Long-Distance Rail Freight in Australia: Towards 2000-The Role of Capital Investment

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Abstract:

The movement of general freight over distances longer than around 500 kilometres is commonly regarded as the type of business which an efficient and customer driven rail system should be able to handle profitably. Such freight movements are also considered suited to rail from a national economic perspective. This is mainly due to the additional externalities imposed by road based heavy vehicles, particularly in terms of carbon dioxide emissions and accidents.

This paper is divided in two main sections. The first examines the role which capital investment can play in improving the efficiency and effectiveness of long-distance rail freight in Australia. The main areas of track upgrading, rollingstock requirements, modernisation of terminals, and information systems development, are discussed in the context of future capital requirements.

The second part of the paper develops the theme of an appropriate appraisal methodology to be adopted for rail capital investment form a national perspective. The main issues identified and discussed include: the unique position of rail systems as owners of the 'right-of-way'; quantification of benefits (eg 'double-counting' dangers, interactions between inter-related projects; elasticities of demand with respect to transit times, reliability and price); economic vs. financial evaluation; and consistency with road appraisal techniques.

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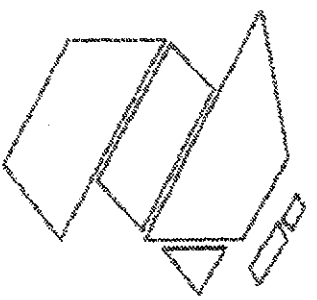

1. INTRODUCTION

The ability of rail freight transport in Australia to become profitable and to generate sufficient capital to replace its infrastructure and rollingstock to remain competitive hinges, to large degree, on substantial improvements to quality and much more productive use of resources than now occurs. The creation of a "greenfields" National Rail Corporation provides a major opportunity to create the necessary environment. The link between National Rail's capital investment funds and work practice changes through its Enterprise Agreement has provided a substantial incentive for radical change to management practices applying to interstate rail transport.

In 1992, the Federal Government announced significant new investment in rail in its "One Nation" economic statement. The implications of that funding are discussed in Ferreira (1992). The "One Nation" focus is on track related investment, which accounts for all but $20 million of the original $454 million to be spent on interstate rail. National Rail's own capital program, involving substantial investment in new rolling stock, control systems and terminal facilities, provides the transportation-related investment necessary to achieve the company's objectives. On current estimates, the "One Nation" program represents approximately one third of National Rail's total capital program during the next five years.

The total replacement value of the asset base to be used by National Rail is estimated to be between $6-8 billion. While the significant amount of the capital which is to be invested through National Rail will enable the company to achieve its charter of providing rail freight services on a commercial basis, it can only go some of the way to enhancing the national rail infrastructure. The first part of this paper examines the role which capital investment will play in improving the efficiency and effectiveness of long distance rail freight in Australia. The focus of National Rail's investment program is discussed in the context of National Rail's financial structure.

This is followed by discussion of what the authors consider to be the main issues in rail investment appraisal from a practitioner's perspective. Those issues include:

- the unique positioning of rail systems as owners of the 'right of way';
- quantification of benefits, for example double-counting' dangers, interaction between inter-related projects;
- elasticities of demand with respect to transit times, reliability and price;
- economic vs financial evaluations; and
- consistency with road appraisal techniques.

2. INVESTMENT IN THE NATIONAL RAIL NETWORK

National Rail is sourcing its investment in two principal ways:

- the "One Nation" infrastructure projects; and

- improvements to its transport operations from its own sources, which are primarily equity and retained earnings.

National Rail will not have access to commercial borrowings until such time as it is able to demonstrate an adequate track record of profitability in its business. Initial investment from the company's sources of finance will focus on short pay-back, high return projects. The company's early investment priorities are designed to address:

- Commissioning of assets which National Rail will be taking over to conduct its interstate freight business, particularly locomotives and wagons.
- A program of new rollingstock to meet business requirements and provide for more efficient operation.
- Information, communications, tracking and control systems to provide for network-wide management of the business and operations by the company.
- A limited amount of investment to reinforce National Rail's productivity growth and to underpin work practice changes.

The investments envisaged by National Rail will include:

- Major upgrading of Brisbane, Sydney and Melbourne interstate freight terminals, to radically change the way in which freight is handled in these locations. The upgrades will re-equip the terminals for longer trains and chassis pool operation.
- Construction of low-tare container wagons, and wagons to specially meet business requirements such as for steel traffic, and either overhaul or construction of new locomotives.
- A major operations communications capability including terrestrial and satellite links, data and voice radio and global positioning using satellite technology.
- Information technology geared to National Rail's work team environment to provide operations, personnel and financial information.

The 'One Nation" infrastructure program provides for:

- extension of crossing loops in the Sydney-Brisbane corridor;
- clearance for double stacked containers between Adelaide and Perth;
- grade, bridge and loop improvements, and replacement of rail;
- conversion of the Melbourne-Adelaide corridor to standard gauge; and
- improvement of freight train access through the Sydney area.

Figure 1 shows the breakup of this program.

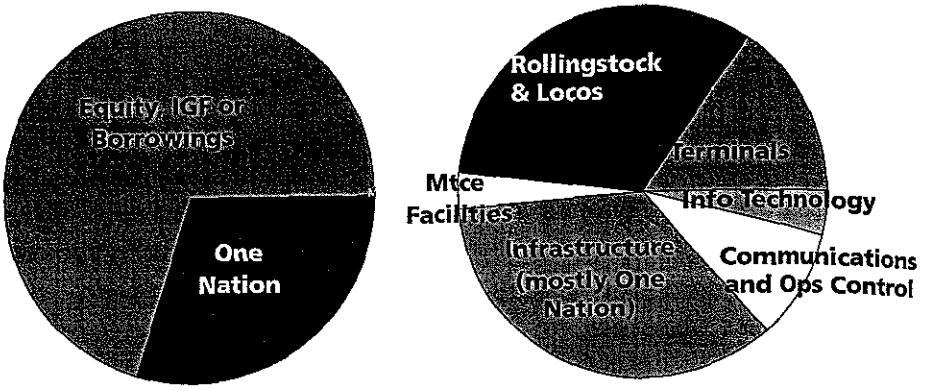

Figure 1. National Rail 5 Year Capital Investment Sources and Purposes

This figure shows clearly National Rail's focus on improving its transportation business. There is a direct parallel between the investments which National Rail is making and the investments which a prudent road transport operator (National Rail's principal competitor) would make in enhancing his business. The road transport operator, however, uses publicly-provided road infrastructure.

The value of the infrastructure asset is by far the most significant component of National Rail's asset base. With a revenue base of only some $500 million, coupled with the inherently competitive and a low return market in which it operates, National Rail will not earn a commercial rate of return on the full written down replacement value of its infrastructure asset base. It was never intended to and the Shareholder's Agreement reflects this. Accordingly, accounting standards will bring the infrastructure valuation in line with its earning potential.

National Rail is required to meet full commercial accounting requirements for all of the assets under its control. It is required, under its charter, to bring the assets related to both its transportation business (equivalent to its road transport competitor) and the infrastructure which it uses to account on a fully commercial basis. This differs from the road transport competitor in that, although the road transport operator operates on a commercial basis, the road system as such does not form part of his balance sheet.

The cost of renewing National Rail's asset base on an ongoing basis is estimated at approximately $120 million per annum. A capital program of this order is within the capability of the company so long as it can achieve and sustain its financial targets. However, except where substitution is possible, this level of re-investment would not provide for the construction of new alignments, or major upgrading of speeds and axle loads in the way which is possible with the publicly funded road system.

In effect, National Rail should be able to sustain itself in the medium term on a commercial basis, delivering modest commercial returns to Shareholders. It will not, however, have any substantial capability to develop beyond the fixed infrastructure inherited from the Rail Authorities. National Rail will continue to operate in the market serviced by the Rail Authorities - albeit more effectively because of its greenfields and

national advantages - but it will not open opportunities for rail and transport development beyond this. Expectations that National Rail will itself provide substantial infrastructure development - new alignments for example - are not realistic.

3. INVESTMENT APPRAISAL ISSUES

Background

Figure 2 shows the main elements which need to be considered in a comprehensive appraisal of freight rail investment. The factors which are critical in evaluating projects from an operator's perspective, and those which interest the wider community are shown separately in Figure 2.

This section deals with four main issues related to capital evaluation of freight rail projects, namely: quantification of costs and benefits; road and rail appraisal; economic and financial evaluation; and investment and profitability. Each of these main issues will now be dealt with in turn.

Quantification of Costs and Benefits

Rail's market share for a specific traffic movement can be said to be a function of the performance of rail relative to its competitors. That performance can be measured in terms of price, transit time, reliability of service delivery and other factors less amenable to quantification such as customer's perception of the image of rail. Thus:

$$MS = f(p,t,r,i) \qquad (1)$$

where MS = Rail's market share
p = relative price of rail
t = relative transit time of rail
r = relative reliability of rail
i = relative image of rail

The elasticities of demand for rail services with respect to each of these main variables will be different for different types of traffic and for different corridors. In reality each origin-destination movement has its own set of elasticities.

One of the main difficulties of estimating the benefits to be gained from a specific investment is the degree to which that investment will improve market share (or halt its decline). The shape of the relationship between market share and the elasticity of demand with respect to the variable being examined is crucial in the quantification of benefits.

For example, let a measure of transit time reliability be the percentage of origin-destination movements which arrive 'on-time' (usually taken as a specified small time difference between scheduled and actual customer delivery). If current reliability is r_1 and market share MS_1 as shown in Figure 3, then what is the benefit of an improvement in reliability to a value r_2?

In practice, constant elasticities are unlikely to hold across the range of the reliability variable if that range is significant in absolute terms. The increase in market share which will accompany an improvement in reliability from say 60 percent to 70 percent, is likely to be much smaller than a similar relative increase which will bring reliability within the range of rail's main competition for a specific traffic movement.

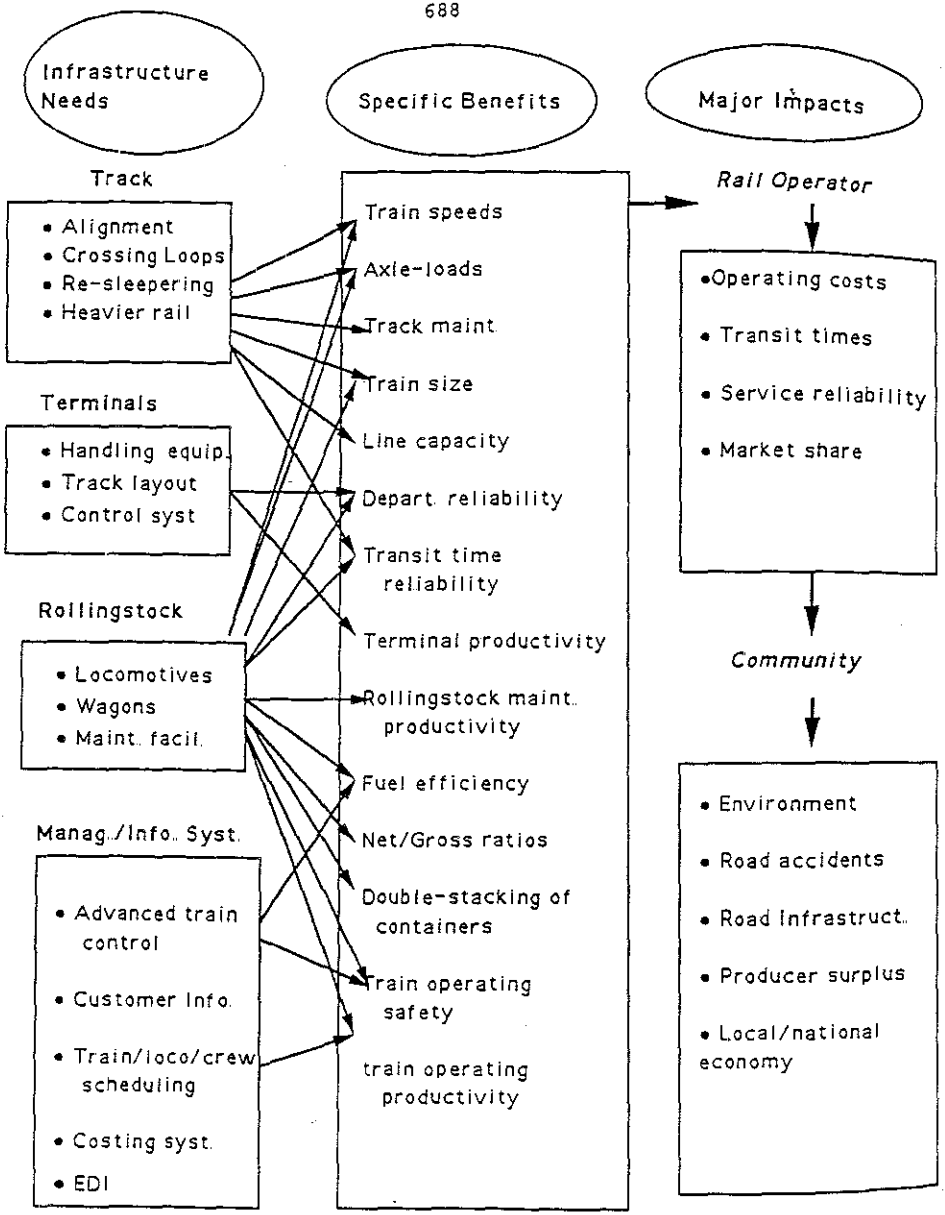

Figure 2 - Elements of freight rail investment appraisal

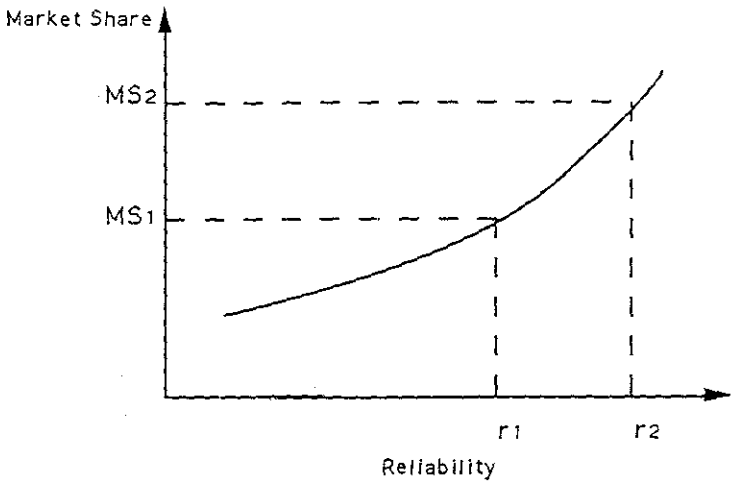

Figure 3 - Market Share and Reliability

The question of apportioning benefits from related projects needs to be carefully considered. These benefits are unlikely to be additive. In addition, there is a danger of double-counting of benefits. An example for an hypothetical corridor illustrates these points.

Rail's market share:	30%
Rail reliability of delivery:	Around 60% (ie. 60% of deliveries take place within 30 minutes of schedule)

Potential related projects which will impact on reliability:

- Track upgrading
- Terminal investment
- Locomotive and wagon purchases
- New train control system

It is unlikely that each project by itself will improve reliability to a level which will increase market share in any significant way. However, two or more projects may cause a significant shift in both reliability and market share. (Each project may bring a number of other benefits which may make the project economically viable in terms of a net present value analysis). In practice, one way to deal with the issue of associated projects is to estimate the overall benefit from the full set of related projects, and apportion this overall benefit according to the contribution made by each project. The need arises to plan for the staging of all associated projects to optimise the total benefit.

The estimate of the benefits which may results from improvements in rail's competitive position in terms of level of service attributes is particularly difficult in the absence of reliable estimates of elasticity functions. For this reason, it is useful to distinguish between those benefits which are more readily quantifiable such as operating cost savings, and market share related benefits. A sensitivity analysis should then be carried out to determine the likely effect of changing the assumptions about the less robust'

estimates. It should be noted that even those benefits which are likely to be easier to quantify, such as those based on engineering parameters may have a substantial degree of uncertainty. For example, one of the benefits of a new locomotive fleet is reduced maintenance cost. The estimation of such effects requires good historical data on maintenance costs for the existing fleet, as well as the likely future maintenance costs of the new fleet. Also required are future 'base-case costs' of not making the investment. Assuming such data are readily available it is necessary to take into account new maintenance practices and the resulting effect on workshop productivity.

Quantification of costs and benefits for the 'base-case' option also involves an analysis of the impact of not making the investment on safety. As pointed out by Hyland (1993), a full risk analysis tends to be neglected in practice.

Road and Rail Investment Appraisal

There are economic efficiency agreements for changing the way in which investment appraisal of road and rail projects is currently undertaken. State road planning agencies currently undertake a cost-benefit analysis of road projects. The major benefits of such projects are likely to be in terms of reductions in:

- road vehicle operating costs
- personal travel time
- road accidents
- congestion costs
- environmental effects

In addition, the economic benefit to a region/state may be included in the appraisal process, as discussed by Ferreira (1992a). Projects are usually ranked according to some investment decision criteria such as Net Present Value or Benefit/Cost ratio. Miller and Tsolakis (1993) put forward a model framework for the evaluation of multi-modal infrastructure provision and applied it to the Australian national highway system. It can be argued that rail track and related investment should be evaluated on the same basis as road infrastructure investment. One of the main reasons behind the formation of two public authorities responsible for the provision of rail services in Sweden, was to place road and rail on an equal investment and pricing basis, (Jansson and Cardebring, 1989).

Nilsson (1992), commenting on road and rail cost recovery in Sweden, advocates a reduction in the relative price of rail to off-set the degree to which heavy vehicles fail to recover their full social marginal cost. This 'second best' approach is akin to the provision of urban public transport subsidies as a way of reducing road vehicle congestion.

Investment decisions related to the main national rail network can only be placed on the same basis as those related to the national highway system if rail operator's responsibility for the provision of track is accounted for separately from their other functions. This distinction can be made without the need to form a separate entity responsible for rail track infrastructure. A separate track business unit, properly accounted for in terms of its costs, can be set-up to 'service' other rail operator's businesses. This practice is being progressively adopted in Australia and overseas. The major differences advocated here are that track infrastructure investment be evaluated on the same basis as road investment. This would be achieved by using the same set of investment decision criteria and taking into account environmental and national/regional economic impacts.

Economic and Financial Appraisal

Capital investment from a transport operator's perspective is restricted to the quantification of costs and benefits which impact directly onto the individual firm. An economic evaluation from the community standpoint, such as cost-benefit analysis, needs to concern itself with externalities such as environmental effects and the impacts on the national and/or local economies. It is important that major rail infrastructure projects be subjected to both financial and economic analysis. This latter type of evaluation would allow a direct comparison with road projects.

Investment and Profitability

Under strictly commercial criteria full cost recovery of both road and rail operations would be required. It is therefore necessary that for all rail investment decisions, excluding the provision of track, the usual commercial criteria be applied.

Currently most inter-State freight movements do not recover their long-term avoidable costs (ie. those costs which could be avoided in the long-run if the traffic was no longer carried by rail). Improvement in rail from an operator's perspective tends to be assessed on the basis of the degree to which the investment is able to contribute towards profitability. Depending on the type of project, that profitability might be at the traffic movement level, major corridor or the entire network. The question of investment in what are currently loss-making activities, is related to the issue of benefit quantification of inter-related projects. For example, investment in new terminals may significantly improve labour and plant productivity at the origin and destination of traffic movements. However, if such movements continue to fail the test of recovering its avoidable costs, it is necessary to determine what other strategies are needed to reverse the position. Simply stated, investments which reduce the amount of loss, should not be implemented on their own. They need to form part of a coherent programme which, as a whole, will result in a positive contribution above long-run avoidable costs. As suggested by Martland (1992), and Norley and Bray (1991), investment decisions are questionable when an operation is optimised and its contribution to fixed costs remains unacceptable

5. CONCLUSIONS

To increase market share, rail needs to change its long standing image as an unreliable service provider. Whilst technology renewal will be a key component of this new customer service focus, the 'culture' of railway operators needs to undergo significant change. The establishment of the NRC should provide a new single identity and renewed focus on customer needs.

Rail investment projects have the potential to reduce the very high road infrastructure maintenance and upgrading costs which are forecast to be required in the next decade. However, that potential can only be realised if the projects contribute significantly to modal shifts in favour of rail (either through actual increases in rail's market share or by avoiding future losses in that share). If the NRC applies strict financial criteria in all its future investment decisions, community benefits in some projects in terms of reduced road maintenance costs; reduced environmental impacts of road freight vehicles; reductions in greenhouse gasses and vehicle accidents will not be taken into account.

This would not be an issue if freight road users were asked to pay for all such costs in full. However, given the difficulties of implementation of such a scheme, it may be more efficient to take such externalities into account when allocating rail funding.

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