CRITICAL EVENTS AND EXTERNAL INTERVENTION IN RAILWAY ADAPTATION

Dr. RD (Dave) van der Meulen and LC (Fienie) Möller

Railway Corporate Strategy CC, PO Box 241, Wingate Park, 0153, South Africa
Mobile +27 (0)83 275 7004; Fax +27 (0)88 012 345 2017; dave@railcorpstrat.com

ABSTRACT

The authors have found line-haul railways to reside in six distinctive corporate citizenship clusters, namely Fortuitous-, Insecure-, Enlightened Liberal-, Enlightened Conservative-, Progressive-, and Assertive Railways. They hypothesized that critical events triggered external interventions to move formerly Fortuitous- and/or Insecure Railways into one of the other, more adaptive, clusters. They tested it using a combined data-driven and case study methodology. The strategic adaptation trajectories of the Progressive Railways cluster, and the Assertive Railways quasi-cluster, supported the hypothesis. The rites of passage appear to involve unshackling railways from constraints that impede full exploitation of the strengths endowed by rail's genetic technologies. An appropriate recommendation for South Africa is that railway stakeholders of all persuasions, namely investors, operators, owners, regulators, shippers, suppliers, and workers, and many others, need to get their minds around their contributions to, and expectations of, the looming critical event that is likely to shape the future of railways in South Africa.

1 INTRODUCTION

1.1 Corporate citizenship and critical events

This paper follows one presented by the authors at Southern African Transport Conference 2007 (Van der Meulen & Möller). They examined sustainable strategic adaptation models for line-haul railways, namely organismic systems and socio-cultural systems, in characteristic settings in Japan, North America, and Europe. Subsequently, they elevated the outcome of strategic adaptation, namely the fit of railways in their settings, to the domain of corporate citizenship (Van der Meulen & Möller, 2008b). The latter study found five railway clusters, namely Fortuitous-, Insecure-, Enlightened Liberal-, Enlightened Conservative-, and Progressive Railways, as well as a quasi-cluster of Assertive Railways, whose members have distinctive corporate citizenships. This broadened the appeal beyond the scientific community to society as a whole.

Noting the existence of the foregoing clusters, and comparing railways that had achieved sustainability to those that had not, it was evident that sustainable railways had established a degree of consistent identity, or *corporate citizenship*. Corporate citizenship is about an entity's contribution to society through its core business, social investment, and engagement in public policy: The manner in which an entity manages its economic, social, and environmental relationships, and the way it engages with its stakeholders, has an influence on its long-term success (World Economic Forum, 2007).

During the course of their research, the authors also noted that many railways that had established a distinctive global corporate citizenship had passed through critical events.

These had precipitated movement from a less sustainable former existence, to a more sustainable present- and future existence. Such critical events usually took the form of an existence-threatening financial crisis, followed by external intervention to resolve it. For the purpose of this paper, a critical event is an event that marks the termination of a particular dispensation for line-haul railways, and the start of a new dispensation.

1.2 The research question and hypothesis

The foregoing background sketch suggested the present research question—*what critical events triggered external interventions that moved formerly Fortuitous- and Insecure Railways into one of the other, more adaptive, clusters*? To unlock the requisite understanding, the authors hypothesized the existence of relations among line-haul railways' corporate citizenship and events along their adaptation trajectory. The research reported in this paper explored the existence and nature of such relations.

1.3 The scope of this paper

An examination of generic corporate citizenship per se was the purpose of the authors' paper for World Congress on Railway Research (Van der Meulen & Möller, 2008b). However, writing up the findings sensitized the authors to potential insight into strategic adaptation by examining how some railways had progressed from a bland or endangered corporate citizenship, to progressive and assertive corporate citizenship. The scope of this paper is therefore to examine those that passed through critical events to become Progressive or Assertive Railways.

Note that the authors have excluded Urban Rail from the present study. As a rule, urban rail is subsidized; hence, its corporate citizenship rests on a different set of relations with its relevant environment than line-haul rail (Van der Meulen & Möller, 2008a). Note also the implicit assumption that all railways must have been bland: In general, this was true until the decade before globalization. Until then, most railways were state railways (with some notable exceptions), and many state railways were unsustainable.

2 METHODOLOGY

2.1 A statistical foundation

The authors commenced their research with statistical analysis of a global railway corporate citizenship database (Van der Meulen & Möller, 2008b), identifying the clusters detailed in §3.2 onwards. However, railways that had moved from Fortuitous- and Insecure- through Enlightened- to Progressive- and Assertive railways, reduced the initial global railway population to a sample that was too small to support further statistical analysis. This paper therefore extended a previous paper's case studies of railways in Japan, North America (United States, Canada, and Mexico), and Europe (Sweden, the UK, and then the rest) (Van der Meulen & Möller, 2007) to countries in the Progressive- and Assertive Railways clusters, but from a higher-level perspective. Pattern recognition revealed that the railways in each of the settings named here had passed through a critical event (misfit- and/or financial crisis) that had materially shaped their future positioning.

2.2 The research design

To lay the foundation for the analysis in this paper, and to avoid frequent references, key aspects of the previous design (Van der Meulen & Möller, 2008b) are recapitulated briefly

here. Scientific descriptive research requires a set of variables, essentially the columns or fields, and a set of cases, essentially the rows or instances, in a database. Noting the similarity between the fundamental adaptation in the railway industry, and human behaviour in general, the authors described and examined railway corporate citizenship from a behavioural perspective. National governments currently regulate most railways[1], whatever the industry structure: The authors therefore examined railways by country.

2.3 The variables

2.3.1 Rail's genetic technologies Bearing, Guiding, and Coupling. They endow rail with competitive strengths in the Heavy Haul (exploiting Bearing and Coupling), High-speed Intercity (exploiting Guiding and Coupling), and Heavy Intermodal or double-stacked containers (exploiting Bearing, Guiding, and Coupling) market spaces (Van der Meulen and Möller, 2006). These technologies fundamentally drive rail's competitive positioning. Supplemental variables relate railways to their particular setting. The authors used the following variables, grouped alphabetically:

2.3.2 Business Group. This represents the way in which railways deal with their task (*Infrastructure Operator Diversity, Train Operator Diversity, Information Technology Leverage, Total Road Network-, Motorways-, and Paved Roads Percentage*).

2.3.3 Competitiveness Group. This represents the way in which railways position themselves to compete in their chosen or allotted market spaces (*Research and Development Level, Relative Maximum Axle Load, Relative Maximum Speed, Distributed Power Presence, Heavy Haul Presence, High-speed Intercity Presence, Heavy Intermodal Presence, Motive Power Type, and Attitude to Competition*).

2.3.4 Contribution Group. This describes the railways' contribution to their society (*Network Coverage, Transport Task—Freight- and Passenger Traffic Volume, Employment Created, and Initiative Source*).

2.3.5 Networkability Group. This describes the extent and gauge of track, and the contiguous network beyond a country's borders (*Narrow-, Standard-, and Broad Gauge; Networkability; and Strategic Horizon*).

2.3.6 Ownership Group. This describes industry structure (*Infrastructure-operations Separation, Infrastructure- and Rolling Stock Ownership Locus, and Infrastructure- and Rolling Stock Commitment Horizon*).

2.3.7 Society Group. This describes the railway setting (*Country (Name), Economic Freedom, Population, Gross National Income, Physical Size, Determinism, and Climate-change Position*).

2.3.8 Sustainability Group. This describes adaptation and fit (*Infrastructure- and Rolling Stock Investment Capacity, Stakeholder Satisfaction Level, Service Reputation, Safety Reputation, Subsidy Influence*).

2.3.9 Time Group. This represents passage of time, a prerequisite for time-dependent or longitudinal research (*Calendar Year*).

[1] Exceptions do exist where railway operations crisscross transparent national boundaries, as in the North American Free Trade Agreement and the European Union.

2.3.10 Further detail. Operational definitions for the variables, as well as measurement scales, are available in file *WCRR2008 Line-haul Rail Operational Definitions.pdf* on the authors' website (Railway Corporate Strategy, 2008). The time-dependent database, containing 113 line-haul railways by country, populated with data for the six years, 2002-2007, for each railway, giving a population (and sample) size of 113x6 = 678 cases, is available in file *WCRR2008 Line-haul Database.xls* on the same website.

2.4 Multivariate statistical analysis

The authors applied multivariate statistical analysis to the database to examine simultaneously relations among multiple variables, and multiple cases. Of two possible methods, they selected only Cluster Analysis for the present paper, to group a large number of cases by within-cluster homogeneity and between-cluster heterogeneity. Statistical analysis ends at the Icicle Plot, Figure 1: Cluster names and the following discussion reflect the authors' interpretation of their knowledge of the variables in the research setting. Note that the cluster analysis used data from the latest year only, namely 2007, to avoid the complication of interpreting clusters where different years could have clustered differently, e.g. Kazakhstan 2002 might be in cluster *n*, while Kazakhstan 2007 might be in cluster *p*. While such longitudinal interpretation is feasible, the authors preferred to emphasize clarity rather than pedantry.

3 FINDINGS

3.1 Cluster analysis

The authors selected the smallest number of clusters that seemed reasonably interpretable, namely the five described and discussed below. The Icicle Plot, Figure 1, shows cases forming clusters: Adjacent cases are related, the shared length indicating the degree of homogeneity. The hatched bands through the icicles, demarcate the chosen number of clusters. For brevity, the interpretations below highlight only high- or low attributes from a corporate citizenship perspective—those not mentioned are medium. *High* and *Low* ratings compare the average of a particular cluster to the average of the population. The authors will discuss the clusters individually from §3.2 onwards.

Note that interpretation is predicated on cluster averages: Individual members may be higher or lower than the average, and may have joined a cluster for several reasons. Note also that railways in many countries are in renaissance: While the number of variables in the database must be limited for practical reasons, successful or unsuccessful adaptation may manifest itself outside those variables. This underscores the difference between data-driven and case study approaches. The latter is more versatile, though less conclusive, in settings where a rigidly-structured research design could impose undue limitations, while human cognition naturally extracts useful findings from apparently chaotic cases.

3.2 Cluster 1: Fortuitous Railways

Twenty medium countries, namely Albania, Bosnia, Macedonia, Syria, Israel, Tunisia, Armenia, Kyrgyzstan, Moldova, Mongolia, Türkmenistan, Sri Lanka, Azerbaijan, Georgia, Latvia, Lithuania, Ireland, Mauritania, Venezuela, and Saudi Arabia, characterized by Latvia. Relative maximum axle load is the only high attribute, the rest being either moderate or low. They are all standard- or broad gauge state railways, whose redeeming quality was an axle load that is sufficiently high to support a helpful degree of competitiveness. The authors therefore named them *Fortuitous Railways*. They lacked attributes with

which to project a distinctive corporate citizenship. In a previous study (Van der Meulen & Möller, 2006), they generally clustered with the countries in Cluster 2 below.

3.3 Cluster 2: Insecure Railways

Fifty-four medium countries, namely Algeria, Egypt, Morocco, Iran, Belarus, Uzbekistan, Kazakhstan, Ukraine, Bangladesh, Pakistan, Cuba, Korea Democratic People's Republic, Sudan, Iraq, Tajikistan, Zimbabwe, Benin, Congo Republic, Togo, Swaziland, Botswana, Namibia, Jordan, Uruguay, Guatemala, Bolivia, Cameroon, Côte d'Ivoire plus Burkina Faso, Kenya, Uganda, Cambodia, Ghana, Colombia, Congo Democratic Republic, Guinea, Indonesia, Thailand, Myanmar, Vietnam, Nigeria, Tanzania, Philippines, Gabon, Madagascar, Mali plus Senegal, Peru, Malawi, Mozambique, Zambia, Argentina, Malaysia, Portugal, Chile, and New Zealand, characterized by Benin. Its members have no high attributes, generally moderate attributes, and low competitiveness. Regarding competitiveness, their low relative maximum axle load and low relative maximum speed; lack of distributed power-, heavy haul-, and/or heavy intermodal presence; and low networkability, rendered them ineffective. The authors named them *Insecure Railways* because they failed to leverage any strengths endowed by rail's genetic technologies, and hence are vulnerable to external threats, or to withdrawal of political support. They lacked attributes with which to project a distinctive corporate citizenship.

3.4 Comment on Cluster 1 and Cluster 2

These clusters represented railways that are most exposed to global drivers of change in the railway industry. They are weakly positioned, and therefore most at risk if they do not respond appropriately. Essentially, permissible axle load differentiates the two clusters. Cluster 2 includes many narrow gauge railways that appear to have difficulty in raising axle load, as well as standard and broad gauge railways that do not appear to exploit their full potential in this regard. Their low competitiveness could compromise their sustainability.

3.5 Cluster 3: Enlightened Liberal Railways

Twelve small countries, namely Austria, Czech Republic, Slovakia, Netherlands, Bulgaria, Denmark, Norway, Hungary, Croatia, Greece, Poland, and Romania, characterized by Denmark. Its members rated high on relative maximum axle load and maximum speed; electric traction, networkability, train operator diversity, information technology leverage; paved roads; infrastructure-operations separation with private participation in rolling stock; economic freedom; gross national income; and subsidy influence. All other variables were moderate, while freight technology was low—distributed power, heavy haul, and heavy intermodal were absent. Railways in these countries have exposed themselves to competition, and taken first steps toward distancing themselves from state ownership. They have also leveraged rail's Guiding genetic technology for high speed, to achieve moderate sustainability. Noting their liberal position on competition through train operator diversity, infrastructure-operations separation, and private participation in rolling stock, the authors have named them *Enlightened Liberal Railways*.

3.6 Cluster 4: Enlightened Conservative Railways

Seven small countries, namely Belgium, Korea Republic of, Finland, Luxembourg, Slovenia, Serbia, and Turkey, characterized by Luxembourg. This cluster is closely related to Cluster 3. Its members rated comparatively high on research and development level, relative maximum axle load, relative maximum speed, high-speed intercity presence, elec-

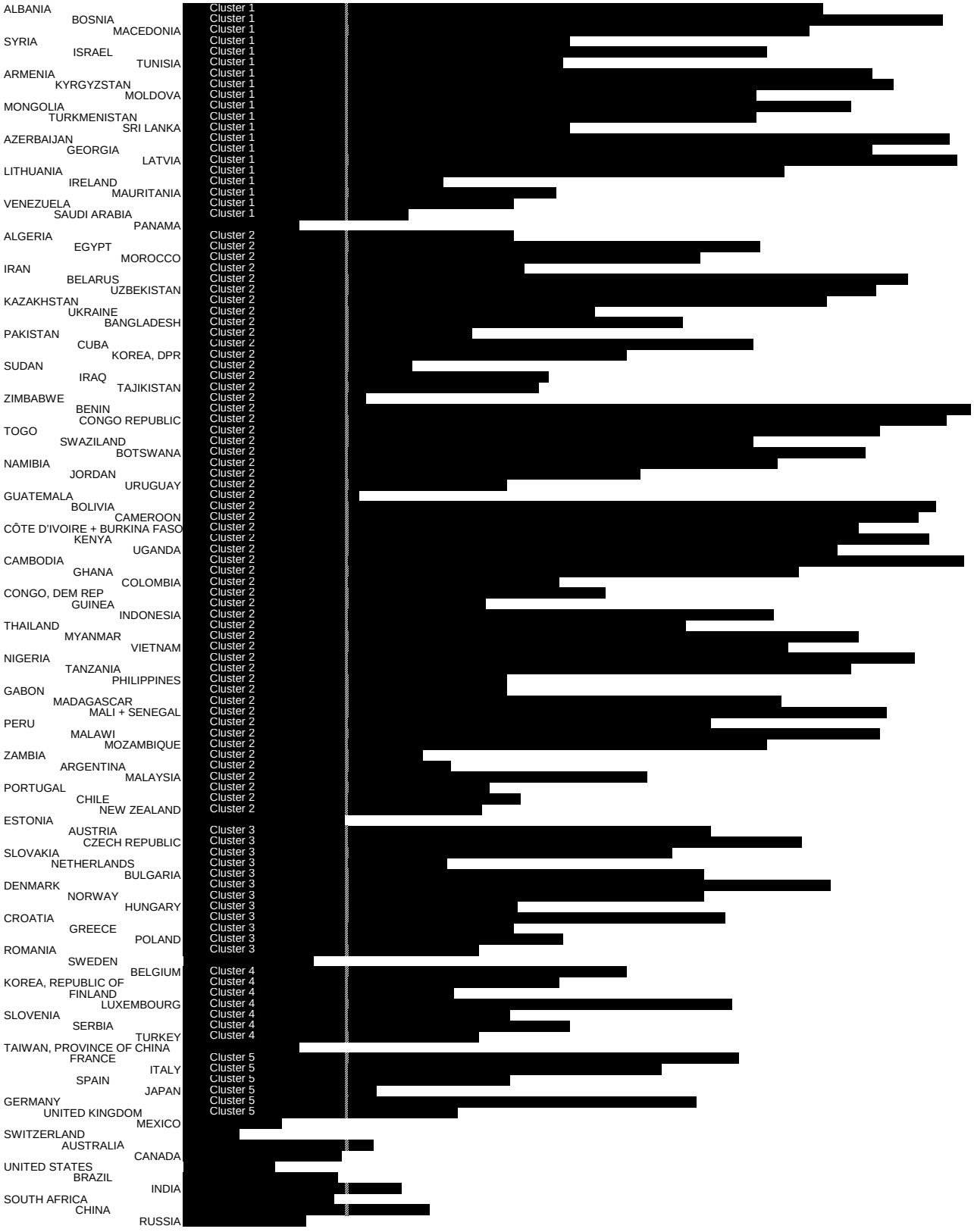

Figure 1: Icicle Plot

tric traction, networkability, information technology leverage, total road network, motorways, paved roads, economic freedom, gross national income, and rolling stock investment capacity. All other variables were moderate, while freight technology was low—distributed power, heavy haul, and heavy intermodal were absent. Railways in these countries have also exposed themselves to competition and, notwithstanding that

competition from road transport, have achieved comparatively high sustainability. Noting their conservative position on competition through low train operator diversity, low infrastructure-operations separation, and low private participation in rolling stock, as well as their lagging position on climate-change, the authors named them *Enlightened Conservative Railways*.

3.7 Comment on Cluster 3 and Cluster 4

The differences between these two clusters are a matter of emphasis. Apropos of the present research question, railways in these clusters have not passed through notable critical events. Instead, they appear to have heeded the example of those that have passed through actual- or imminent critical events, and thereby pre-empted the turbulence that could have been their lot. Hence, the common theme of enlightenment that runs through the naming of these two clusters.

3.8 Cluster 5: Progressive Railways

Six populous countries, namely France, Italy, Spain, Japan, Germany, and United Kingdom, characterized by France. Its members rated high on research and development level, relative maximum speed, high-speed intercity presence, electric traction, attitude to competition, standard gauge, train operator diversity, information technology leverage, total road network, motorways, network coverage, freight traffic volume, passenger traffic volume, employee count, economic freedom, population, gross national income, infrastructure investment capacity, and rolling stock investment capacity. This is the most extensive list of competitive attributes in this study with respect to passenger mobility, although freight technology was low—distributed power, heavy haul, and heavy intermodal were absent. All other attributes were moderate. However, railways in these countries are still under government stewardship, and infrastructure operator diversity is absent. Actual-ization of their corporate citizenship is correspondingly circumscribed. While the name speaks for itself, it is worth noting that these railways have gone through, or are still facing, fundamental adaptation to deal with sustainability, particularly with respect to freight traffic. Their freight market shares are off all-time highs, and all except Japan have had to accept the European Commission's intervention packages to restructure the railway industry.

3.9 Statistically independent countries

3.9.1 Statistical independence. Note that, for n clusters, there must be at least n–1 statistically independent cases, which separate the clusters. This outcome is inherent in cluster analysis: Statistically independent countries are simply more individual than those in any of the clusters. In this study, Figure 1, Icicle Plot, shows Panama, Estonia, Sweden, and Taiwan, to be statistically independent, separating Clusters 1 and 2, 2 and 3, 3 and 4, and 4 and 5. Although each one of them is an interesting case in its own right, the authors have nevertheless excluded them from further discussion.

In addition to the statistically independent cases, cluster analysis also yielded several neighbouring cases, which did not cluster, but remained *statistically quasi-independent*. The latter term means that such cases are adjacent to one another in the Icicle Plot, and may even appear to have shared attributes[2], but they do not make the cut as a cluster. In icicle plot order, these cases were Mexico, Switzerland, Australia, Canada, United States, Brazil, India, South Africa, China, and Russia. Noting their sizeable number, and the

[2] For example, many were International Heavy Haul Association members.

unmistakable stature of several of them, one could not simply dismiss them as different. The authors therefore treated them as a quasi-cluster. By separating them from the rest, and comparing ratings against their own median, the authors found as follows:

3.9.2 Cases above the median—Assertive Railways. Several statistically independent countries are pacesetters in global railways. Cluster analysis has thus substantiated what is common cause. Although they have distinct differences, they are nevertheless similar in how they leverage rail's competitive strengths. Each is indisputably successful in meeting the transport task in its own country, yet they are all sufficiently different not to cluster. Therefore, in recognizing them as individual corporate citizens of global significance, the authors named them *Assertive Railways*, as follows:

3.9.3 The United States. It rated high on many attributes—research and development level, relative maximum axle load and -speed; distributed power-, high-speed intercity-, and heavy intermodal presence; attitude to competition, standard gauge, infrastructure operator diversity, information technology leverage, total road network, infrastructure- and rolling stock ownership locus, network coverage, freight traffic volume, economic freedom, gross national income, physical size, infrastructure investment capacity, and subsidy influence. Its blend of competitive private enterprise and technology leadership has established a formidable corporate citizenship in freight railways, a role model revered by the world. Yet the Staggers Act of 1980 was necessary to liberate its railways from onerous regulation that had driven several of them to bankruptcy (Orenstein, 1990). Evidently, a critical event was needed to prepare them for their present pre-eminence.

3.9.4 China. It rated high on research and development level, relative maximum speed; distributed power-, high-speed intercity-, and heavy intermodal presence; electric traction, attitude to competition, motorways, paved roads, freight traffic volume, employee count, population, physical size; and infrastructure- and rolling stock investment capacity. Its comprehensive exploitation of the full potential of rail's genetic technologies has driven phenomenal development and growth, leading to towering railway corporate citizenship. Its adaptation has been entirely proactive, thus making critical events needless.

3.9.5 Switzerland. It rated high on relative maximum speed, high-speed intercity presence, electric traction, networkability, infrastructure- and train operator diversity, information technology leverage, paved roads, motorways, rolling stock ownership locus, economic freedom, gross national income, rolling stock investment capacity, and subsidy influence. All other variables were moderate, except those that necessarily associated with a small country, such as population and physical size, while freight technology was also low—distributed power, heavy haul, and heavy intermodal were absent. While surging passenger- and freight traffic had put pressure on the network, funding for infrastructure enhancement was constrained, and freight traffic had experienced losses (Jackson, 2007a). The evidence points to an approaching critical event.

3.9.6 Australia. It rated high on research and development level, relative maximum axle load; distributed power- and heavy intermodal presence; electric traction, train operator diversity, information technology leverage, motorways, infrastructure-operations separation, infrastructure ownership locus, rolling stock, ownership locus, infrastructure commitment horizon, economic freedom, and gross national income. Its blend of technology leadership and competitive private enterprise has established formidable corporate citizenship, particularly in freight railways with both private- and public infrastructure ownership (Various, 2007). Its proactive development trajectory appears to have preempted the need for a critical event to initiate change.

3.9.7 Russia. It rated high on research and development level, relative maximum speed; distributed power- and high-speed intercity presence; electric traction, attitude to competition, broad gauge, paved roads, freight traffic volume, employee count, physical size; and infrastructure- and rolling stock investment capacity. Given the bounded networkability of its broad gauge, it has also led the 1520 Strategic Partnership to capture Far East-Western Europe long haul intercontinental business (Jackson, 2007b). Despite still being essentially a state railway, it has nevertheless preempted the need for a critical event by implementing phased reforms for on-rail competition (Russian Railways, 2008).

3.9.8 Cases below the median—Canada, India, Mexico, Brazil, South Africa. Canada and Mexico are examples of railways that have emerged successfully from critical events (Van der Meulen & Möller, 2007). India is hard at work aligning its railways with contemporary positioning precepts. Brazil concessioned many of its railways in the late 1990s and they have since proven sustainable. Although they are currently below the median, they appear set on a development trajectory to assertive status.

However, line-haul railways in South Africa, for which read incumbent Transnet Freight Rail, currently suffer from misfit against stakeholder expectations. The presence of heavy haul operations is a redeeming virtue, notwithstanding which it ranked below all other members of the quasi-cluster. If it were not for heavy haul, South Africa would likely be relegated to the Insecure Cluster. The aggregate content of the present paper to this point thus suggests that the writing is on the wall regarding an imminent critical event …

4 DISCUSSION OF FINDINGS

The authors have previously reported (Van der Meulen & Möller, 2007) that mechanistic railway systems did not effectively adapt to their settings: They faded away, or changed following external intervention. They were either state railways, or railways under heavy state regulation. In the present paper, the authors have found a common critical event, namely that society and state reached a point beyond which they no longer tolerated failure of their railways to adapt to their requirements. External intervention inevitably followed, to release the fundamental drivers of railway competitiveness, thereby enabling railways to assert themselves as proud corporate citizens. They found further that state railways missed the stimuli, arguably due to one or more of protection of their franchise; insulation from competition; accountability to ideology; organizational-, stakeholder-, and strategic inertia; and absence of institutional arrangements to foster adaptation.

Some railways in the Fortuitous- and Insecure clusters could have the potential to implement rail's competitive strengths by transforming to one or other of the more adaptive Assertive-, Progressive-, or Enlightened clusters. Railways that do not overcome that challenge might well fall by the wayside, because insecurity and sustainability do not go hand in hand. There is however still a long way to go, as Fortuitous Railways and Insecure Railways outnumber those that have established, or are already developing, a sustainable global corporate citizenship.

5 CONCLUSIONS AND RECOMMENDATIONS

The authors have applied a combined scientific approach and case study approach to examine positioning of railways in terms of their corporate citizenship. The strategic adaptation trajectories from Fortuitous- and Insecure Railways, through the two Enlightened Railways clusters to the Progressive Railways cluster or to the Assertive

Railways quasi-cluster, supported the hypothesis that critical events precipitated external interventions that moved formerly Fortuitous- and Insecure Railways into one of the more adaptive clusters.

The rites of passage appear to involve unshackling railways from constraints that impede full exploitation of the strengths endowed by rail's genetic technologies. In presenting this paper at a conference in South Africa, the critical issue for that country is thus to acquire an understanding of those rites, and to construct its railway future with minimum disruption through what appears to be an inevitably turbulent passage.

If countries, or their railways (depending on where the drive or power to intervene resides), do not initiate adaptation timeously, their line-haul railways will likely fade away. Fortunately, most railways do have intrinsic worth, particularly if they have the potential to leverage one or more of rail's genetic technologies through constructive intervention. Critical events may thus not be terminal ones, and usually they do lead to a more sustainable dispensation. However, the Insecure Railways moniker was not chosen idly. Critical events in insecure railways arguably carry higher risk than in railways whose sound fundamentals give them some measure of immunity against such critical events.

The following recommendation is thus appropriate for South Africa. Railway stakeholders of all persuasions, namely investors, operators, owners, regulators, shippers, suppliers, and workers, and many others including society and the economy at large, need to start getting their minds around their contributions to, and expectations of, the looming critical event that is likely to shape the future of line-haul railways in South Africa.

6 REFERENCES

Jackson, C, 2007a. Meyer has three mountains to climb, Railway Gazette International, 163, pp. 703-705, 707-708.

Jackson, C, 2007b. 1520 partners debate co-operation, Railway Gazette International, 163, pp. 33-35.

Orenstein, J, 1990. United States railroad policy, Chicago: Nelson Hall.

Railway Corporate Strategy CC, 2008. www.railcorpstrat.com, go to *Downloads* Page.

Russian Railways, 2008. www.rzd.ru, go to *Reform* Pages.

Van der Meulen, RD & Möller, LC. 2006. Railway globalization: Leveraging insight from developed- into developing regions, Proc. 7th World Congress on Railway Research [CD-ROM]. Montréal, Canada.

Van der Meulen, RD, & Möller, LC, 2007. Some global touchstones in railway adaptation, Proc. 26th Southern African Transport Conference [CD-ROM], Pretoria, South Africa.

Van der Meulen, RD, & Möller, LC, 2008a. Strategies for Sustainable Mobility: Urban Railways as Global Corporate Citizens, Proc. 8th World Congress on Railway Research [CD-ROM], Seoul, Korea.

Van der Meulen, RD, & Möller, LC, 2008b. Ultimate Interoperability: Line-haul Railways as Global Corporate Citizens, Proc. 8th World Congress on Railway Research [CD-ROM], Seoul, Korea.

Various, 2007. *Boom times in Australia [Cover feature]*, Railway Gazette International, 163, pp. 767-768, 770-773, 775-778.

World Economic Forum, 2007. www.weforum.org/corporatecitizenship.