The key role of Operations & Maintenance in the optimization of profitability on a high-speed rail project

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Introduction

- Operations and maintenance (O&M) activities have a direct impact on the overall profitability of high-speed rail projects;

- The total costs associated with O&M activities must be estimated at the very early stage of a high-speed rail project, and these costs should be projected out over a long period of time, usually 30 to 50 years.

- Cumulative annual expenses for O&M (plus renewals) may represent as much as to 2 times the initial capital cost.

- As a result, it is obviously essential to estimate O&M costs carefully, then work to optimize them for maximum efficiency of the whole system over its expected useful life.
1. Methodology

- The optimization of the overall profitability of a high-speed rail project involves:
  
  - The adjustment of a ridership & revenue model during the design phase;
  
  - the set-up of simulation tools for operations and maintenance;
  
  - then it requires several iterative modeling phases based on the adjustment of key parameters, such as:
    
    - the characteristics of the transportation supply (fares, services, levels of frequency,...) that directly influence the demand levels,
    
    - the overall route capacity and the performance of the railroad system (travel times, capacity and operational performance of the rolling stock, design speed of the infrastructure, and maintenance policy, etc...).

The overall process aims at maximizing the EBITDA (Earning before Investment, Tax, Depreciation &Amortization), also named Gross Operating Profit (Revenues – O&M Costs), taking into account the performance of the Infrastructure and the Rolling Stock.

Simply maximizing the revenues then minimizing the O&M costs, as seen in numerous studies, will lead to a non-optimized situation.
The overall process requires iterative adjustments between the key parameters to achieve an optimal economical profitability: O&M activities are central to this analysis.

- Marketing & Branding
- Socio-economics & Transport Market
- Ridership
- Quality of Service
- Operating & Maintenance Plan
- Performance of the Infrastructure
- Type of Rolling Stock
- Revenues
- O&M Costs
- Capital Costs

Overall Economical Profitability of HSR Project
The detailed breakdown of the O&M Costs shows that most of them are either linked to ridership, infrastructure design or rolling stock configuration.

<table>
<thead>
<tr>
<th>Nature of O&amp;M Costs</th>
<th>Type of O&amp;M Costs</th>
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<th>Type of O&amp;M Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Administration &amp; General Expenses</td>
<td>Fixed amount</td>
<td>V. Catering</td>
<td>Logistics &amp; Goods</td>
</tr>
<tr>
<td>Headquarter Staff</td>
<td>Fixed amount</td>
<td>Logistics &amp; Goods</td>
<td>Linked to ridership</td>
</tr>
<tr>
<td>Insurance, Provision for Claims</td>
<td>Linked to ridership</td>
<td>VI. Energy</td>
<td>Train consumption</td>
</tr>
<tr>
<td>Advertising, Promotion, Loyalty Program</td>
<td>Linked to ridership</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II. Sale Costs</td>
<td>Linked to ridership</td>
<td>VII. Infrastructure Maintenance</td>
<td>Linked to operating plan *</td>
</tr>
<tr>
<td>Distribution Cost</td>
<td></td>
<td>Ticketing machine maintenance</td>
<td>Fixed amount</td>
</tr>
<tr>
<td>Ticketing machine maintenance</td>
<td>Fixed amount</td>
<td>Web-site design &amp; maintenance</td>
<td>Fixed amount</td>
</tr>
<tr>
<td>III. Passenger Service</td>
<td>Linked to operating plan *</td>
<td>VIII. Rolling Stock Maintenance &amp; Cleaning</td>
<td>Linked to operating plan *</td>
</tr>
<tr>
<td>On-board Staff</td>
<td>Linked to operating plan *</td>
<td>Staff, Spare parts, Equipment &amp; Tools</td>
<td>Linked to operating plan *</td>
</tr>
<tr>
<td>Operating Staff at stations</td>
<td>Linked to operating plan *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger Information Service</td>
<td>Fixed amount</td>
<td>IX. Stations Maintenance &amp; Cleaning</td>
<td>Linked to ridership</td>
</tr>
<tr>
<td>IV. Operating Control Center</td>
<td>Fixed amount</td>
<td>Staff, Spare parts, Equipment, Tools &amp; Utilities</td>
<td>Linked to ridership</td>
</tr>
</tbody>
</table>

*The operating plan is the result of the optimization of the ridership, infrastructure performance and rolling stock configuration*
2. Consequently, it is essential to involve the Operator early in the process

- The early involvement of the Operator in an high-speed rail passenger service increases the opportunity for project success...

- ... as operators know how to incorporate operating & maintenance efficiencies into the system, and know best how to reduce project risk

  - The Operator understands best how to design and integrate the various elements of the system (ridership, performance of the infrastructure, rolling stock type and configuration, schedule/efficient operations plan, maintenance processes, etc.)

  - The Operator will then have a stake in the system, knowing that it will be designed and built properly, and then can be efficiently operated and maintained once built

  - The Operator is experienced at identifying and addressing operational, technical and commercial risks, and also at identifying other commercial opportunities;

  - Through this type of design/build involvement, an Operator can be in the position of willingness to take a share of the risk.
Early Operator Involvement  (continued)

- International experiences show that when an Operator becomes involved too late to play a meaningful role in the design of the system, the following consequences may occur:
  - Poor overall financial profitability;
  - Non optimized operating & maintenance costs;
  - Lower ridership than expected;
  - Higher infrastructure costs;
  - Integration risks and delayed completion.

An experienced Operator with proven skills of implementing railroad operations and marketing activities from scratch is required and must be involved at the very early stage of the project for optimal efficiency.
3. Selected sample studies in US intercity corridors

- The French National Railways (SNCF) proposed to develop, implement and operate new high-speed rail services in response to FRA Request for Expressions of Interest in 2009/2010 in 4 US corridors:
  - The Chicago Hub Network;
  - The St-Petersburg – Miami Corridor;
  - The Dallas Forth Worth – San Antonio Corridor;
  - And the San Francisco – San Diego Corridor.

- These studies were developed using the methodology aimed at optimizing the overall profitability of the high-speed rail projects and this work required several iterative steps to maximize the EBITDA.
Key Results

- **Chicago Hub Network**
  (2018-2050 period; $2010)
  - O&M Expenditures
    - USD $32.7 billion
  - Capital Costs
    - USD $69.4 billion
  - EBITDA
    - USD $77.2 billion
  - O&M Expenditures & EBITDA are respectively representing 47% and 111% of the capital costs.

- **St-Petersburg to Miami**
  (2018-2050 period; $2010)
  - O&M Expenditures
    - USD $6.4 billion
  - Capital Costs
    - USD $20.8 billion
  - EBITDA
    - USD $14.7 billion
  - O&M Expenditures & EBITDA are respectively representing 30% and 71% of the capital costs.
Key Results (continued)

- **Dallas Ft Worth – San Antonio** (2018-2050 period; $2010)
  - O&M Expenditures
    - USD $6.8 billion
  - Capital Costs
    - USD $14.0 billion
  - EBITDA
    - USD $29.2 billion
  - O&M Expenditures & EBITDA are respectively representing 19% and 210% of the capital costs.

- **San Francisco – San Diego** (2018-2050 period; $2010)
  - O&M Expenditures
    - USD $30.0 billion
  - Capital Costs
    - USD $38.1 billion
  - EBITDA
    - USD $39.4 billion
  - O&M Expenditures & EBITDA are respectively representing 43% and 103% of the capital costs.
Conclusion

- The ridership modeling process must be linked to the O&M model during the system design phase, and NOT be done in isolation;
- The Operator has a key role in determining optimal economical profitability of the high-speed rail project, and the best results occur when the operator is involved early in the process.

The usual sequence followed on most US HSR projects does not lead to optimal profitability

The above sequence has proven to maximize the overall HSR profitability employing an iterative process with early Operator involvement.
...Thank you for your kind attention