Benchmarking freight rail operations management systems in South Africa

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Abstract. Transport and communication services are important contributory factors to economic development and global competitiveness. In economies heavily reliant upon the export of primary commodities, the rail freight mode of transport is very important in this context. We evaluate the performance and management systems of a southern Africa based rail freight operator relative to international best practice. A comparative criterion based upon performance indices and management practices, which evaluate the resource utilization efficiencies is established and applied. This forms the basis for recommendations on best operational strategies, a management framework and decision support systems, in order to enhance resource utilization in the organisation. Specific emphasis is placed on empty wagon re-distribution management.

1. Introduction

Transport and communication services are important contributory factors to economic development and global competitiveness (Salai-i-martin 2010). Freight transportation service arises from the spatial distribution of resources, products and customers (Crainic 2000).

In the modern economy, road and rail freight are the dominant modes of transportation. The modal split of total freight moved vary widely from continent to continent. (Wiegmans et-al 2007), notes that in the EU road freight accounts for 91% of total tonne-kilometres (tonkms) moved whilst the rail freight market share is 9% and is in decline. In South Africa, the modal split currently stands at 88.8% road
freight and 11.2% rail freight (State of logistics survey 2011). In the USA, rail freight accounts for 40% of total freight moved (Wiegmans 2007).

Due to overstretched capacity, roads are fast becoming the bottleneck of supply chains. There is an urgent need to shift freight from road to rail in order to reduce logistics costs, decelerate road wear and ease road congestion (SOL 2011).

Despite the declining market share, rail freight affords significant advantages to the global economy over road freight. The advantages include reduced greenhouse gas emissions, cost competitiveness, superior safety and reduced road congestion (Giannetoni 2010). In appreciation of these advantages, many regional economic blocks are seeking effective strategies to reverse modal split trends in favour of rail freight (Wiegmans 2007). (Ferreira 1997), proved that increases in rail freight market share is a direct function of the level of service offered, principally transit times and reliability.

A company’s competitiveness depends on its ability to efficiently combine factors of production to produce target outputs. Efficiency commonly refers to how well the input resources are used. (Spychalski 2004), established that the deregulation of the US rail industry resulted in reduced freight charges, reduced head count and improved operational efficiency. Valuable lessons could be learnt and adapted from rail operators that have sustainably improved efficiency and competitiveness in the face of road freight competition.

(Menachof 2000), points out that in order to succeed in a highly competitive world, companies must provide high quality and responsive service. He further suggests that this may be achieved by measuring a company’s performance relative to what customers want and what competitors are providing.

(Yasser 2001), argues that in order to guarantee survival, organisations need to continuously benchmark their performance with the world’s best. (Geerlings 2006), suggests that benchmarking is one of the most promising ways to sustainably improve service quality, efficiency and competitiveness in the transport industry.

The American productivity and quality centre defines benchmarking as
“Benchmarking is a systematic and continuous measurement process: a process of continuously measuring and comparing an organisation’s business process against business process leaders anywhere in the world to gain information which will help the organisation improve its performance.” The three key elements of benchmarking are:

- Measuring company performance against that of best-in-class companies;
- Determining how the best-in-class achieve these performance levels;
- Using the information as the basis for your own company’s targets and strategies.

Benchmarking involves four key components: (i) identifying the best performance, (ii) setting appropriate performance indicators, (iii) understanding the reasons behind the relative success and (iv) adapting lessons learnt. The determination of what constitutes best practice, that is, the appropriate themes and related performance indicators is critically important in benchmarking practice. (Button 1993), however notes the difficulties associated with comparing quality and service levels within the transport industry.

Potential benefits of benchmarking to a company include: (1) improved strategic planning (2) objective assessment of organisational strengths and weaknesses (3) cost savings and improvements to product and business processes (4) enhanced organisational capacity to effect quality and process improvements [5].

An increasing number of companies are using benchmarking as a tool for comparing performance, continuous improvement and learning. (Ockwell 2001), identifies three focus areas for benchmarking in the rail industry as equipment utilisation, labour productivity and operational efficiency. (Dickerson 2006), identifies the ‘peer selection process’ as an important step in benchmarking projects. He emphasises that the peer group should be fairly similar.

The market share for the rail freight industry in South Africa is in decline (Ockwell 2001). The combined effect of sustained fuel price increases, e-tolling and congestion, is increasing logistics costs and making roads the bottleneck of supply
chains. An urgent need arises to move freight from road to rail wherever possible. This effort compliments several initiatives by various stakeholders in SA to achieve this objective. Benchmarking is identified as a possible solution methodology.

Benchmarking against best performing rail operators positively impacts service levels and operational efficiency. The hypothesis held is that sustainable service quality improvement directly leads to improved rail industry competitiveness relative to road freight and consequent recovery of lost market share.

The following Research Questions are addressed:

1. What performance indicators are employed to evaluate resource utilisation and operational efficiency in rail freight operations?
2. Which are the best rail freight operators in terms of operational efficiency?
3. What is the relative performance of the rail freight industry in South Africa, assessed against international best practice?
4. What operating practices characterise successful rail freight operators?

2. Methodology

The primary objective of this effort is to benchmark the operational efficiency of the rail freight industry in South Africa relative to selected European rail freight operators and contribute towards development of effective strategies to improve freight rail competitiveness in South Africa. The methodology adopted is summarised below.

A key preliminary step in benchmarking is peer selection. In this project, the peer group selection process was constrained by the following realities:

- Few freight rail companies publish annual reports available to the public. The peer group selected constitutes a sample of the European rail operators that do publicise annual reports. They do not necessarily represent international best practice. European rail operators are however generally considered relatively efficient.
- American rail freight operators have recorded significantly higher operational efficiency levels, arguably offering best practice. The US rail industry is however largely deregulated and privatised. The different
operating regime renders them unsuitable for inclusion in the peer group.

- Rail freight operators that have adopted effective strategies to improve operational efficiency and regain market share.

Subject to the above highlighted constraints, ten EU rail operators were identified for inclusion in the peer group. The performance indices (PI’s) of these operators as published in year 2003 are compared with PI’s of a South African rail operator (Saro) published in year 2012. In year 2012, a significant increase in staffing levels was recorded by Saro. The underlying factors are not fully understood, but this study may help evaluate the impact of this development on productivity. The ten year gap is occasioned by the available published data, and accommodates the technological gap between developed and developing regions.

Official published operator annual reports and published data were used as data sources for the purposes of this analysis.

After identifying the peer group, the next step involved establishing benchmarking focus areas and these are (i) wagon utilisation, (ii) labour productivity and (iii) operational efficiency. These focus areas were further broken down into respective performance indicators (PI’s) commonly used in the rail industry as follows:

<table>
<thead>
<tr>
<th>Focus Area</th>
<th>Performance Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wagon Utilisation</td>
<td>- fleet size</td>
</tr>
<tr>
<td></td>
<td>- Tons/wagon</td>
</tr>
<tr>
<td></td>
<td>- Tonkms/wagon</td>
</tr>
<tr>
<td></td>
<td>- Sales/wagon</td>
</tr>
<tr>
<td>Labour Productivity</td>
<td>- Employees</td>
</tr>
<tr>
<td></td>
<td>- Tons/employee</td>
</tr>
<tr>
<td></td>
<td>- Tonkms/employee</td>
</tr>
<tr>
<td></td>
<td>- Sales/employee</td>
</tr>
<tr>
<td>Operational efficiency</td>
<td>- Revenue</td>
</tr>
<tr>
<td></td>
<td>- Tons</td>
</tr>
<tr>
<td></td>
<td>- Tonkms</td>
</tr>
</tbody>
</table>
The performance indices for all the freight rail operators under study were computed and analysed relative to each other. The best performance against each index was established.

The final step of the current work involved an attempt to identify reasons behind the relative success/failure of the South African rail operator (Saro) against each performance indicator and best performance. The outputs fed into rail industry strategies to enhance competitiveness.

3. Results and Analysis

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Railion</th>
<th>SNCF</th>
<th>Fret</th>
<th>CP</th>
<th>RCA</th>
<th>Trenitalia</th>
<th>BCargo</th>
<th>SBB</th>
<th>GreenCargo</th>
<th>VRCargo</th>
<th>RENFE</th>
<th>Saro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tons/employee</td>
<td>11,292</td>
<td>2,894</td>
<td>9,082</td>
<td>26,565</td>
<td>8,500</td>
<td>19,000</td>
<td>11,297</td>
<td>12,386</td>
<td>18,718</td>
<td>598</td>
<td>7,486</td>
<td></td>
</tr>
<tr>
<td>Mln Tonne-kms /employee</td>
<td>3.12</td>
<td>1.13</td>
<td>2.04</td>
<td>5.45</td>
<td>2.33</td>
<td>2.43</td>
<td>2.04</td>
<td>3.64</td>
<td>4.32</td>
<td>0.23</td>
<td>4.28</td>
<td></td>
</tr>
<tr>
<td>Revenue in €/employee</td>
<td>138,541</td>
<td>43,549</td>
<td>69,531</td>
<td>252,518</td>
<td>73,457</td>
<td>111,667</td>
<td>174,056</td>
<td>193,466</td>
<td>151,461</td>
<td>6,651</td>
<td>103,009</td>
<td></td>
</tr>
<tr>
<td>Employees/railcar</td>
<td>0.22</td>
<td>0.37</td>
<td>0.29</td>
<td>0.19</td>
<td>0.20</td>
<td>0.20</td>
<td>0.25</td>
<td>0.41</td>
<td>0.21</td>
<td>2.61</td>
<td>0.383</td>
<td></td>
</tr>
<tr>
<td>Revenue/ton</td>
<td>12</td>
<td>15</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>6</td>
<td>15</td>
<td>16</td>
<td>8</td>
<td>11</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Revenue/tone-km</td>
<td>0.04</td>
<td>0.04</td>
<td>0.03</td>
<td>0.05</td>
<td>0.03</td>
<td>0.05</td>
<td>0.09</td>
<td>0.05</td>
<td>0.04</td>
<td>0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue/railcar</td>
<td>30,116</td>
<td>15,911</td>
<td>20,337</td>
<td>48,621</td>
<td>14,551</td>
<td>22,443</td>
<td>43,726</td>
<td>69,936</td>
<td>31,084</td>
<td>17,347</td>
<td>39,438</td>
<td></td>
</tr>
<tr>
<td>Tons/railcar</td>
<td>2,455</td>
<td>1,144</td>
<td>2,656</td>
<td>5,115</td>
<td>1,684</td>
<td>3,819</td>
<td>2,838</td>
<td>5,118</td>
<td>3,841</td>
<td>1,560</td>
<td>2,866</td>
<td></td>
</tr>
<tr>
<td>Tonkms/railcar</td>
<td>677,328</td>
<td>446,952</td>
<td>597,258</td>
<td>1,048,621</td>
<td>461,224</td>
<td>488,578</td>
<td>512,688</td>
<td>1,505,882</td>
<td>887,231</td>
<td>611,637</td>
<td>1,638,662</td>
<td></td>
</tr>
</tbody>
</table>
Table 1 illustrates the PI’s abstracted and calculated from the various sources. The first PI, tonness/employee, evaluates employee productivity in terms of total tonnage contribution per employee. Saro ranks ninth of the eleven operators evaluated. With a productivity level of 7486 tonnes/employee, productivity in SA’s rail industry approximates 28% of the most productive operator, RCA. The difference possibly arises from varying degrees of automation, technology, work ethics and staffing levels within the respective organizations. The comparison however shows great potential for productivity improvements in SA subject to strategic interventions.

The second PI is tonne-km/employee. At 4.28 million tonne-km/employee, Saro ranks third best within the peer group. A significant contributory factor to this improvement from the first PI above is the relatively larger rail network size in SA and mineral commodities typically move large distances to the ports.

In terms of revenue/employee, Saro ranks seventh within the peer group. At €79 000/employee, the yield is 31% of the best performing operator, RCA, which registered a yield of €252 000/employee. There is significant scope for productivity and revenue generation increase. Possible areas for attention include tariff regime, employee head count and overall employee productivity.

In terms of employees/wagon, at 0.383, Saro ranks second in the cohort. This is indicative of a relatively large number of employees per unit asset. This possibly indicates relatively low levels of capitalisation or alternatively relative over-staffing. At 0.19, the best operator, RCA, is twice as efficient.

In terms of revenue/tonne, Saro recorded €10.6/ton and ranked sixth in the peer group. The PI suggests competitive tariffs relative to EU standards and practices.

In terms of revenue/wagon, Saro recorded €30 336 and again ranked sixth best in the peer group. With respect to rolling stock, this position is indicative of competitive asset utilisation and return on capital relative to EU standards.

In terms of tons/wagon, a measure of wagon capacity utilization, Saro registered 2866 tons/wagon and ranked third best in the peer group. A commendable position
which could possibly be due to the relatively large proportion of bulky mineral commodities conveyed within the South African network.

In terms of tonne-km/wagon, Saro registered 1638662tonkm and ranked the best in peer group. The geographical size of SA and associated network size is considered contributory in this PI.

4. Conclusion

Benchmarked against EU freight rail operators, the South African rail industry reflects mixed performance. It registers superior asset utilization levels, specifically wagons especially when distance is integrated. Return on capital for wagons is also quite favorable.

The South African rail industry however ranks quite unsatisfactorily with respect to employee productivity and related performance indicators. Strategies to enhance employee productivity are urgently required. Productivity improvements would create additional capacity to absorb additional market share.

References


