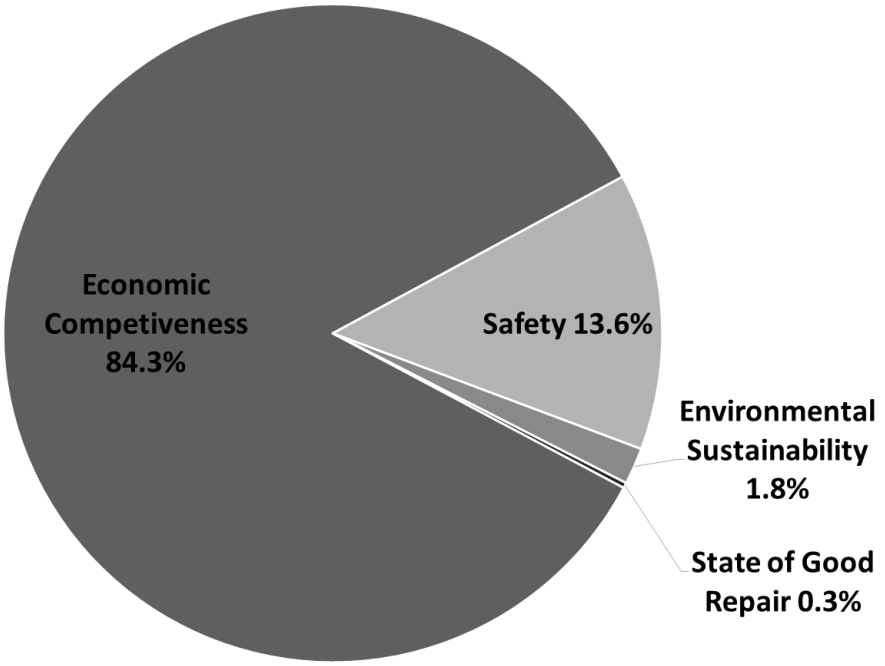
The basis of the projections in the change in transit ridership, provided by Wichita Transit, is the increased frequency and more direct service provided by the expanded public transit routes. This was adjusted for the service hours provided on each route, assuming ten rides per hour and a two percent annual growth rate. The projections further assume that the expansion of the Innovation Campus will increase ridership based on 255 annual work trips, a ten percent modal split and a 2.5 percent growth rate. These projections indicate transit ridership will increase significantly in the years following the increased levels of service on the route and continue to grow at a much slower rate in the later years of the project.

Average Annual Transit Increases 2015-2035	
Daily Ridership	1,480
Daily Passenger Miles	7,779
Daily Passenger Hours	519

The analysis results in a positive return on investment using both a three percent and seven percent discount over a 20-year period. This is based on undiscounted costs of $88.3 million over 20-years including capital improvements and operation and maintenance costs. There are undiscounted benefits of $428.8 million over 20-years. The benefit cost ratio is 5.73 discounted at three percent and 6.77 discounted at seven percent.

	3% Discount	7% Discount
Total Benefits	$391,620,557	$348,776,648
Total Costs	$68,358,221	$51,488,184
Benefit Cost Ratio	**5.73**	**6.77**

The majority of the benefits, approximately 84.3 percent, are accounted for by improvements in economic competitiveness, both travel time savings and mode shift savings. The remaining benefits are from safety improvements, state of good repair and environmental sustainability, at 13.6 percent, 0.3 percent and 1.8 percent, respectively.



Benefits

Summary of Benefits

(in millions of $)

Type of Impact	Benefit	Value @ 3% Discount	Value @ 7% Discount
Economic Competitiveness	Travel time savings	$153.00	$134.90
	Travel cost savings	$177.60	$159.41
Safety	Reduced miles traveled	$53.03	$46.93
Environment	Reduced miles traveled	$7.23	$7.05
State of Good Repair	Improved quality of roadways	$0.76	$0.49
Total Benefits		$391.62	$348.78

Economic Competitiveness

Economic competitiveness is measured in two ways, travel time savings and mode shift savings.

Travel time savings is the projected reduction in travel time to work for workers in vehicles. This reduction in travel time increases economic competitiveness by making additional time available for more productive activities. This is calculated using the difference between the vehicle hours traveled without the improvements and vehicle hours traveled with the improvements. The projections of daily regional vehicle hours traveled were adjusted for the number of working days in a year and the estimated number of workers in each vehicle. This was monetized using the inflation adjusted hourly value of travel time savings from the Department of Transportation.

Mode shift savings is the projected financial benefit of moving workers from private vehicles on to public transportation. The financial savings increases economic competitiveness by making additional dollars available for more productive activities. This is calculated using the projections of daily regional vehicle miles traveled, adjusted for the number of working days in a year. This reduction in miles traveled was monetized using personal vehicle operating expenses per mile from the U.S. Department of Transportation. The savings in the operation of personal vehicles was then reduced by the cost of using public transportation.

Safety

The improvements in safety resulting from the changes in traffic infrastructure around the campus were estimated based on the reduction in vehicle miles traveled. The Kansas Department of Transportation provides the crash rate per million vehicle miles traveled. This was used to estimate the number of potential accidents that may be prevented from reducing the number of miles traveled.

State of Good Repair

The state of good repair was estimated based on the reduction in maintenance and operating costs in the roadways to be improved. The data provided by the City of Wichita Department of Public Works was adjusted for inflation over the project period using a two percent inflation rate.

Environmental Sustainability

The environmental impact of the project was estimated based on the decrease in miles traveled by private vehicles offset by the increase in miles traveled by public transportation. The majority of the environmental impact of the project is attributed to the reduction in carbon emissions, which accounts for 76 percent of the value of emissions reduction.

Costs

Capital dollars were used as given and not adjusted for inflation. Operation and maintenance costs were adjusted for inflation over the term of the project using a two percent inflation rate.