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Measuring users' impact to support economic growth through Transportation Asset Management planning

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Abstract

The Moving Ahead for Progress in the 21st Century Act (MAP-21), was enacted by the US Congress to support the economic growth of regions. With this in mind, the state Departments of Transportation (DOT) policies for allocating construction and maintenance funds for infrastructural rehabilitation represent a mechanism to spur economic growth. Economic downturns highlight the importance of a transparent, cost-effective methodology for allocation of scarce resources that provide equity to the entire population of road users. The paper proposes adding social and economic components to the current traffic-based prioritisation method for low-volume, rural bridges in Iowa and evaluates the potential change in the distribution of funding among the state's structurally deficient bridges. The proposed method illustrates the value-added of transportation infrastructure projects to the state's agricultural economy, concluding that the addition of socioeconomic factors to the current decision-making process can increase the net benefit of the investments in low-volume bridges to the state's agricultural economy.

Keywords

social return on investment, SROI, rural bridges, asset management, decision-making, benefit cost

Disciplines

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Comments

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MEASURING USERS' IMPACT TO SUPPORT ECONOMIC GROWTH THROUGH TRANSPORTATION ASSET MANAGEMENT PLANNING

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Abstract

The Moving Ahead for Progress in the 21st Century Act (MAP-21), was enacted by the US Congress to support the economic growth of regions. With this in mind, the state departments

of transportation (DOT) policies for allocating construction and maintenance funds for infrastructural rehabilitation represent a mechanism to spur economic growth. Economic downturns highlight the importance of a transparent, cost-effective methodology for allocation of scarce resources that provide equity to the entire population of road users. The paper proposes adding social and economic components to the current traffic-based prioritization method for low-volume, rural bridges in Iowa and evaluates the potential change in the distribution of funding among the state's structurally deficient bridges. The proposed method illustrates the value-added of transportation infrastructure projects to the state's agricultural economy, concluding that the addition of socioeconomic factors to the current decision-making process can increase the net benefit of the investments in low-volume bridges to the state's agricultural economy.

Background

The effects of agriculture on regional economic growth has been a popular research topic for several decades (Harrison 1992; Wantchekon 2014; Robertson 2012; Informa 2013). Timmer (2002) studied different models that quantify the contribution of agriculture in economic development and concluded that the level of economic growth achieved is directly related to closing three specific gaps: the technology gap, the capital gap (both physical and human), and the "environment" gap. Timmer (2002) based his research on historical studies completed on 65 developing countries and found that a "highly significant positive relationship existed, from 1960 to 1985, between growth in the agricultural sector and growth in the nonagricultural sector; about 20 percent of the growth rate in agriculture was added to the exogenous growth rate in nonagricultural".

Throughout history, bridges have represented economic growth, facilitating the trading of commercial products between regions (Harrison, 1992). The symbolism remains valid today, not only for the national interstate network, but also for the rural, farm-to-market (FM) road network on which farmers must transport their products from the fields to the distribution centers. Unfortunately, transportation infrastructure policy short-sightedness has led governments to focus on the urban economy's high-volume transportation needs while unintentionally disregarding the potential impact that agricultural zones have for regional economic growth. This pattern can be seen in both developed and undeveloped countries. A case in point is the ever-worsening condition of rural road infrastructure in United States, which unnecessarily increases the cost of producing agricultural products by increasing the road users' cost (TRIP, 2014). Canada is another typical example where planners and policymakers have founded their economic policies since the late 1900's on the assumption that regions could only prosper if they became industrialized. This results in the diversion of resources from Canadian agricultural bases, which were the main source of growth in the past. Consequently, some regions have neglected or ignored opportunities for developing manufacturing spin-offs from base industries such as agriculture (Cummings, Morris and Murray, 1999).

Wantchekon (2014) provides an example of the importance of bridges in the developing world. That study detailed the social and economic regression of an African village after the collapse of a local FM bridge. The village went from having one of the largest markets and best schools in its nation to a village surrounded by poverty. The working population left the village to become moto-taxi drivers in a nearby urban center when the sale of the region's agriculture products in the village market became less lucrative due to the increased transportation costs caused by the detour. The town also lost its political voice, allowing politicians to reallocate the resources necessary to rebuild the bridge, leaving the town without the critical infrastructure it needed to rebuild its economy.

This paper's motivation is to evaluate the use of social and economic indicators as part of the rural infrastructure funding prioritization and allocation decision process and compare the result against current practices. The initial hypothesis is as follows:

Reevaluating current rural infrastructure policies and procedures to incorporate the socio-economic impact of the farm-to-market road network will better distribute available resources, so that regions that might otherwise be ignored can fairly compete for funding in a manner that promotes economic and social growth.

The state of Iowa in the United States of America will be used as a case study to test the above hypothesis. Iowa is recognized as a worldwide producer of corn and soybeans; however, recently it has been the center of controversy between farmers and infrastructure policy makers due to the continuing lack of investment, on low-volume FM bridges that left the state with 5,000 structurally deficient rural bridges (McIntosh 2013). This paper offers an alternative that supports the US Federal Highways Administration (FHWA) policy, requiring all state departments of transportation (DOT) to design and implement transportation asset management plans (TAMP). TAMPs are designed to bring together the engineering and business side of infrastructure planning, extending the life cycle of the assets in a more cost-effective way, as well as supporting regional economic growth.

Case Study Problem Statement

According to the 2013 Report Card for America's Infrastructure, over 35% of the nation's bridges were classified as structurally deficient or functionally obsolete (ASCE, 2013). The report mentions that the nation needs to remain focused on aging bridges and work to decrease the total number of deficient bridges to below 15% over the next decade. Additionally the report also states that 74% of these bridges are located in rural areas. The report goes on to recommend that the highest priority be placed on repairing or replacing large-scale bridges in urban areas to reduce congestion. Unfortunately, the report overlooks the problem in states with a strong agriculture economy, such as Iowa, and fails to recognize that these states have the highest percentages of obsolete or deficient bridges, with over 22% of the total rural bridges in deficient condition (TRIP, 2014) including some with less than 70 Average Daily Traffic (ADT) (Iowa Department of Transportation, 2014). This paper's intent is not to try to make rural bridges more competitive than high-volume bridges, increasing rural assets' share of available funds. Rather, the objective is to question current methods for prioritizing resource allocation to the existing rural road network and improve the manner in which funding is allocated from the current share of rural road improvement money. It also seeks to outline a framework for rationally prioritizing low-volume bridges based on their contribution to the state's economy rather than merely qualifying resources based on the number of vehicles that cross these structures each day.

In 2013, TRIP reported that Iowa was facing an annual transportation funding shortfall of US$215 million in order to meet the state's most critical public roadway needs. In an interview with the Iowa Department of Transportation (IADOT) bridge engineer, Scott Neubauer, he stated that with US$200 million over the next five years, 50 more state bridges will be repaired or replaced leaving more than 5,000 county bridges in poor condition (McIntosh, 2013). Polk County Engineer Kurt Baileys said, "That is not enough to keep up with inflation, let alone the cost of construction that we are seeing. We are basically flat in road use tax, and it is tough to keep the system up as costs increase every year." (McIntosh, 2013)

The 2013 Report Card also mentions that the FHWA reports that more than 30% of existing US bridges have exceeded their 50-year design lifespan. To understand Iowa's current state, it is important look at its history identifying the reasons behind the condition of the current transportation system in the rural areas. At the beginning of the 19th century, dirt roads acted as section boundaries, and traditional families lived on parcels that could be worked with family labor and horse power (Friedberger, 1989). The county road system was built based on a section of land, or one square mile (640 acres) (Informa Economics, 2013). In addition to this, between 1939 and 1940, over US$43 million in funds were allocated to the FM roads; however, some of these projects were suspended as a consequence of World War II. In 1944, the Postwar Highway Act authorized the expenditure of US$500 million per year for three years, and permission was granted to expand the Federal-Aid Secondary (FAS) road system. The FAS road system had also been expanded to include the FM system. (Johnson, 2002) Unfortunately, the interest in maintaining the FM system has not persisted through the years, and the state of Iowa changed its percentage of road-use taxes allocated to the FM system from 15% in 1949 down to 8% (Johnson, 2002) jeopardizing the sustainability of these roads.

The modernization of the agricultural industry in the last century has had an impact on the size and production of the cropland used for corn and soybeans, adding new exigencies to the transportation infrastructure in rural zones. The average acreage per farm under crop production went from 56 acres in 1954 to 276 acres in 2007. Furthermore, the number of farms has declined by 55%, but many acres have been rented to large scale farmers (Informa Economics, 2013). Additionally, the production of corn has increased from 54.7 bushels per acre in 1960 to 158.8 in 2013 (USDA, 2013) . As expressed by the Informa Economic's report to the Soy Transportation Coalition (2013), with these changes, today's farmers would benefit from a county road system that could handle properly configured 97,000-pound trucks, even if this represents the reduction of the total infrastructure system by focusing on improving the roads with higher impact, or amending the current grid from 1 square mile to 2 square miles, decreasing at the same time the liability of the state and local government (Informa Economics, 2013).

Today's sustainability challenge lies in the rapid growth of the transportation demand followed by unstable fuel prices upon which the taxes that provide the funding for public highway construction are based. However, the actual responsibility of public agencies is to consider the needs of the users for whom the infrastructure is providing essential services. Therefore, the growth and modernization in the agricultural industry is a vital interest that must be included in the decision- and policy-making processes used today for the nation's transportation infrastructure.

Scope of Work

This study uses the framework in Figure 1 to establish the needs and uses of the proposed methodology. In order to analyze policies and procedures within an organization, it is imperative to first recognize its goals and mission in order to comprehend the purpose for the asset management decision making.

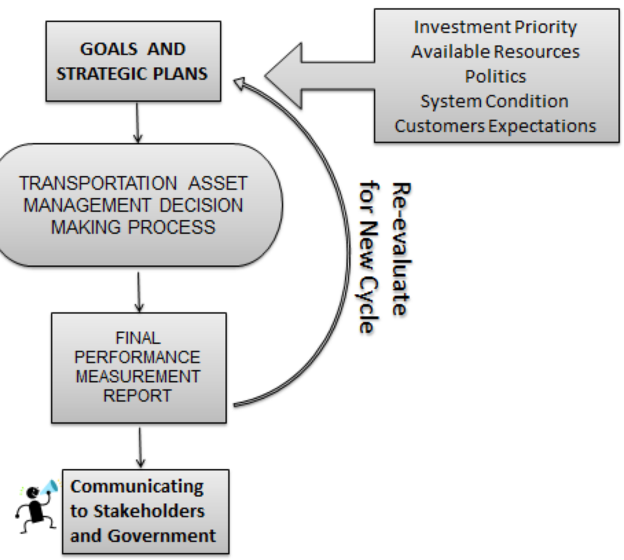

Figure 1 Summary of TAM Framework

This research methodology targets the following goals set by MAP-21, the FHWA's Transportation Asset Management (TAM) initiative, and IADOT mission:

- MAP-21's goal: To support regional economic growth (FHWA, 2012)
- TAM's goal: Deliver to an agency's customers the best value (FHWA, 2014)
- IADOT's Mission: Delivering a modern transportation system that provides pathways for the social and economic vitality of Iowa, increases safety, and maximizes the customer's satisfaction (IADOT, 2012-2013)

The above goals share a common interest in economic growth and the wellbeing of the road network's users. Furthermore, these goals must allow the organization to transparently measure its performance for self-evaluation, as well as to serve as a communication tool to taxpayers and legislators thereby helping increase the institution's credibility and support. The economy has reached a point where public institutions such as the DOT are forced to look closely at how the money is being spent, so that the resources are allocated in the most cost-effective ways, ensuring the sustainability of the transportation system.

From an economic perspective, the U.S. provides nearly half of all the world's grain exports, and Iowa ranks first among the states in production of corn and soybeans (USDA, 2013). The state and federal governments are required to support the local economy through transportation infrastructure. Therefore, this research analyzes the condition deficit of rural bridges located in agricultural zones of Iowa by studying the current prioritization methods used to allocate funds to these bridges and comparing that result to the outcome of one proposed method that includes Social Return on Investment (SROI) as an indicator.

Social Return on Investment (SROI)

SROI was developed by the SROI Network formed in 2008 in the United Kingdom with the purpose of promoting the use and development of their methodology internationally. SROI is a framework based on "generally accepted accounting principles" (GAAP) that can be used to quantify and understand the social, economic, and environmental outcomes. This methodology has been used by both governmental and nongovernmental organizations to forecast the value created if the selected projects attain their intended outcome. The outcome is a metric that can be used to compare different prospective projects and make resource allocation decisions (The SROI Network, 2012). In essence, SROI analyzes the stakeholders' interests and the social, economic, and environmental impacts generated from the allocation of resources to specific bridges. The analysis also prevents inflating the impact by identifying and isolating the users that are deceptively impacted or that, due to specific circumstances, an impact does not exist.

SROI uses financial proxies that help monetize social and environmental outcomes. This study used HDM-4, a computer software developed by the World Bank for Highway Development and Maintenance Management System. Road user cost (RUC), which involves social, economic, and environmental factors such as emissions impacts, drivers' travel time and salaries, vehicle operational cost, road condition, weather, and emissions among others (The World Bank, 2013) was adopted as the financial proxies to calculate the total impact of the SROI.

IADOT's policy for prioritizing local bridges involves using a point system where each indicator receives a score on a scale of 0 to 10. Those points are later added together to obtain a total priority score used in a descending order of importance. Parallel to this, the proposed method uses the same point system where the SROI ratings also assign a score on a 10-point scale and totaled in the same manner. These indicators are shown in Table 1. As can be seen in the table, the estimated AADT and the detour distance from the current method have been merged and now form the SROI indicator.

Table 1 Prioritization Methods Indicators

<table>
<tr><th>Weight</th><th>Current</th><th>Proposed</th><th>Weight</th></tr>
<tr><td>25%</td><td>Sufficient Rating</td><td>Sufficient Rating</td><td>25%</td></tr>
<tr><td>25%</td><td>Estimated AADT</td><td rowspan="2">SROI</td><td rowspan="2">50%</td></tr>
<tr><td>25%</td><td>By, Pass, Detour</td></tr>
<tr><td>25%</td><td>Bridge Posting</td><td>Bridge Posting</td><td>25%</td></tr>
<tr><td>100%</td><td>Total Score</td><td>Total Score</td><td>100%</td></tr>
</table>

Both the current and the proposed SROI method provide a prioritized list of bridge candidates for funding as their final output. Comparing the two lists will answer the question of whether the implementation of the SROI-based method would produce a different output than the current method of prioritization by which resources are allocated to maintain, rehabilitate, or replace structurally deficient low-volume bridges. In other words, will including the SROI parameter actually provide a higher benefit-cost ratio to the maintenance funds, helping support the local farmers and, consequently, the economy of the region? The new candidates' list also helps solve the question of what, if any, is the impact on the users of structures located in urban versus rural zones.

Table 1 shows the different indicators used by each of the two prioritization methods and how the total scores were calculated for each candidate bridge by adding the points of each of those variables with their specific weighted score.

The authors analyzed the implementation of the SROI as a key performance indicator (KPI) applied to the TAM as an integrated system. FHWA TAMP policy advocates a marked reduction in the use of the "worst-first" scenario for asset management planning. Worst-first is defined by city and county engineers waiting until a bridge must be closed before including it a given year's funding program. FHWA advocates evaluating the entire regional network as a single system while a TAMP allocates funding in a manner that optimizes overall network condition and investing in keeping good roads and bridges in good condition (FHWA 2012).

Research Methodology

There were 97 bridges on the Iowa DOT 2014 State-City Bridge Candidates List. Any highway bridge within the corporate limits, whether in whole or in part, may be submitted for consideration to the list, including bridges on FM extensions within the city limits of cities with populations less than 500 (IADOT 2, 2014).

Social Return on Investment (SROI):

The authors used the SROI framework to identify the stakeholders and their impact. SROI provides the tools for the decision-making process by requiring the user to analyze effect based on where the actual impact occurs (Figure 2 SROI Framework). Specifically, this study understands impact as to what could happen if no maintenance is done, on the premise that not enough financial resources are available to cover all agencies' liabilities.

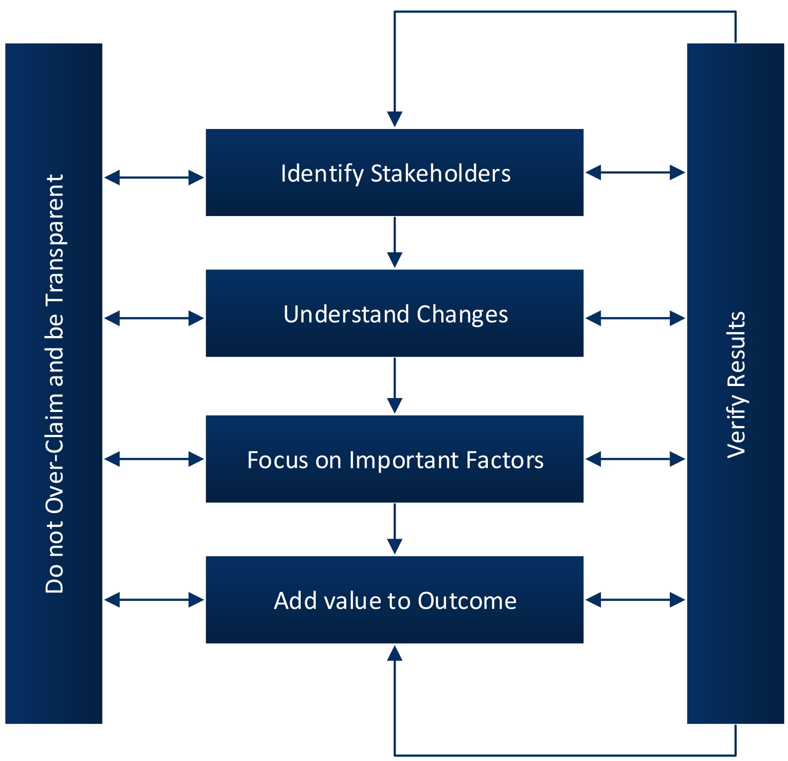

Figure 2 SROI Framework

Identifying the impact will allow state agencies to measure their performance based on the impact to stakeholders instead of basing performance on number of assets and liabilities, helping to draw accurate conclusions about the performance of the organization. This condition is especially relevant considering the presence of assets, which are still part of the agencies' inventory but are socially obsolete.

As this study focuses on the impact that the local bridges have on the agricultural industry, stakeholders were classified in four groups, recognizing that each group has a different impact based on RUC (Figure 33). As mentioned earlier, the RUC was calculated using the HDM-4 Model which, unlike others, differentiates between gravel and paved roads. Also, users were classified in two major groups based on the FHWA 13-vehicle classification (FHWA, 2011) shown in Figure 3. The first category includes vehicles with single trailers of three or more axles, as well as multiple trailers with five or more axles representing the vehicles that carry fertilizer, seed, and machinery to the farm and the ones that haul produce to market after harvest. The second category includes vehicles classified between 1 and 7, which includes motorcycles, passenger cars, 2-axle/4- and 6-tire units, buses, and 3 or more axle-single units.

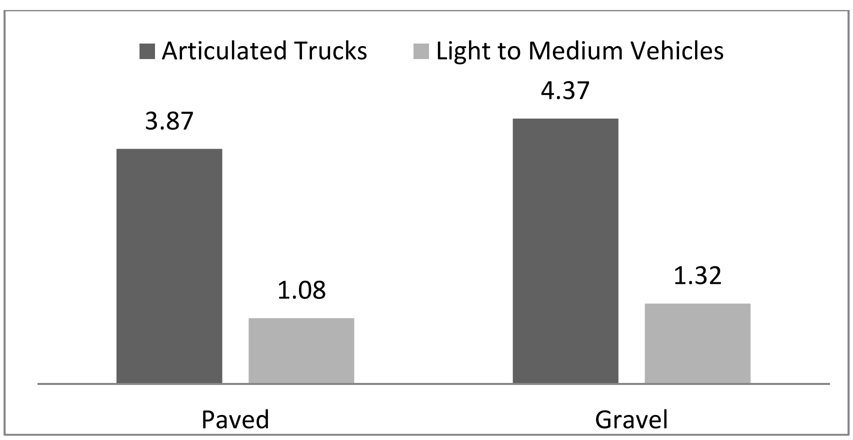

Figure 3 RUC (US$ per vehicle -mile) by type road

Computing Rural Bridge SROI and Lifecycle Costs

The present value of the total impact throughout the lifecycle of the asset is calculated based on the annual total impact (RUC) according to detour distances, the type of vehicle, and type of road using Equations 1 and 2 (Network, 2012). Finally, the SROI index is calculated based on the lifecycle cost of the asset and the present value of the total impact (Equation 3). There are three steps in calculating the SROI index:

1. Projecting into the future :

   Total Impact = $\sum_{t=1}^{(life\ span)} Impact\ at\ end\ of\ year\ 1(1 - deterioration\ rate)^{t-1}$ (1)

   Note: This equation was simplified assuming that there would be a maintenance allowance throughout the lifecycle to prevent for deterioration. Since deterioration equals zero, the total annual impact equals the annual VOC.

2. Calculating the net present value:

   Present Value (PV) = $\sum_{t=0}^{(life\ span-1)} (\frac{Impact\ at\ end\ of\ year}{(1+r)^{t+1}})$ (2)

3. Calculating the ratio

   SROI Index = $\frac{\text{Total Present value of benefits}}{\text{Value of investments}}$ (3)

One of the challenges of this research was the limited information available in the literature review and at the county engineer’s offices detailing the lifecycle cost (LCC) of small bridges. Therefore, the conceptual LCC was calculated using a top-down stochastic method based on the cost per square foot of a concrete slab, concrete T-beam, concrete I-beam, and steel bridges as shown in Table 2 (Rinita Anand, 2014).

Table 2 Bridges LCC/SF

Type of Bridge	LCC Cost/sqft
Concrete Slab bridge	US$362.65
Concrete T-beam bridge	US$354.97
Concrete I-beam bridge	US$344.55
Concrete box beam bridge	US$340.20
Steel bridge	US$328.48

The second challenge was the limited traffic count data available. IA DOT does not have the resources to conduct comprehensive traffic counts by vehicle classification on all local roads across the state; however, this information is necessary to calculate the SROI because in this study the socioeconomic benefit will primarily be from impact to heavy trucks essential to agriculture rather than lighter passenger vehicles.

Estimating Rural Bridge Traffic Characteristics

To calculate the AADT of heavy trucks and lighter vehicles at each of the candidate bridges, daily traffic data was collected at 12 locations that differentiate traffic based on the FHWA 13 vehicle classes. These traffic stations were classified by Rural Primary, Municipal Primary, Rural Secondary, and Municipal Streets. The average percentage of truck traffic and the average percentage of lighter vehicle traffic were calculated for each of the four road types as shown in Table 3 and were used along with the estimated AADT calculated by the DOT for each of the candidate's bridges.

Table 3 Actual AADT and Trucks %

	Total AADT	**% of Trucks**	**% of Lighter Vehicles**
Rural Primary			
Site 276	2979	22.69%	77.31%
Site 257	3368	21.77%	78.23%
Site 267	4209	11.20%	88.80%
Average	**3519**	**18.55%**	**81.45%**
Rural Secondary			

Site 300	260	6.47%	93.53%
Site 301	986	5.65%	94.35%
Site 307	877	6.11%	93.89%
Site 312	1077	8.06%	91.94%
Average	**800**	**6.57%**	**93.43%**
Municipal Primary			
Site 804	3085	10.35%	89.65%
Site 830	2531	8.79%	91.21%
Average	**2808**	**9.57%**	**90.43%**
Municipal Street			
Site 902	20486	0.22%	99.78%
Site 912	3535	0.79%	99.21%
Site 901	6018	0.17%	99.83%
Average	**10013**	**0.39%**	**99.61%**

Bridges Prioritization and Impact Analysis

In 2014, the Iowa DOT used its current prioritization process to identify 46 out of the 97 recommended bridges for funding in the annual program. The total number of bridges was limited to the total amount of available funding for that fiscal year. The total cost to rehabilitate the 46 bridges on the 2014 list was estimated to be at US$87,758,303. The SROI index was calculated for each of those bridges resultant on an average SROI index of 46. Then the total impact and the total life cycle cost of these 46 bridges were added to calculate the total SROI for the annual fiscal year which gives an index of 24.

In comparison, the proposed SROI-based prioritization method using the same amount of available funding reprioritized the list and recommended 66 bridges to be rehabilitated. This is an addition of 22 bridges to the budget while cutting 2 bridges from the actual 2014 list. The average SROI index of the 66 bridges was calculated at 50 and the total SROI for the total year was calculated at 28. Table 4 summarizes the results and compares the two methodologies.

Table 4 Summary of Results and Comparison of Methodologies

	Methodology	
	Current	**Proposed**
Number of Bridges Funded	46	66
Average SROI per bridge	46	50
Total Impact	US$2,111,612,173	US$2,514,868,485
Total Life Cycle Cost	US$89,577,190	US$89,433,955
Total SROI	24	28

In Table 5, the total of the 22 new bridges was also compared to the total of the 2 displaced bridges originally in the funding. Not only were 22 more bridges able to be funded, but there was also a significant increase in the total impact resulting in a higher SROI index, indicating a net improvement in the overall impact to the rural bridge network for virtually the same investment.

Table 5 Bridges added vs. Bridges displaced

	Investment	Impact	Life Cycle	SROI
New Bridges Added	US$13,670,523	US$1,032,800,880	US$13,422,713	77
Bridges Left out	US$13,556,872	US$629,544,568	US$13,565,948	46

Integrating SROI as a Key Performance Indicator in the TAM Framework

As mentioned before, the current method used to allocate the resources to the local bridges is only applied to pre-selected candidates that are nominated by local engineers. Because this filter has been pre-established, the SROI has only been considered for bridges that have already shown some kind of distress. This practice continues to follow the worst-first scenarios, diverting the agencies from taking proactive measurements that could expand the life cycle of the assets.

In order to get the best of the proposed methodology, the authors suggest an early implementation. Figure 25 presents a proposed TAM framework, identifying two stages when the SROI could be added as a key performance indicator (KPI).

Based on the prioritizing process used by IADOT, this study had to apply the SROI to the latest stage after the candidates had already been identified. However, if the final goal of the TAM is to support an infrastructure system that is sustainable and that helps allocate money to extend the lifecycle of the structures resulting in the most cost-efficient investment of the resources, then it becomes necessary to start looking at the condition, life cycle, finances, and user's impact of the entire inventory. The author is aware that to implement SROI at an earlier stage, as shown in the framework, represents a significant effort and commitment for state DOTs to maintain an updated inventory of all structures including local and county bridges. However, this ideal application promises the possibility to identify and focus on the transportation systems that truly matters to the users.

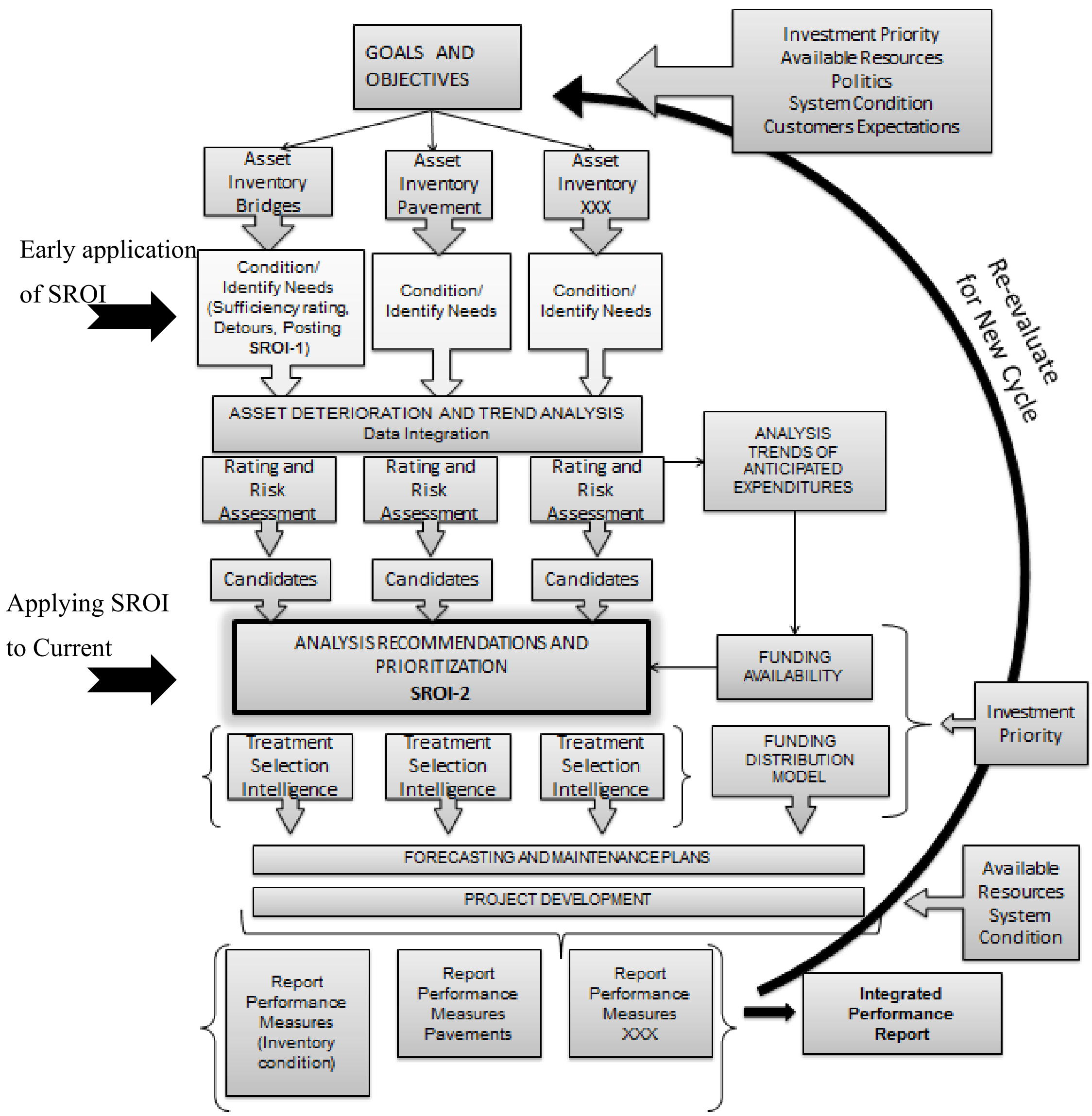

Figure 4 TAM Framework

Beyond Key Performance Indicators

In order to reliably sustain a system, the framework integrates the analysis of trends and anticipated expenditures, which come from an updated inventory, as well as the lifecycle of the assets so that the DOT can ensure that those bridges will continue receiving the required attention. In order to secure the required maintenance cost over time, the institutions must set realistic goals based on the forecasted revenue generated and a manageable inventory. This could lead to unpopular decisions that require the elimination of assets that have simply been ignored over the years. In the case of Iowa, several of these bridges in rural areas have already been closed to traffic but kept in the agencies' inventory, not only adding to the liability of the state, but also providing a false overall condition of the state's bridges that does not reflect the service offered to its stakeholders.

Although this study does not analyze the bridges with the lowest impact in the state, it could potentially help in the decision-making process, as well as in the justification and communication of these decisions to the stakeholders about the need to eliminate bridges from the state's inventory without causing a negative impact to their users. This is also explained by the evolution of the agroindustry, which has indirectly shaped the transportation system over the years, even though the actual transportation grid has not been re-evaluated or designed to keep up with today's requirements.

Conclusions

Comparing the IADOT's asset management policies with the overall condition of its bridges, reveals a disconnect between the desire to improve the DOT's responsiveness to Iowa road users' needs and its duty to support the economic growth of the region. The current policy for allocating maintenance and rehabilitation resources to high-volume urban bridges versus low-volume rural bridges includes an unintentional bias to fund urban over rural assets. Even though agriculture contributes nearly 33% of Iowa's annual economic output (Decision 2014), the majority of the bridges in structurally deficient condition are located in rural areas on FM roads, causing heavy agricultural equipment and loaded trucks with harvested crops to detour to bring equipment and materials to the farm and to transport crops to the market. The study addressed this issue by proposing the inclusion of SROI to the prioritization process for low-volume, rural bridges in Iowa to provide a way to more equitably allocate resources provided to enhance the impact on Iowa’s most important industry. The proposed methodology demonstrated that the number structurally deficient, low-volume bridges that could be rehabilitated and restored to full service with the same amount of funding could be increased by 24%. The change would reduce the percentage of structurally deficient bridges on the state’s list from 52% to 32%.

The inclusion of the SROI as a KPI was the result of analyzing stakeholder impact, which favors assets supporting high traffic volumes over those in rural areas while driving decisions that divert funding away from the maintenance of rural bridges. This research shows how fundamental asset allocation policies can inadvertently divert resources away from important sectors of a state’s economy and it demonstrates a simple method for including stakeholder impacts as an important step in asset management policy development. SROI could potentially be applied to different market sectors as a means to bring focus to the interests of their stakeholders.

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