

TEN QUESTIONS FOR SOUTH AFRICAN RAILWAY STAKEHOLDERS

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ABSTRACT

Like other industries, the railway industry has experienced globalization. This paper sets out to identify key issues, which must be traded off against one another, to promote the process of alignment among the many claims, explanations, proposals, and theories that have been put forward to reposition ailing railways in South Africa within affordability, possibility, and reality constraints. All stakeholders will ultimately be held accountable for creating a vibrant rail industry. This paper addresses achieving a workable nexus, and how to move forward from there. The author will show that several irreconcilable positions exist in the railway setting. Restructuring, or a change from government to private ownership, will not by itself resolve the problem. Given the multi-final nature of socio-cultural change, the author can not presume to recommend ideal outcomes: At this time it is appropriate only to recommend the need for engagement among stakeholders.

1 INTRODUCTION

1.1 Railway globalization

Railways in South Africa groan under crushing burdens. The industry has experienced globalization, which an open economy cannot avoid, although its outcomes have not found favour with all those affected. It is therefore valuable to appreciate the ramifications of globalization with specific reference to railways. Until the 1950s, railways led transport development, because early Industrial Age technology could not support the road vehicles that came to dominate contemporary land transport. Nevertheless, railways in turn came to dominate the heavy haul (bulk commodities), high speed intercity (passengers), and heavy intermodal (double-stacked containers) market spaces. Each of these railway niches presents such substantial entry barriers that one could argue that nowadays roads should lead railways in supporting economic- and transport development.

1.2 The South African railway setting

Railways in South Africa exhibit many symptoms of unsustainability. Stakeholders of diverse persuasions have questioned the status quo, and have expressed their findings on many levels. At transaction level, clients have demonstrated dissatisfaction, by account closing to violent uprising. Academics have examined the relative roles of rail, road, and other modes. Popular-, business-, and technical presses have reported the proceedings, mostly negatively regarding rail's ability to deliver. Investors who could potentially fund expansion and renewal have appeared unforthcoming. At national level, prospects of restructuring the industry have placed government at odds with organized labour. South

Africa has made several attempts to resolve its railway issues, which have set aspiration levels for whatever political processes transpire within the context of its national development-, logistics-, and mobility imperatives. The first was Moving South Africa; the most recent was the National Freight Logistics Strategy (2005). While such processes are naturally fragile, one might ask whether they are not unduly so with respect to railways, and whether an appreciation of the interrelations among key issues could create space for movement toward a holistic solution.

1.3 Aligning aspirations

Despite much stakeholder posturing, no meaningful movement has been forthcoming at execution level. Many clients, politicians, researchers, unionists, etcetera, have opined on what should be done, in the light both of the positions they present, and of experience with ailing railways in other countries. Among other, several speakers at SATC 2005 addressed aspects of the problem (Maluleke, Marsay, Stander & Pienaar, and Van der Mescht). This paper identifies key issues, which must be traded off against one another, to promote the process of aligning the many explanations, proposals, and theories that stakeholders have put forward in support of their positions, within the constraints of affordability, possibility, and reality. As a menu, it sets out to define a range of options: Where items might be mutually exclusive, it sets out to point out likely contention.

1.4 Relevant stakeholders

The title cannot list all relevant stakeholders. They are a complex assemblage, which needs to find a nexus of interest before it can advance in unison. Logisticians and travelers must come first—they decide what services they will support. Next, national and provincial governments are responsible for creating an enabling setting, wherein investors, operators, suppliers, and users can craft rail's future contribution to South Africa's logistics and mobility tasks. Only governments can stimulate development, recognizing South Africa's diverse overall requirements. Last, suppliers of consumables, finance, equipment, material, and services, need to be attracted by a fair and rewarding dispensation. Labour, particularly in organized form, is a special supplier, because its constituency commands substantial political power. All stakeholders will be accountable both to themselves and to future generations for creating a vibrant rail industry. This paper addresses achieving a workable nexus, and how to move forward from there.

1.5 Research methodology

The author addresses both freight and passenger railways, including metropolitan rail. He examined previously developed positions, and aligned them with expectations that stakeholders have articulated. Line haul- and metropolitan rail have fundamentally opposing drivers, so the author defined the terms of reference with respect to railway competitiveness and sustainability (Railway Corporate Strategy). The format for this paper is to present a topical issue, then to examine global best practice solutions, and finally to question that issue in the South African context. To segue to the ten questions in the title, Section 2 poses each question in turn to stakeholders:

2 THE TEN QUESTIONS: HOW WILL RAILWAY STAKEHOLDERS ...

2.1 Ensure rail's sustainability?

2.1.1 *The issue—avoiding asset deterioration*

The fact that a railway exists does not guarantee its sustainability: Many are no more than subsistence railways. They cannot renew themselves, and must eventually pass into oblivion. Adequate earnings alone, augmented by subsidy if appropriate, can reverse the inevitable outcome and assure sustainability. *Earnings* is used in preference to *revenue*, because the former connotes payment for services rendered to a willing buyer, while the latter does not exclude proceeds of operations protected from competition. What conditions must railways meet to establish adequate and stable earnings?

2.1.2 *The solution—raising competitiveness*

Sustainability is an ability to lead a going concern in whatever direction the dominant stakeholder coalition decides. It inescapably requires funding—extracted directly from the environment as payment for services rendered, or indirectly as taxation by a stakeholder who commands the requisite power. The direct path seems preferable, because a railway can then determine its own destiny. Inherent competitiveness vis-à-vis alternative modes is essential to directly support railway sustainability. However, railways cannot match the ubiquitous access of their most aggressive competitor, road transport: Therefore they must demonstrate alternative strengths to attract customers. Successful railways have positioned themselves to exploit the three self-sustainable niches (Section 2.3), in which railways are inherently competitive (where level playing fields are not an issue). Appreciate that metropolitan rail is a special case—it is not inherently competitive against other modes, except from a throughput capacity perspective.

2.1.3 *Running on entropy*

Advancing rust and vegetation overgrowth are steadily wringing life out of railways in South Africa. Present asset depletion strategies offer no solution, but run down the remaining entropy, and only defer inevitable extinction. Former railway users have unambiguously stated their position, by voting with their feet. Railway stakeholders in South Africa thus need to question how to raise competitiveness on a broad front. The following sections address several pertinent issues: The Gautrain example is showing that global best practice solutions are indeed transferable to South Africa.

2.2 Establish market contestability?

2.2.1 *Users' wants*

Contestable markets drive supplier performance and client satisfaction ever higher. Rail transport users also want clear competition among a real choice of service providers. In several major markets, parallel competition among railways, as well as full competition on national- and international routes, have transformed state rail monopolies into aggressively competitive dispensations. The trend is accelerating, as countries which have not already done so, discard their previous monolithic state railway paradigms.

2.2.2 *How railways introduce market contestability*

First prize in railway contestability is to offer a choice of routes and operators, a dispensation the author terms *parallel competition*. Such contestability prevails in North America, where economic regulators will not sanction mergers that eliminate competition among alternative railways. Second prize is to vertically separate operations from infrastructure, a dispensation that applies to countries that either never had parallel competition, or eliminated redundant routes after nationalizing previously independent railways. Although many forums debate the merits of vertical separation, followed by open access operations, they fail to acknowledge that open access is not first prize, but Hobson's choice—making the best of a given situation. The British Rail saga is an

eminent endeavour to stimulate competition in all functions—ownership, operations, and maintenance. That is, all except one—access to infrastructure. Arbitrary allocation of access is the critical issue, whether by franchises or by slots. Franchising is predicated on a relatively short term horizon, to admit market signals, but it does not fit the long life of railway assets. It might work for scheduled passenger services, but is not ideal for random freight movements. There is no economically rational way to allocate train slots other than by auction, but that opens a Pandora's Box of issues. Open access can thus be only a palliative. One can only eliminate arbitrariness by allowing or introducing competition on alternative routes. In heavy haul, parallel competition has stimulated the most effective railway solutions on Earth—witness Australia's Pilbara iron ore railways, Canada's Québec North Shore iron ore railways, and the United States' Powder River Basin coal hauls.

2.2.3 Options for ex-colonial railways

Many ex-colonial railways, including those in South Africa, originated from competitive access to prized colonial resources. Although subsequent politics and preferences introduced unitary control, the competitive essence of many routes could not be obliterated. The re-privatization of Mexican railways in 1998 provided an example of competitive access in a comparable setting, by introducing the exclusive franchise model of other North American Free Trade Agreement members. At face value that model is similar to vertical integration, and indeed often confused with it, but exclusive franchises position competitive operators on alternative- or parallel routes. With the Mexican solution informing them, railway stakeholders in South Africa should seriously question the advantages of placing existing competitive routes from hinterland to ports under exclusive franchise rather than unitary control, to encourage intense competition among them.

2.3 Leverage rail's genetic technologies?

2.3.1 Railway genetic technologies

Three genetic technologies distinguish railways from other transport modes—*Bearing*, which supports carrying heavy axle loads; *Guiding*, which supports running at high speed; and *Coupling*, which supports scaling conveyance, i.e. train, configuration to meet capacity requirements. Exploiting these genetic technologies to the limits of their respective technologies, either individually or in mutually reinforcing combination, and progressively extending those limits as technology advances, enable railways to position themselves in market niches where they confidently dominate other transport modes.

2.3.2 Exploiting genetic technologies

Railways create and grow market opportunities by exploiting those genetic technologies. Free competition among railways in North America stimulated *Bearing*, or heavy axle loads, a trend that metamorphosed into heavy haul. *Guiding* founded high-speed intercity passenger trains in Japan, and then spread to other countries, particularly in Europe. Heavy intermodal trains, conveying double-stack containers, exploit *Bearing*- and *Guiding* genetic technologies simultaneously. They are competitive with both maritime- and road transport: The associated long hauls have stimulated national networks to link into continental and intercontinental railway networks. Note that *intermodal* is not synonymous with *heavy intermodal*: Simply including a rail sector in container movements, without raising lading density, fails to exploit the full competitive strength of rail. The distinction is unmistakable when comparing railways that prosper in intermodal with those that do not.

2.3.3 Timing in South Africa

Three weak railway applications burden South Africa—general freight, mainline passenger, and metropolitan rail. They are weak because their low axle load and low

speed exploit neither Bearing nor Guiding genetic technologies: Unsurprisingly, such applications are under threat around the world. Of applications that strongly exploit rail's genetic technologies (heavy axle load, high speed, and long trains), only heavy haul is present in South Africa. Introducing the outstanding competitive applications, double-stack container trains and high-speed intercity services will, as a minimum, require overcoming the constraints of its narrow track-gauge legacy. While many existing assets undoubtedly need to be renewed, new investment within present technological parameters has the potential to turn out a monumental faux pas. Public-private partnerships are on the horizon, and inappropriate or premature investments could result in fire-sale asset valuations, because new participants' preferred solutions and risk profiles are simply so different that they may well be incompatible. No country has yet invested substantially ahead of possible private sector participation in railways. The critical question for railway stakeholders in South Africa is thus which assets to renew, and on what timescale.

2.4 Enhance safety?

2.4.1 Safety can be built in

In 2004, Japan's high speed railways celebrated forty years of fatality-free operation, demonstrating that accidents are not inseparably part of railway operations. Their performance breakthrough demanded a concurrent safety breakthrough. Inherently safe design, plus meticulous monitoring of critical performance indicators, eliminated the human factors that underlie many safety violations and undesired incidents in other railways.

2.4.2 Opportunities to enhance safety

Breakthrough requires systemic solutions. Piecemeal, after-the-event, palliatives will not remedy systemic safety dysfunction. Serendipitously, competition strengthens rail's genetic technologies, steadily raising permissible axle load, permissible speed, and permissible train length, thereby rendering old equipment obsolete. The ensuing replacement of assets creates regular opportunities to upgrade to contemporary safety philosophies. Breakthroughs such as ABS braking, adaptive speed control, automatic navigation, and lane departure warning, have upped the ante for competitors. Comparable breakthroughs, such as automated operation, computer based train management, distributed power, electronic braking, and lineside- and on-board monitoring have enhanced railway safety, but implementation depends on replacing obsolete equipment.

2.4.3 Symptoms and solutions

Railways in South Africa are reputed to have a derailment every day, and a fatality every other day. Although a paradigm shift is clearly indicated, rail safety regulation, though necessary, should only set the tone, but not impose unaffordable solutions that might sink a lame railway. In the absence of competition, rebuilding and refurbishing within existing parameters became preferred to renewing and replacing, thereby frustrating the systemic change required to support regular safety enhancement. Stakeholders need to question how South Africa will replace antiquated trains and infrastructure, and implement contemporary safety systems, absent the competition that spurns refurbishment and demands renewal.

2.5 Fortify rail's franchise?

2.5.1 Rail's Achilles heel

The perceived inequalities of competition between rail and road are frequently lamented. However, they only associate with railways that do not leverage their genetic technologies, and will persist as long as rail attempts to directly emulate competitors. Attempts in Europe

and Japan to emulate the ubiquitous access and small consignments offered by road hauliers—CargoSprinter and CargoMover, and Super Rail Cargo, respectively—have not convinced their markets. Rail cannot realistically compete for ubiquitous access, because it needs guideways to support heavy axle loads or high speeds, or both.

2.5.2 *Effective competition*

Successful railways differentiate themselves from competing transport modes, rather than competing head-to-head against them, by avoiding settings where rail cannot exploit the strengths of its genetic technologies. They compete in three niches, so distinct that they are virtually separate transport modes. Heavy haul competes against sources in *other countries*, with <1000km hauls and aggressive cost reduction. High-speed intercity competes against road and air in the 300-1000km mobility niche. Heavy intermodal competes against *other modes* in the 3000-12000km niche between road- and maritime.

2.5.3 *Differentiate and focus*

Railways in South Africa imagine that they compete head-to-head against other modes, instead of differentiating themselves with respect to them. However, instead of making inroads into road traffic, the converse has happened. Many private sidings, intended for small consignments of low-axle-load wagons, have fallen off the network into disuse. Likewise, long distance passenger trains do not differentiate themselves significantly with respect to either road at the low end, or air at the high end. Rail is not inherently competitive in the markets mentioned, so the inevitable followed. Railway stakeholders in South Africa should question how to adapt rail's extensive but unfocused network to the advantages of heavy axle load and high speed, or both. It may be prudent not to retain the existing network, but rather to shrink it, strengthen it, and focus it on what rail does well.

2.6 Extend rail's domain?

2.6.1 *Network economics*

Network economics differs fundamentally from classical economics. For increasing input, classical economics posits diminishing returns, whereas network economics posits increasing returns. The telecommunications industry bears witness of exponential growth in scale, and decrease in cost. Moving physical goods follows the same laws as moving information. Railways that have recognized that analogy know that network economics drives network operators to link their networks, and train operators to expand their horizons. Research (Van der Meulen & Möller) has shown that railways in larger networks fare better in many respects than railways in smaller networks, or even isolated railways.

2.6.2 *Networking railways*

Railways can now convey consignments over distances approaching a quarter of Earth's circumference. As in the telecommunications industry, end-to-end connections are essential, to achieve reach; and parallel connections are essential, to ensure reliability and competition. Monolithic state railways cannot meet these requirements; hence unbundling of infrastructure and operations is an essential first step in wide area networking. Beyond that, interoperability is critical, meaning macro interoperability across the emerging global railway network, rather than micro interoperability within particular continental domains.

2.6.3 *Challenges for Africa and South Africa*

Outside heavy haul, railways in South Africa, and indeed in Africa as a whole, face major challenges. An African continental railway network does not exist, and the economies of most African countries are too small to support one. For perspective, first note that when ranking African countries among US states, by size of economy, only six (South Africa,

Egypt, Algeria, Nigeria, Morocco, and Tunisia) would rank as US states; then note that Africa is more than three times the size of the United States. Network economics requires linked networks to support long hauls: Railway stakeholders in South Africa will need to question and resolve the contending requirements of existing short haul heavy services, and longer term aspirations for a substantial continental network that, as a realistic railway application, could only be supported by substantial growth in the heavy intermodal niche.

2.7 Achieve scalability?

2.7.1 Comparative railway sizes

Comparing the 10th and 90th traffic volume percentiles, the relative scale of the world's railways is $>10^3$ for freight, and $>10^4$ for passenger (Railway Directory). Not even so-called rich countries can afford nonconformist equipment standards: How much less countries with affordability constraints? There is no way that railway bit players can enjoy economies of scale without participating unreservedly in global designs and industry standards.

2.7.2 Global supply industry concentration

Railway suppliers have gone through seismic change in recent years: A large number of small national suppliers has coalesced into a small number of global system integrators, supported by tiers of sub-suppliers. System integrators produce large-scale standardized solutions for rail's three competitive niches discussed in Section 2.3. Furthermore, a vibrant global market in used equipment has emerged: To the extent that interoperability allows, it is moving good, used, railway equipment, particularly rolling stock, from high-cost to low-cost countries, to the advantage of both.

2.7.3 The cost of lost opportunities

Railways in South Africa, and their users, have grappled with the high opportunity cost of being unable to support potential export traffic growth. Whereas many global competitors buy locomotives and wagons off-the-shelf, railways in South Africa must on the one hand pay a premium for small order quantities of non-standard equipment, and on the other hand be satisfied with sub-optimum performance that associates with low axle load. Furthermore, while there is a significant global market in used standard-gauge rolling stock, yard/meter/Cape gauge railways are on their last legs, and there is in fact a global scarcity of used narrow-gauge rolling stock. South Africa thus cannot even contemplate used equipment. This impasse is simply not competitive in global markets. The question for South African railway stakeholders is thus how to acquire competitively-priced rolling stock on demand to support incremental capacity in step with market opportunities.

2.8 Diversify ownership?

2.8.1 Attracting investors

Multiple infrastructure- and train operators have been found to drive real transport prices down under fair competition. States do not compete against themselves, so private participation is a sine qua non. To minimize the risk perceived by investors, it is necessary to keep open options for alternative asset deployment, so that if a transaction fails, the assets are not orphaned. It is thus important to embrace railway industry global standards and best practices to attract investors.

2.8.2 New business models

Globally aware railways have developed ways and means to attract private funding into previously state-owned railways. Besides outright ownership, which secures the most integrated investment, instruments such as asset leasing, concessioning, open access,

and private rolling stock, have been developed to balance commitment, entry (and exit) barriers, flexibility, risk, and transaction cost. In principle, clients who are willing to commit funding to long-term railway assets are the best customers a railway could desire—they cannot easily desert to competitive modes. As in other transport modes that rely on private investment, one outcome is intense use over a relatively short asset life. This contrasts with the relatively moderate asset utilization and long term commitment typical of state railways. A different take on appropriate technology is thus a contingent outcome, resulting in a tendency to prefer lower capital investment with possibly higher operating costs.

2.8.3 Mitigating risk

South Africa has recently taken a first major step to private participation in railways: In the passenger segment, Gautrain has already attracted private funding through a public-private partnership. It illustrates the nature of questions that railway stakeholders in South Africa will need to answer. On the one hand, risk that cannot be mitigated remains with the initiating authority that envisages a project. On the other hand, operator partners hedge their risk by ensuring alternative application for rolling stock—if it cannot be deployed elsewhere in South Africa, it should at least be deployable elsewhere in the world. In the freight segment, the National Freight Logistics Strategy (2005) holds the prospect of creating space for the private sector to play a meaningful role in all aspects of the freight system. However, as yet there is scant evidence of the private sector clamouring to enter. Aspirations to cross-subsidize non-competitive operations from marginally competitive operations could prove an onerous burden: Such incentives as exist might be neutralized through social impositions. Concessionaires could run down assets further if a line is not inherently competitive and hence sustainable: Alfred County Railway's recent demise is an example. Stakeholders will need to question the risk of uncertain returns where many aspects of railways in the South African setting are not inherently competitive.

2.9 Manage change?

2.9.1 Large-scale systemic change

Promoting and managing change, in system as large as a country's railways, is an enormous task. Within that setting there exist deterministic systems, organismic systems, and socio-cultural systems. The three major areas of difference, namely structure, dynamics, and purpose, which exist between mechanical and social systems, are so pronounced that the same principles which make the design and control of a mechanical system so successful cannot be used to meet the challenges of managing complex social organizations (Gharajedaghi, p. 5). Changing socio-cultural systems, such as a failed railway that is required to support a developing economy, and which create new structures and admit multi-final outcomes, is particularly challenging.

2.9.2 Implementing large-scale change

Several examples of large-scale change in the world of railways are noteworthy. The most complex, most quoted is the United Kingdom, where a monolithic state railway was unbundled into units that made economic sense at the time. However, it is critical to appreciate that none of the three competitive niches mentioned in Section 2.3 (heavy haul, high-speed intercity, and heavy intermodal) is present there, with the possible exception of the high-speed Channel Tunnel Rail Link to mainland Europe. The ongoing turbulence will therefore persist until stakeholders accept the need for, and the modalities of, channeling public funds into railways. The alternative, of withholding funds, could conceivably reach the agenda in the UK's search for value, rather than preconceived solutions, from public funds. Another good example is Europe, where freight rail's market share is desperately small, and infrastructure is largely predicated on passenger service requirements. Large-

scale change under European Commission leadership is underway, and includes the Community of European Railways, European Association for Railway Interoperability, European Freight and Logistics Leaders Forum, European Infrastructure Managers' Association, International Union of Public Transport, International Union of Railways, and Union of the European Railway Industries. The scale of the change speaks for itself.

2.9.3 Engaging in meaningful transformation

South Africa's democratic transformation has arguably been the most compelling demonstration of socio-cultural change the world has recently seen. By contrast, a deterministic-system approach has brought railways in South Africa to near extinction. The powerful dynamics of organismic- and socio-cultural systemic change offer a means to align all stakeholders with a shared and workable destiny. To the extent that the process excludes uninhibited participation by essential stakeholders, it cannot find direction and get underway. The aspirations are well known: Politicians want development, employment, and mobility; labour wants full and stable employment; freight owners want effective logistics solutions; travelers want affordable, convenient, and safe mobility; and suppliers want a vibrant railway market. While some aspirations may seem irreconcilable, the *do nothing* option prolongs the downward spiral. Simultaneous, though possibly incomplete, satisfaction of aspirations can only be achieved by engagement and compromise. Stakeholders need to question how to engage one another in a meaningful transformation process, to avoid a shrinking railway for all.

2.10 Act before it is too late?

2.10.1 The risk of marginalization

One of the most cutting aspects of globalization is the way in which it marginalizes non-mainstream players. Unless there is conscious and continuous adaptation, the comparatively higher cost of doing business outside the mainstream pulls such players ever further from the mainstream, until the situation is beyond remedy.

2.10.2 The challenge for marginalized railways

Where there is insufficient revenue and minimal entropy, railway sustainability is no longer possible, and total meltdown must ultimately occur. The writing has long been on the wall for railways that do not fully exploit rail's genetic technologies. Economic laws are immutable: Politicians may therefore at best achieve a phase shift by which to favourably align particular processes and outcomes with other issues on their agenda, but may at worst trigger unintended consequences that are worse than the original problem.

2.10.3 Restoring South Africa to the mainstream

Railways in South Africa have drifted out of the mainstream for the reasons mentioned under the first nine questions. Meltdown is already well underway. Railway stakeholders thus need to question how they will devise and implement robust adaptation before it is too late. It is now essential to plot a course to return to that mainstream as best they can.

3 CONCLUSIONS

3.1 Irreconcilable positions

The author has drawn attention to several essentially irreconcilable positions that are present in the South African railway setting. Contending stakeholders could well have pulled so far in opposing directions that a solution space does not currently exist.

3.2 Avoiding false hopes

To restructure, or change from government- to private ownership, will not ipso facto resolve South Africa's railway problem. Around the world, many railways failed before concessioning, open access, and privatization. Several will fail thereafter too. It is possible that some elements of likely or workable outcomes could be anathema to particular stakeholders. It is also possible that some railway activities will need to exit—all are simply not globally competitive. Attempting to prop up unsustainable activities will drain the economy by diverting funds that could achieve more desirable returns elsewhere. Nevertheless, overall survival is more valuable than satisfying stakeholders individually. Recall Albert Einstein's caution that a problem cannot be solved at the same level at which it was created: It is sobering to reflect that state railways were a state creation, and that solving problems at that level will need a higher level intervention.

3.3 Recommendations on moving forward

Given the multi-final nature of socio-cultural change, this author can not presume to make specific recommendations regarding ideal outcomes. At this stage it is appropriate only to recommend the imperative of engagement among railway stakeholders. Clearly, give-and-take is required. The solution process cannot commence until stakeholders declare their willingness. South Africa has demonstrated that it can craft the requisite higher level transformations. The railway problem is no less a problem than overcoming its political legacy, and it demands resolution at the same transcendental level.

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