THE FIFTH ANNUAL

STATE OF LOGISTICS SURVEY FOR SOUTH AFRICA

Logistics value and cost drivers from a macro and micro-economic perspective

2008

Imperial Logistics

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Edited by David King
CSIR

Contact details:
CSIR Built Environment
Tel +27 12 841 3871
Fax +27 12 841 4755
www.csir.co.za

This report can be downloaded electronically at www.csir.co.za/sol.

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The CSIR's Logistics and Quantitative Methods group applies a multidisciplinary approach to conduct innovative research and development in the areas of logistics and supply chain management, and complex decision-aiding, using mathematical and statistical modelling. It has a history in research and consulting in various industries, and is the originator of the South African State of Logistics survey.

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The Centre for Supply Chain Management is an ancillary academic institution with its primary responsibilities being consulting and research services in the fields of supply chain strategy, strategic and business positioning, and market and economic research.

Imperial Logistics

A special word of appreciation to the sponsor, Imperial Logistics, who has also contributed significantly to this year's survey.

PREAMBLE

Hans Ittmann

The world is experiencing the worst financial crisis in many decades and the effects of this are being felt across the globe. Governments are taking unprecedented steps to try to curb this grave situation. It is possible that the worst is still to come. South Africa is also affected and we are possibly already in a recession. All indications are that this situation will persist at least for this year and into next year. Many companies across different sectors of the economy are struggling. Those in the logistics sector are also experiencing the effects of these difficult times.

Simultaneously the logistics industry needs to get credit for the fact that in the true spirit of supply chain management or logistics, products are delivered at the right place, at the right time and at the right cost. In this regard we can make the general statement that the logistics industry is performing very well, given the environment it has to operate within. However, it will be increasingly difficult to maintain these levels of service. History shows that circumstances will improve at some stage and it is therefore critical that companies should spend time and effort into redesigning and improving their supply chains to prepare for the upswing. Creativity and innovation will be critical in this regard.

The theme of this survey is 'Logistics value and cost drivers from a macro and micro-economic perspective'. It is very appropriate, given the financial situation, that the emphasis is on the value that can be derived from logistics as well as logistics costs. Over the five-year period since the start of this survey, the way these have been calculated has been refined continuously. Logistics costs are one of the critical factors and this survey clearly indicates rising logistics costs. This is due mainly to two reasons, namely a constant rise in fuel prices over the 2007 reporting year and much higher inventory levels, and associated costs, than in previous surveys. Freight is still predominately on road and there seems to be little chance of this changing in the near future. Because of the high and increasing internal logistics costs, South Africa's position on the World Bank logistics competitiveness report will most probably deteriorate. This needs serious attention and the survey makes recommendations on the areas that need to be improved.

The Council for Scientific and Industrial Research (CSIR) and its associates believe we are again addressing critical aspects in the fifth State of Logistics Survey. In many respects the survey is very similar in format to previous surveys and allows for comparisons in trends, etc. that is vital to keep track of what is happening. This survey should, and must, open the way for further discussions, interactions and dialogue on various logistics and supply chain management issues. It is only through these collaborative interactions that relevant research can be conducted to the benefit of the country. Indications are that this is starting to happen increasingly and the CSIR welcomes this development.

Over the past year our relationship with Imperial Logistics, the company that is sponsoring this survey, has strengthened. We would like to thank them for their continued financial support and also all those who have contributed to the survey, especially the researchers from Stellenbosch University.

Hans W Ittmann
CSIR Built Environment, Pretoria, South Africa
March 2009

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PREFACE from Imperial Logistics

The current economic crisis is having its ripple effects on logistics and distribution operations. Manufacturers and logistics service providers need to take a number of steps to deal with the difficult economy. One of the most important actions companies can take is to ensure that their supply chains are well managed. Companies should refrain from using their experiences and gut feelings as a guide when making optimisation decisions and instead engage with professional logistics and supply chain management companies. Imperial Logistics therefore partnered with the CSIR and Stellenbosch University to identify trends and determine the state of logistics. The survey illustrates that all stakeholders should move to get rid of inefficiencies in their supply chains in order to contribute towards the success of the South African economy.

Imperial Logistics is proud to be the principal sponsor of the fifth State of Logistics Survey. Being instrumental in providing valuable information for industry leaders and managers, Imperial Logistics appreciates the opportunity to contribute significantly towards the strategic decision-making process within the industry.

We entered into a formal relationship with the CSIR to contribute and ensure the supply chain community benefits from the continuation of the survey. Being in the second year of our association, Imperial Logistics was actively involved from planning to completion. As a leading logistics and supply chain management company in southern Africa and Europe, we were able to provide valuable insight and contribute from a practical and experiential perspective.

We congratulate the CSIR on the fifth edition of the survey and are looking forward to working together on future editions.

Marius Swanepoel
CEO Imperial Logistics

About Imperial Logistics

Imperial Logistics is the leading logistics and supply chain management company in southern Africa with an impressive international footprint in Europe. Imperial Logistics Southern Africa provides customised value-added logistics services and supply chain solutions to blue chip customers in almost every industry. Imperial Logistics is 100% owned by Imperial Holdings and the southern Africa division is home to more than 70 operating companies, categorised into three key divisions, namely Transport and Warehousing, Consumer Products and Specialised Freight. Imperial Logistics International focuses on European markets and comprises four operating units, namely Panopa Logistik, neska, Imperial Reederei and Brouwer Shipping.

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EXECUTIVE SUMMARY

The theme for last year's survey was logistics for regional growth and development and the leading role South Africa plays in the southern African region in terms of economic and logistics development. This year's theme is somewhat more inward-looking and is titled 'Logistics value and cost drivers from a macro and micro-economic perspective'. The survey focuses on internal and external logistics value and cost drivers that influence South Africa's global competitiveness.

MACRO-ECONOMIC PERSPECTIVE

THE STATE OF LOGISTICS IN SOUTH AFRICA – EXPOSURE TO EXTERNAL RISKS

Logistics costs for 2007 amounted to R317 billion or 15,9% of GDP, up by 1% from 2006. Transport still dominates the logistics cost distribution with 53%, inventory carrying costs stand at 16%, while management, administration and profit are at 16%, and storage and ports at 15%. South Africa's current logistics configuration leads to unacceptable risk exposure to global upheaval. Transport remains the biggest contributor to logistics costs and thus the biggest challenge in South Africa's logistics system.

LAND FREIGHT TRANSPORT VOLUMES AND COSTS

Close to 1,6 billion ton of freight was observed on the four different typologies in South Africa in 2007. Almost 1,4 billion ton was observed on road at an average transport distance of 178 km, delivering 245 billion ton-km. Rail only contributed 205 million ton at an average transport distance of 629 km, delivering 129 billion ton-km. The market share split for road and rail by tons transported thus stands at 87/13. This points to an unsustainable situation; a viable domestic intermodal solution that will reduce risk and lower costs is still necessary.

INDUSTRY-LEVEL PERSPECTIVE

THE VALUE OF LOGISTICS

Most logistics analyses and commentary focus on costs and challenges. Unfortunately, the availability and integration value of logistics are often neglected. All recent definitions of logistics include reference to the need to meet customer requirements. Logistics is not merely about achieving the lowest transport or storage costs, but it is about finding the lowest overall costs for the operation. Understanding that the state of logistics should be measured in terms of consumer satisfaction and the total effectiveness of the value chain, provides valuable guidance to logisticians and supply chain professionals.

LOGISTICS (AND SUPPLY CHAIN MANAGEMENT) COST DRIVERS

The spotlight falls on three aspects: fuel, skills development (people) and collaboration (the key to controlling and optimising logistics costs). Increases in fuel prices exert positive pressure on supply chain professionals to review collaboration with logistics service providers (LSPs) and to find intelligent solutions, decreasing the high demand for transportation and reducing logistics costs. It is vitally important for South Africa to increase investment in tertiary education and skills development to improve the country's competitiveness in the global logistics market. Partnerships with LSPs mean that companies can focus on doing what they do best, but control could be lost and it's therefore important to work closely with LSPs to ensure the right level of detail and cultural fit are achieved. LSPs are provided with opportunities to upgrade their capabilities, offer value-added services through a collaborative approach to improve performance, efficiency and effectiveness.

SKILLS IN LOGISTICS – AN UNCERTAIN FUTURE

South Africa, by all known global competitiveness measures is in serious trouble as far as the labour production factor is concerned and programmes to address labour and training issues have been less than successful. In order to understand this situation better, current productivity should be researched and future needs analysed, but scant information is available as is common for most studies in the logistics field. Demand-side analysis indicates that employment figures remained mainly flat or even declined slightly for the transport, storage and communications sector, driven by declines in postal and telecommunications employment. Supply-side analysis suggests that all indicators, in relation to the economy, are declining. Future solutions for South Africa's surface freight transport skills problems will have to consider a return to rail. This means highly technical skills development in an area where the country is already behind.

THE POTENTIAL COSTS OF BAD ROADS IN SOUTH AFRICA

The riding quality of a road has, for many years, been used as the primary indication of the condition of a road. The potential effects that worsening road conditions can have on the broader economy are increases in vehicle damage and costs, vehicle operating costs, pavement damage and costs, damage to transported cargo, environmental damage and costs, and increases in congestion and decreases in safety. A limited case study indicated that trucks travelling on roads with average and bad riding conditions experienced an increase in costs of between 684% and 1 560%, respectively.

THE GREEN SUPPLY CHAIN – COST BURDEN OR VALUE CREATOR?

South Africa emits 1% of the global annual CO_2 emissions, but has an energy-intensive economy. Both its green house gas (GHG) emissions per capita and GHG emissions per unit of GDP (emissions intensity) are nearly double that of the world average. Up to 75% of most companies' carbon footprints come from transportation and logistics. This places a heavy burden on managers to accept responsibility, invest and take the required measures towards a green supply chain. The perception persists that transforming to a sustainable, green supply

chain results in reduced profit margins. The effective greening of the supply chain necessitates a holistic systems and network assessment that leads to life cycle optimisation. The desired result is Green-Gold, where green supply chain management drives cost savings and process improvement.

AISI – ADDING VALUE TO THE SOUTH AFRICAN AEROSPACE INDUSTRY

The Aerospace Industry Support Initiative (AISI) is a fully government-funded mechanism that exists to support South Africa's local aerospace industry in its drive to become an active and valued player in the global aerospace manufacturing industry. South Africa to a large extent holds the building blocks of a world-class aerospace and defence industry. Significant interventions are however required for the industry to successfully meet the challenges facing the country and the global market place that it wants to serve. The AISI is mandated to manage these interventions.

INTRODUCTION

Ittmann Hans W

It is very fitting, given the global economic crisis, that the theme of the CSIR's fifth annual State of Logistics Survey is 'Logistics value and cost drivers from a macro and micro-economic perspective'. Pressures on reducing logistics costs internationally are even more acute in the South African context given our geographic location and therefore the importance of the focus on logistics value and cost drivers. The CSIR and its partners are pleased to present the fifth annual State of Logistics Survey. This survey continues to add data points to the different trends of critical factors that are so important to understanding what is happening in the logistics environment in South Africa. From a data analysis point of view, the survey covers the 2007 reporting year. The aim of the survey is much the same as in previous years, namely to provide a comprehensive picture of the state of logistics in South Africa, incorporating a macro-economic view (top-down) and an industry-level perspective (bottom-up). This survey does not address the small business development perspective as in previous surveys, which does not imply that this perspective is in any way unimportant or inferior. Logistics as a developmental constraint for SMMEs in urban and rural environments remains critically important.

The world economy is in a deep recession and it will take a number of years to get out of this slump. In fact things are possibly going to get even worse before there is a real turn around. Governments are doing their utmost to limit the damage by introducing various measures to minimise job loses, to invest in projects that will assist and strengthen the upturn whenever that happens, etc. The South African economy lags behind this downturn although more and more industries are feeling and experiencing what has been happening globally. The projected growth rate for South Africa for 2009 is now down to 1,2%, the lowest rate since 1998.[1] Five principles that have informed the South African budget planning for 2009 are: protecting the poor, creating employment, investing in infrastructure, promoting competitiveness and fiscal sustainability. The emphasis on infrastructure investment and improvement must be welcomed and will have direct benefit to the state of logistics in the long term. In this regard the situation in South Africa is not unique. A recent report by the AASHTO in the USA highlights the top five transportation headaches and their remedies.[2] The headaches identified in the USA are almost exactly the same as in South Africa namely:

- Ageing bridges, crumbling pavements (roads) and deteriorating transit
- Congested roads, highways and transit systems
- Traffic fatalities and injuries
- Demand is stressing the system
- Everyone's costs are rising.

1 Budget Speech by the Minister of Finance, Trevor Manuel, 11 February 2009
2 America's Top Five Transportation Headaches – and Their Remedies, The American Association of State Highway and Transportation Officials (AASHTO), Washington DC, January 2009

The benefits derived from addressing these are huge for South Africa. Significant programmes for infrastructure improvements will create jobs and boost economic growth. The long-term benefits from infrastructure improvements outweigh the costs i.e. it will ultimately improve the logistics competitiveness of South Africa. It is also critical to use innovative and advanced technologies for construction and improvements to ensure these last longer, are environmentally friendly and take less time for maintenance.

The logistics costs as a percentage of GDP are again presented in this survey. A determined effort went into refining the cost model used and all calculations over the past five years have been updated using this model. The logistics costs in South Africa for 2007 are R317 billion or 15,9% of GDP. Increases in transportation costs and inventory carrying costs have contributed to this significantly. The transportation cost component is 53% of the total costs and this is much higher that the world average of 39%. High fuel prices, freight moved along long distances mainly from Gauteng to the coastal areas and vis-à-vis, on the major corridors and the lack of freight moving back to rail, which is cheaper, are the main contributors to this higher percentage.

For the first time over the past five years this survey addresses the critical issue of skills in logistics. A previous supply chain foresight study referred to the "skills time-bomb" in logistics.[3] The situation still prevails and serious attention is required to attend to this situation at all the various skills levels. Another addition to the survey is an endeavour to calculate and quantify the costs of bad roads in the country. A limited sample of vehicles travelling on different quality roads has been used to calculate the potential increase in vehicle damage costs. Other cost factors are also highlighted.

The next World Bank report on international logistics competitiveness is due in June 2009. In the first report South Africa was fairly well placed, namely 24th out of 150 countries.[4] For South Africa to remain in this good position, it is essential to maintain a comprehensive picture of the state of logistics. The numbers as presented in this survey indicate that South Africa could be worse off in the next survey. The internal, within country, logistics costs need to decrease. The global economic downturn that is now spilling over to developing countries such as South Africa will make it difficult to remain competitive but it is in these times that innovative approaches and solutions are required to at least retain the competitiveness position in the global market place.

TRENDS IN SUPPLY CHAINS

It is always good for companies to re-examine their supply chains periodically. In the midst of difficult economic times it is even more advisable to conduct such reviews. That is because the global economic downturn is providing temporary reprieve from high oil prices and creates an opportunity to think ahead, and prepare and plan for the next upturn.

3 Supplychainforesight 2006, Survey conceptualised and initiated by Barloworld Logistics, 2006
4 The World Bank 2007. Connecting to Compete: Trade Logistics in the Global Economy, Washington DC

The environments within which supply chains operate globally will remain very dynamic where things can change overnight. We believe this reality is going to become the norm. Supply chains therefore need to be designed in such a way that they are sufficiently resilient to be able to accommodate changes quickly and effectively.[5]

In the sixth annual survey in 2008 of global supply chain trends, conducted with 100 international participants by PRTM management consultants, 10 such trends are highlighted.[6] These are the following:

- Globalisation is accelerating, leading to large structural shifts for global supply chain organisations
- Pressure to reduce costs and ensure access to local markets continue to drive accelerated globalisation
- Despite average reductions of 17% per globalisation initiative, many companies have difficulty realising savings in management costs
- The major target regions for globalisation are converging on China and India, while Eastern Europe is catching up as a top outsourcing destination
- Product quality and safety, as well as supply chain delivery and security, are the most critical concerns when expanding the supply chain globally
- Limited supply chain flexibility and the lack of internal competency to manage partners are major barriers to globalisation
- Environmental sustainability is a key consideration in the development of future globalisation strategies
- The evolution of supply chain maturity, enabled by advanced supply chain practices, appears to have reached a plateau
- By 2010, the need for greater supply chain flexibility will overtake product quality and customer service as the major driver for improving supply chain strategy
- The COO agenda across industries and geographic regions is converging on improving supply chain flexibility and performance.

The above trends are focused on the international supply chain environment although we in South Africa need to take note of these. Additional trends that will become more prevalent and important are the impact of transport, and thus supply chains, on climate change and global warming. There will be increased pressure to limit the carbon footprint of the transport sector. As part of this, green supply chains will become a requirement. These issues need to become part of the thinking, planning and operations of those in the supply chain management and logistics sectors.

5 Sheffi Y, 2006. The Resilient Enterprise. The MIT Press, Cambridge, Massachusetts, USA
6 Global Supply Chain Trends 2008-2010, Driving Global Supply Chain Flexibility through Innovation, 6th Annual Survey by PRTM Management Consultants, 2008

MACRO-ECONOMIC PERSPECTIVE

The state of logistics in South Africa – exposure to external risks

Havenga JH, De Jager N, Van Eeden J, Jacobs N[7] and Braun M[8]

INTRODUCTION

As South Africa enters an era of uncertainty in times of unprecedented global upheaval, many questions will be asked regarding the country's economic stability and resilience. In terms of monetary policy, fiscal management and sound financial infrastructure it seems that the country is well-prepared to weather this storm. The Reserve Bank has raised interest rates since 2006 in line with inflation problems, thereby protecting the currency to some extent and providing leeway to now lower rates and stimulate growth. The fiscus managed public income to the extent that tax collection has become more efficient with wider compliance. Commercial banks recently received a clean bill of health despite a severely affected global banking system.[9]

All of these successes have, however, a single common theme, which is the backbone of all high performing management systems, i.e. management information. Without monthly and quarterly GDP and inflation figures, money supply measurements, key indicators such as housing prices, liquidations and business confidence indices and many more, the ability to manage the financial system would be extremely challenging.

The availability and correct use of management information therefore determine the state of readiness of a system to respond to change. Change has two possible manifestations, i.e. gradual change or cataclysmic change (in nature this is the difference between evolution over long periods of time and catastrophes such as meteor hits). In both cases information has a role, i.e. during evolutionary change it hones the performance of the system while during cataclysmic change it enables survival. The absence of information will therefore either cause a system to run down gradually since it is not enabled to respond to a changing environment, or it could even be destroyed as its inability to protect itself from upheaval is exposed.

In the preceding physical science context, information is equated to the state of order in the system (the opposite of being run down), but it is not much different in business science where order also equals information and growth. A case in point is whether South Africa would have

7 Stellenbosch University: Department of Logistics and Centre for Supply Chain Management (CSCM)
8 Max Braun is an independent transport management, distribution and logistics consultant
9 South African banks that are owned by overseas banks recently saw their share of market capitalisation of overseas banks rise sharply

invested more in electricity generation infrastructure if the recent energy crisis's advent was anticipated and the impact understood.

In this survey, management information with regard to South Africa's logistics infrastructure and its performance is further enhanced. Government's contribution to this body of knowledge is still mostly lacking – for instance, out of 72 performance measures issued by The Presidency in 2007, nothing refers to logistics performance in the country.

The results discussed here indicate that logistics costs for 2007 amount to 15,9% of GDP in South Africa. It is therefore long overdue that management information is not only maintained, but also acted upon.

MODEL IMPROVEMENTS

In line with stated intentions since the first State of Logistics Survey published in 2003, major enhancements to the model were made in 2008. Most remaining gaps in the modelling system were addressed and more attention was given to detail. The improvements are discussed here.

Transport costs in previous models were defined as either 'line-haul' or local delivery and the underlying cost structures of only a few vehicle combinations on road were used. In this update, actual costs were established and used for all modes other than road. The inability to obtain actual road costs is due to the highly fragmented nature of the industry and no requirements for reporting. The extent of road freight transport in South Africa, however, necessitated the development of an extensive road cost model to improve the reliability of the overall model. The road cost model:

- Differentiates between 34 vehicle combinations
- Differentiates between metropolitan, regional and corridor transport typology costs, rather than just line-haul and local delivery
- Utilises all known drivers of road costs such as fuel, maintenance, toll fees, etc
- Differentiates between variables in terms of cost drivers on different typologies (between and within typologies, i.e. fuel costs in Gauteng Metro would be higher than in Durban and toll fees on certain routes would be higher than on others)
- Uses the most refined measurement of volume demand available.

These refinements resulted in a world-class model and one of a few, if not the only one, that contains this level of detail. All figures since the first survey published in 2003 were reworked according to the new approach.

The approach to inventory carrying costs was widened to include all data from various statistical releases from StatsSA. As the data were historically available, the data could also be backdated. These improvements caused a downward adjustment to transport costs and upward adjustment of inventory carrying costs as reflected in Table 1.

Table 1: Adjustments to previous survey results due to model improvements

Year	2003	2004	2005	2006
Inventory carrying costs (2007 model)	R26 bn	R27 bn	R28 bn	R30 bn
Restated inventory carrying costs (2008 model)	R26 bn	R29 bn	R33 bn	R38 bn
Transport costs (2007 model)	R117 bn	R128 bn	R141 bn	R155 bn
Restated transport costs (2008 model)	R101 bn	R110 bn	R121 bn	R133 bn

The overall effect of these changes on the cost of logistics is reflected in Table 2.

The improvements caused a slight downward adjustment of logistics costs as a percentage of GDP, but resulted in a more robust model, further increasing the confidence in the outputs.

Table 2: Effect of adjustments on total logistics cost statement

Year	2003	2004	2005	2006
Logistics costs as % of GDP (2007 model)	16,6%	16,4%	16,2%	15,7%
Logistics costs as % of GDP (2008 model)	15,4%	15,3%	15,2%	14,9%

Disaggregation of results on an industry level and the expression of results as a percentage of sales will enable the development of an industry benchmarking tool. This work is an important step in that direction. The country's actual logistics cost performance is introduced in the next section.

OVERALL PERFORMANCE OF LOGISTICS

The logistics costs in South Africa for 2007 were R317 billion or 15,9% of GDP. The contribution by the various stack elements is depicted in Figure 1.

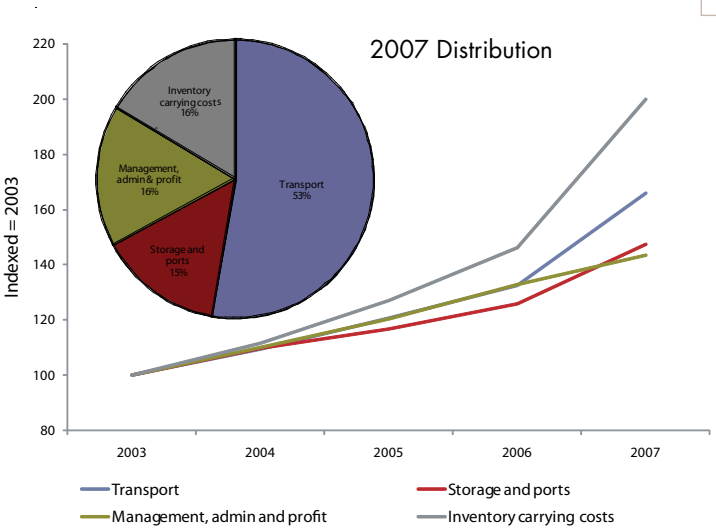


Figure 1: Logistics cost growth at current prices (nominal) and 2007 cost contribution

Even with the lower cost figures for transport (as per Table 1), the percentage contribution of transport costs to total logistics costs (53%) is still higher than the world average of 39%. Transport and inventory carrying costs also show an alarming upward trend, even when the real (constant) increase is considered (Figure 2).

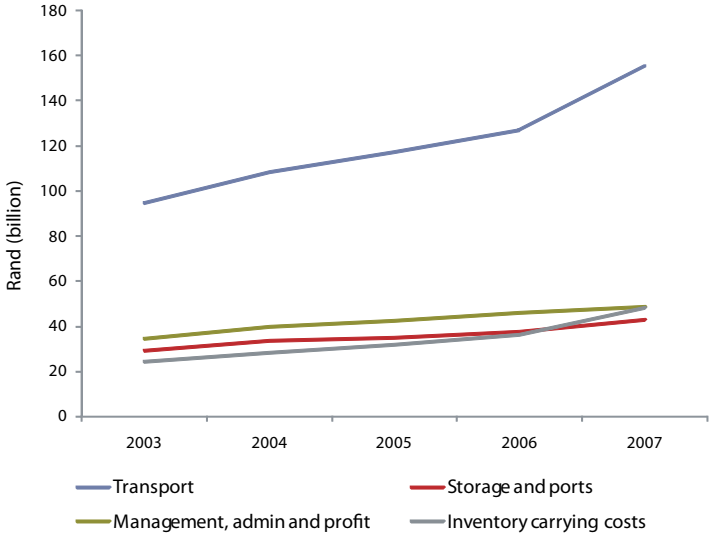


Figure 2: Logistics cost growth at 2000 constant prices (real)

This means that inventory carrying costs have doubled over four years and transport costs have grown by more than 50%. The actual logistics cost figures are depicted in Figure 3.

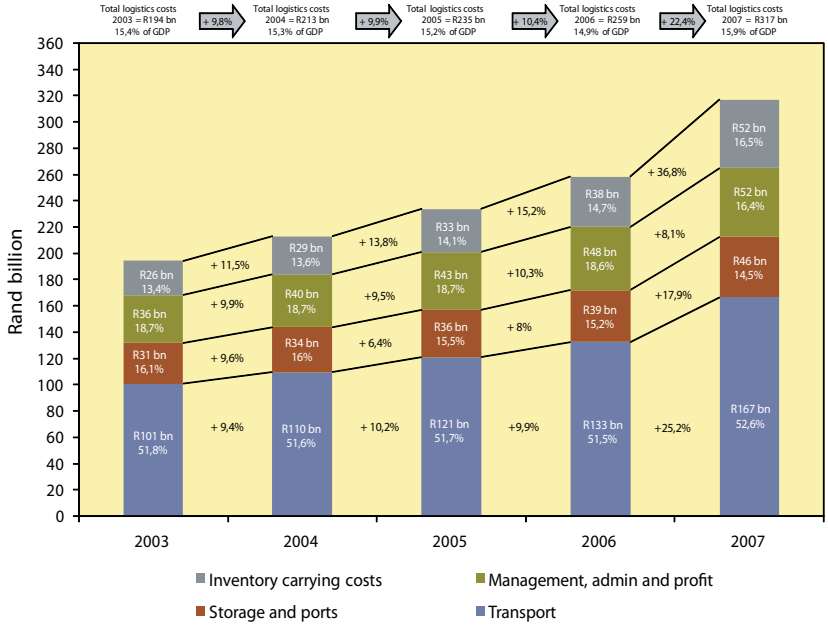


Figure 3: Actual logistics cost figures for South Africa

The significant growth in inventory carrying costs is further impacted by two key factors:

» The average interest rate for 2007 was 2% higher than for 2006, which contributed nearly R1 billion to the increase in inventory carrying costs
» In addition, on average 18,4% more stock was tied up in inventory (R393 billion versus R332 billion in 2006) and this contributed a further R13 billion increase in inventory carrying costs.

The double jeopardy of more stock in a high interest rate environment therefore contributed to an extremely poor performance in this stack element, with a concomitant impact on logistics costs in general.

One of the contributors to increased inventory is the long transport distances in South Africa, which not only lead to higher than normal transport costs, but also to added time that inventory is delayed (Figure 4).

The real interaction between inefficient transport and inventory delay is complex, as a direct relationship also exists between actual storage time and the delay in inventory as logisticians attempt to circumvent transport challenges.

Another part of logistics costs that experienced an increase, which is related to an additional delay in inventory, is storage. Table 3 shows the increments of this increase.

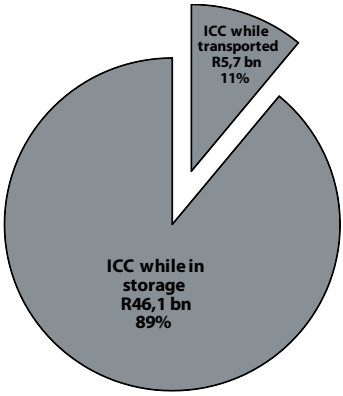


Figure 4: Transport's contribution to inventory delay financing inventory carrying cost elements

Table 3: The causes of increase in storage costs in 2007

Factor incurring change	R billion
Inflation	2,8
Increase in storage volume	0,4
Storage cost increases above inflation	1,7
Delay in inventory	2,2

In the case of storage the effect of inventory delay is additional time that goods require storage. This factor is external to the unit price of storage, which can either increase or decrease in line with, above or below inflation. Finally, additional volumes due to an increase in production will also have an effect on total storage costs.

SENSITIVITY TO EXOGENOUS FACTORS

Transport is an input into extraction, manufacturing and service processes just like any other input in the economy. The base commodity purchased can be described as ton-km and it is a fact that South Africa needs more of this commodity per unit extracted, produced or service provided than most countries in the world. Apart from that, unlike most other processes, transport is dependent directly on a risky and unpredictable core cost driver, i.e. the price of fuel. In 'normal' strategic procurement terms this input would be managed carefully and with clear strategies in mind. Often, in South Africa, this is not the case on a company, industry, infrastructure or regulatory level. That is why transport costs, as a percentage of GDP, can be expected to be erratic and exposed to global risks, as illustrated in Figure 5.

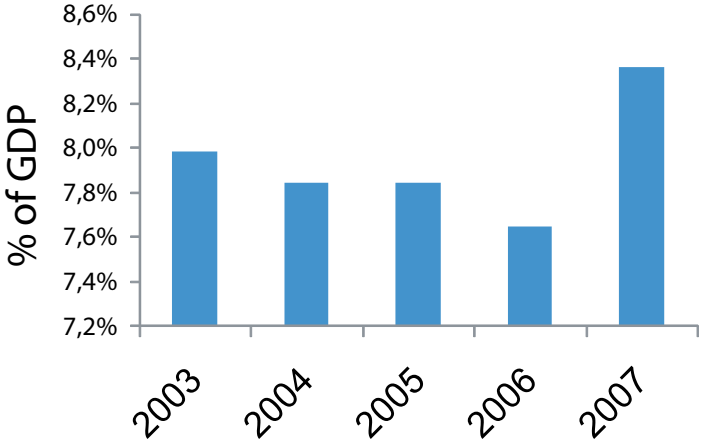


Figure 5: Transport costs as a percentage of GDP

From 1 January to 31 December 2007 the average diesel price increased by 32%. Fuel contributes 32% of all road transport costs and road transport's cost market share further increased to 90% in 2007, making South Africa increasingly vulnerable to fuel price fluctuations. Thus 29% of transport and 15% of South Africa's logistics costs are exposed to direct external factors (given the current configuration) and cannot be controlled by logisticians. Many other 'hidden' aspects are also outside the sphere of control, such as the additional cost burden on operations that are caused by ailing infrastructure. Furthermore, externalities that are not accounted for (such as congestion, accidents, pollution) add aspects that cannot be controlled directly on a firm level.

PRIMARY AND SECONDARY SECTORS

Logistics cost elements can also be distinguished between the primary and secondary sectors (Figure 6).

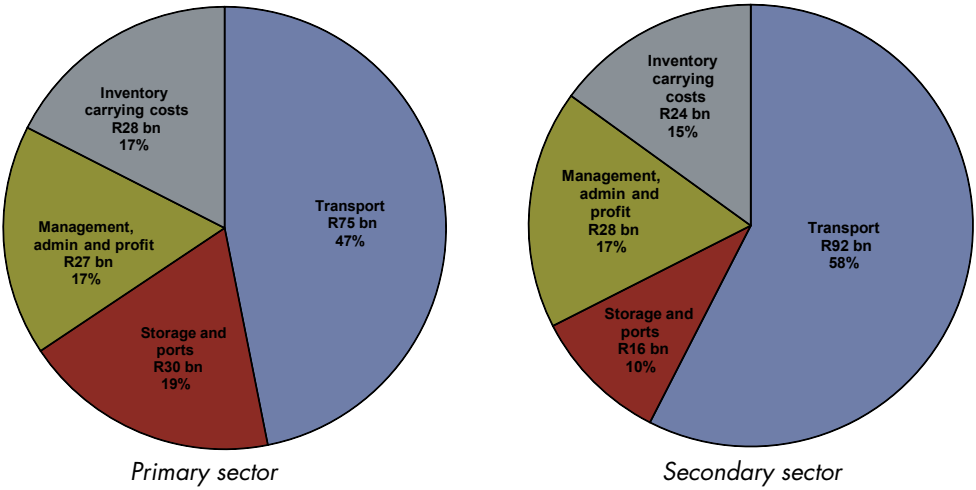


Figure 6: Primary and secondary sector logistics cost elements

The transport costs for the secondary sector is extremely high and if it is calculated as a percentage of value-add, it means that for every rand value added by this sector, 58% is incurred in transport costs. This is a massive burden on the global competitiveness of South Africa's manufacturing sector.

CONCLUSION

South Africa's current logistics configuration leads to unacceptable risk exposure to global upheaval. Whereas logisticians continually attempt better practices, the current modal configuration, infrastructure condition and lack of management information pose a total system risk. The core drivers of logistics costs are currently the price of imported fuel and the interest rate. Strategic procurement practices suggest, at minimum, that more transport output should be generated with local input. This could be achieved only by higher local fuel production or a switch of transport supply to a locally-generated power source such as rail. This switch can be enabled only by intermodal services being provided by road and rail operators in South Africa.

Transport remains the biggest contributor to logistics costs (and the biggest challenge in South Africa) and as such is analysed in more detail in the following section.

Land freight transport volumes and costs

Havenga JH, Simpson Z and Van Eeden J[10]

INTRODUCTION

South Africa's R167 billion transport costs described in the previous article are a product of volume and cost per unit of transport in the country. The drivers of these costs differ greatly per mode. To meaningfully impact South Africa's transport costs, an understanding of the country's modal configuration (i.e. the key transport modes) as well as the cost drivers for these key modes is therefore imperative.

METHODOLOGY

The National Freight Flow Model (NFFM) utilises the South African National Roads Agency's (SANRAL) Comprehensive Traffic Observation (CTO) yearbooks as a basis for the development of a current and historical view of freight traffic flows in South Africa. The model accounts for the differences between corridor, rural and metropolitan freight and the various carrying capacities of the types of trucks used. This is then collated and compared to actual rail data to develop views on market shares, corridor densities and overall investment strategies for South Africa.

A comprehensive freight demand model (FDM) developed recently allows for the disaggregation of freight into a much finer level of granularity, i.e. commodity, commodity characteristics, magisterial district origin and destination level. The two models, NFFM that is used in the State of Logistics report, and the FDM utilise completely different methodologies, i.e. demand-side based on gravity and truck observations. However, on a typology level the results correlates r^2 = 99,9%. This correlation increases the confidence in the results that are reported below.

MODAL CONFIGURATION

Road and rail are the predominant means of freight transport in South Africa (contributing 99% of all logistics costs), and therefore require close attention. The remaining 1% of costs is associated with other modes (0,08% with air, 0,29% with coastal shipping and 0,69% with pipelines).

South Africa's sea routes are not well developed for domestic shipping due to relatively high terminal costs, limited vessel and terminal capacity and inclement weather conditions. Plans are afoot to address these limitations, but no concrete advancements have been made. Air transport has a higher predominance in more advanced economies with high levels of

10 Stellenbosch University: Department of Logistics and Centre for Supply Chain Management (CSCM)

beneficiation, which is not yet the case in South Africa. Pipeline transport is increasing with the first private project coming on line and planned capacity expansion at Transnet Pipelines (Petronet), but contribution to overall costs are still low. All of these costs are accounted for in the cost model, but not discussed further in terms of modal configuration.

Close to 1,6 billion ton of freight was observed on the four different typologies in South Africa in 2007 (see Figure 7). Almost 1,4 billion ton was observed on road at an average transport distance (ATD) of 178 km, delivering 245 billion ton-km. Rail only contributed 205 million ton at an average transport distance of 629 km, delivering 129 billion ton-km.[11]

11 The model is an observation-based model (as opposed to a survey or gravity model). This means that freight is 'observed' or counted at 363 counting stations in the country and then allocated to a typology (corridor, rural, metropolitan or bulk mining). It is then further allocated to a specific sub-class, i.e. the Cape Town-Gauteng corridor or the Durban-Gauteng corridor. A vehicle travelling from Cape Town to Beitbridge, for instance, will be counted twice (once on the Cape Town-Gauteng corridor and once on the Gauteng-Beitbridge corridor). In order to enable road and rail comparisons, the actual rail data are classified in the same way. Since gravity modelling results are now also available and actual rail data are available, the double-counting percentage can be estimated and is around 10%.

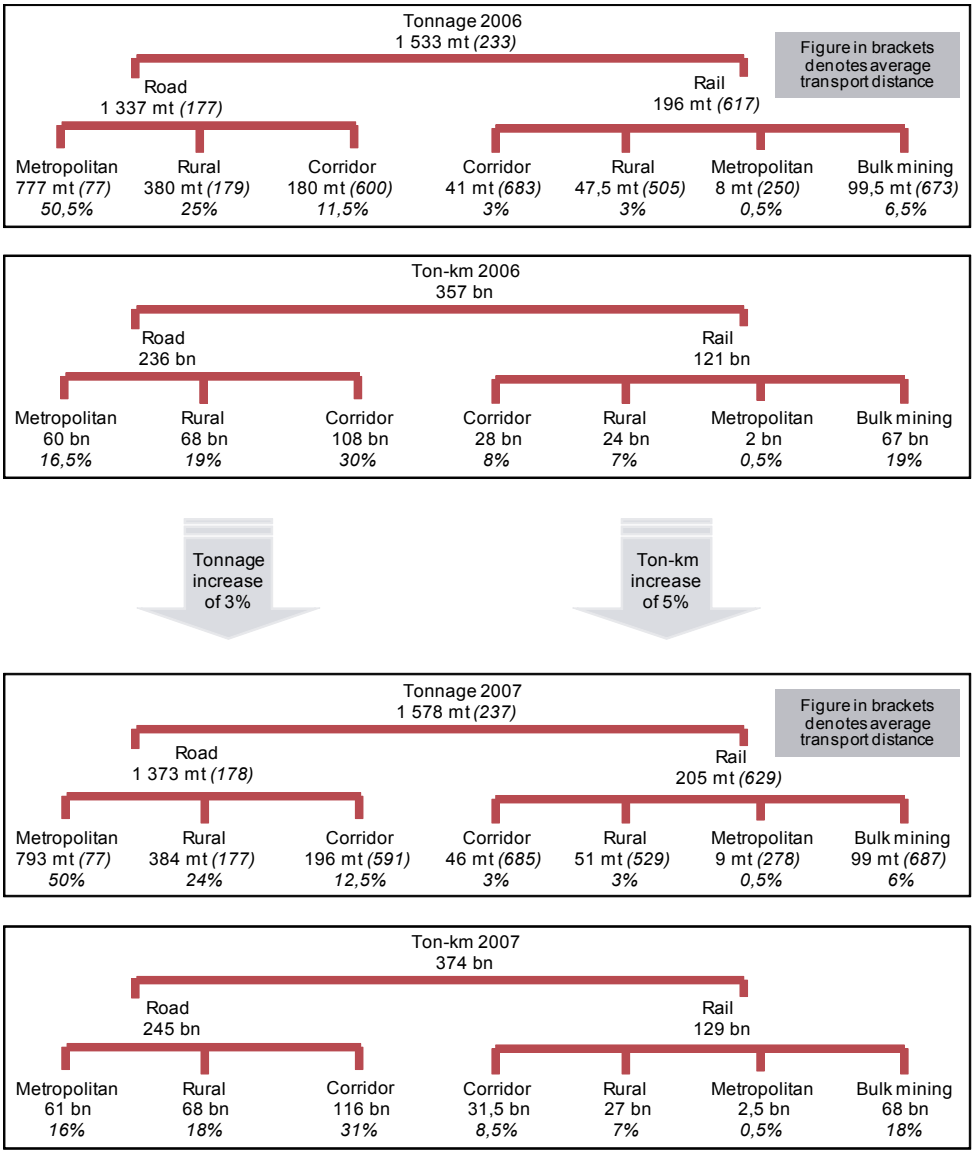


Figure 7: Modal distribution of road and rail freight in South Africa

BULK MINING

Most bulk mining in South Africa is transported by rail, mostly on world-class 'export machines', i.e. the coal line between Mpumalanga and Richards Bay in the east and the iron ore line between Sishen and Saldanha in the west. Together 99 million ton (6% of all tons observed) over an ATD of 687 km produces 68 billion ton-km (18% of all ton-km produced by all modes). This form of transport is by far the highest contributor to rail market share and also the most lucrative rail transport in the country. It has no road alternative and is 'captured' rail traffic.

CORRIDORS

South Africa's unique spatial challenges require more corridor transport relative to the size of our economy than most countries in the world. In fact, it is hypothesised that only Russia's situation might be worse, though it is not known. Of the 242 million ton required over an ATD of 608 km (147 billion ton-km), rail has a ton market share of 19% and a ton-km market share of 21%. The development of corridor transport since 1993 is depicted in Figure 8.

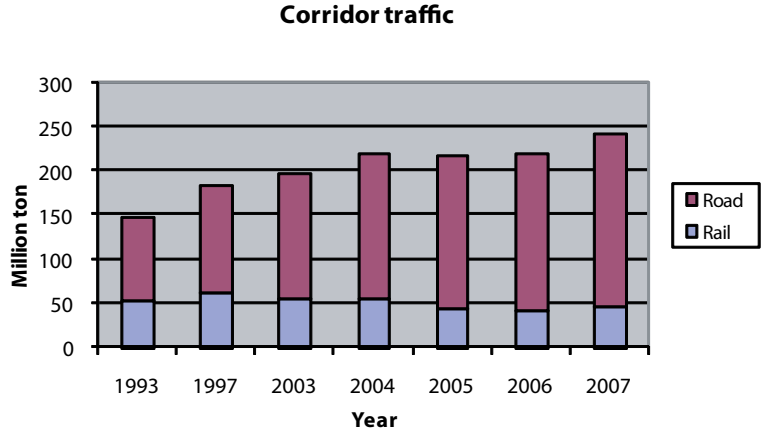


Figure 8: Corridor transport in South Africa since 1993

While rail has managed to halt the loss of corridor ton transported over the past few years, the significant growth in corridor freight movements has been captured by road. Corridor freight's compound annual growth rate (CAGR) since 1993 has been 3,6% with a market share decline for rail from 36% in 1993 to 19% in 2007 (a CAGR decline of 4,6% over the period).

RURAL AREAS

Of the 435 million ton required over an ATD of 218 km (95 billion ton-km), rail has a ton market share of 12% and a ton-km market share of 28%. The development of rural transport since 1993 is depicted in Figure 9.

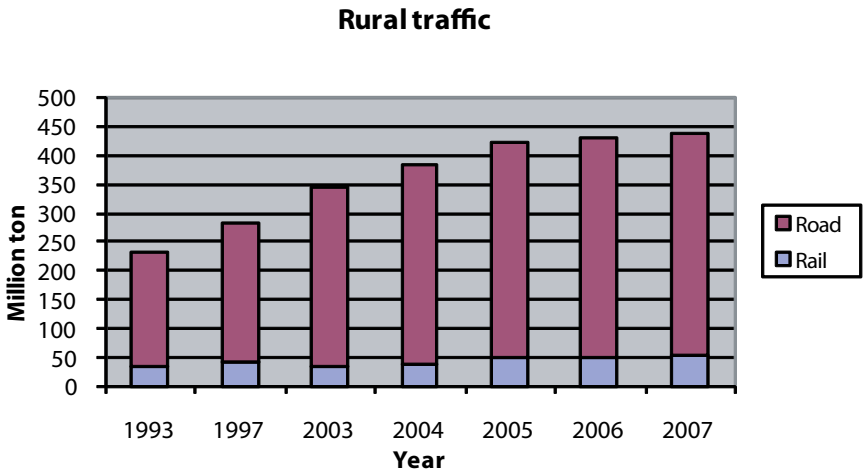


Figure 9: Rural transport in South Africa since 1993

Rural freight's compound annual growth rate (CAGR) since 1993 has been 4,7% with a market share decline for rail from 14,4% in 1993 to 11,7% in 2007 (a CAGR decline of 1,5% over the period).

METROPOLES

Of the 802 million ton required over an ATD of 79 km (63 billion ton-km), rail has a ton market share of 1% and a ton-km market share of 4%. The development of metropolitan transport since 1993 is depicted in Figure 10.

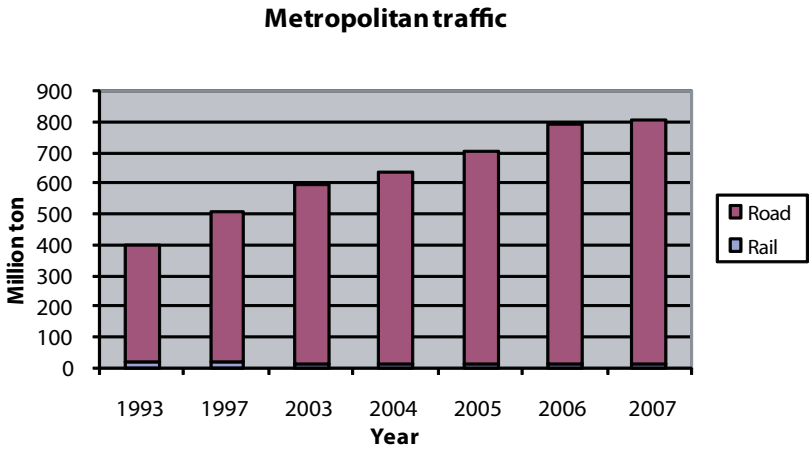


Figure 10: Metropolitan transport in South Africa since 1993

Metropolitan freight's compound annual growth rate (CAGR) since 1993 has been 5,2% with a market share decline for rail from 5,1% in 1993 to 1% in 2007 (a CAGR decline of 10,9% over the period).

OVERALL MARKET SHARE

The road/rail percentage split drives the question of modal shift on a macro-scale and informs the possibility of improving competitiveness through modal reconfiguration, or not. As evidenced in the previous paragraphs, it can be expressed as overall ton market share, overall ton-km and overall costs or income (see Table 4).[12]

12 For road transport it is often (in fact mostly) an 'in-house' or 'private' transport cost and not for reward. Transnet Freight Rail's business model does not include taking ownership of freight, which means that almost all rail freight is for reward. It is therefore more prudent to refer to costs (meaning the costs of transport) and income meaning tariffs. An attempt is however made here to split the total road transport into outsourced and in-house, based on unverified work in progress by StatsSA. It is acknowledged that the figures are unofficial and subject to future correction, but at least these begin to provide a rough indication.

Table 4: Market share for land freight

		Ton in millions	Ton-km in billions	Costs or income in R bn
Mode	Rail	205	129	14
	Road-for-reward (outsourced)	279	58	27
	Road as ancillary traffic (in-house)	1 094	187	124
% Market share	Rail	13%	34%	8%
	Road-for-reward (outsourced)	18%	16%	16%
	Road as ancillary traffic (in-house)	69%	50%	75%

Although rail provides 34% of transport output (ton-km), only 13% of tons shipped are by rail and rail receives only 8% of the proceeds available for transport in South Africa. It also means that road-for-reward accounts for only 16% of all road transport costs and that rail's market share of outsourced traffic is around 36%.

Another approach to market share (and probably the most important) would be around 'contestable' traffic. It is, after all, not really feasible to shift traffic onto road or rail that could not travel on the other mode, effectively. This would mean that:

- 'Captured rail' traffic (i.e. bulk mining) is excluded
- 'Captured road' traffic (i.e. metropolitan and to some extent rural) is excluded
- It is assumed that even ancillary road transport on corridors should be a target for modal shift for a railroad.

This means that for contestable traffic, only corridor market share should be considered (including road ancillary traffic) and this is reflected in Table 5.

Table 5: Corridor market share analysis

		Ton in millions	Ton-km in billions	Costs or income in R bn
Volume	Rail	46	32	7
	Road	196	116	53
% Market share	Rail	19%	22%	11%
	Road	81%	78%	89%

Intermodal transport as a 'mode' is not depicted, as no domestic intermodal solutions exist for South Africa.

ROAD COST DRIVERS

The cost drivers for rail transport are not yet made public, but can, for the biggest portion of land freight (i.e. road costs equalling 91% of all costs) be determined from the logistics cost model discussed above. See Figure 11 for the contribution of different road cost drivers.

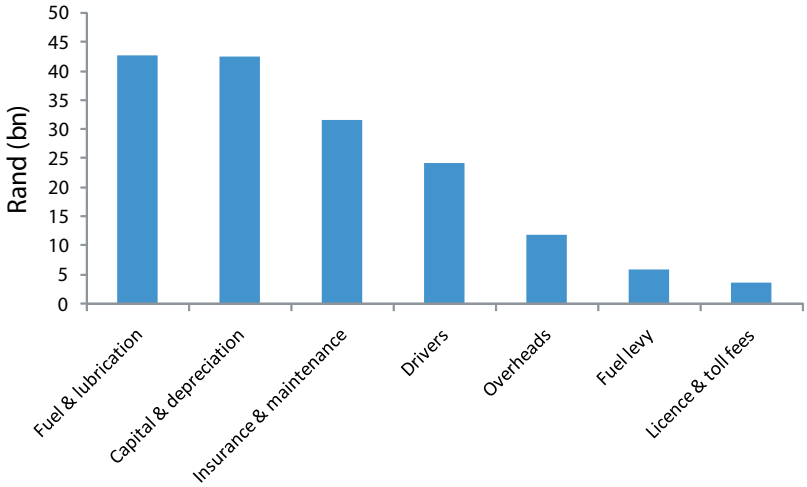


Figure 11: Road cost drivers

Fuel is, by far, the most difficult cost driver to control. South Africa should consider better transport options, especially for corridor transport, where intermodal solutions could alleviate congestion, save costs and reduce global risk.

CONCLUSION

The combined picture provided by the logistics cost model and the land freight transport model clearly point to an unsustainable situation. The core question remains – when will South Africa see changes that will reduce risks and costs and provide the domestic intermodal solution that the country clearly requires.

INDUSTRY-LEVEL PERSPECTIVE

The value of logistics

Rossouw C[13], CSCMP

INTRODUCTION

Most logistics analyses and commentary focus on costs and challenges. Unfortunately, the availability and integration value of logistics are often neglected. In many ways, this causes an incorrect mindset; as logistics and supply chain professionals, we underestimate the contribution we make to the businesses that employ us and the economy that surrounds us.

PRODUCT AVAILABILITY AND CONSUMER SATISFACTION

Originally, logistics was simply defined as "getting the right product to the right place at the right time". Other dimensions of quantity and quality were added as the definition matured. Today, all definitions of logistics include reference to the need to meet consumer requirements.

> *"Logistics Management is that part of Supply Chain Management that plans, implements and controls the efficient and effective flow forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in* ***order to meet customers' requirements.****"* Council for Supply Chain Management Professionals (CSCMP)

If the availability of consumer products is used as the measure of the state of logistics in South Africa, we can be proud of world-class status. As South African consumers we have access to a wide range of products in perfect condition at almost 100 000 points of purchase, and that in a relatively harsh logistics environment. The logistics effectiveness of some consumer-centric value chains deserves mention:

- Our cold chain is highly effective, especially considering our climate. Perishable products like fresh milk and meat are made available across the country in packaged format on a daily basis. Using first world standards, this is par for the course. Comparing it with the rest of the developing world, those value chains that have to deal with the same environment as us, it is actually amazing.
- Although slightly less traditional to consider, the South African banking system is a very effective value chain. It provides and collects cash across our vast geography, providing same day value (no delay in passing the ownership of cash), with single days of cash

13 Volition – Supply Chain Specialists

holdings as inventory, within a relatively hostile environment; with almost 100% service level.

In many ways we are spoilt. Invariably things do go wrong – when fuel stations ran dry in the December peak season of 2007, we were up in arms. The reality though is that extensive growth in fuel demand was handled without any capacity investment in the fuel pipeline.

It would be true to recognise that a lack of investment in underlying capacity is compromising the efficiency and effectiveness of logistics in South Africa. The demise of our port and rail infrastructure impacts the availability of raw materials for manufacturing. Procurement and logistics professionals find ways to deal with this, ensuring that our factories continue to produce products required by local and international consumers. In its own right, this ability illustrated the value of logistics – a science that is focused on results.

AVAILABILITY IN OTHER TYPES OF SUPPLY CHAINS

The value of logistics is slightly less obvious in the world of engineering. When we consider asset-centric value chains, the value of logistics is about maximising the utilisation of high-investment equipment. This means that the logistic system is responsible for ensuring the right parts are available at the right time, right place, etc. If we measure the state of logistics by our success in this arena, we can also be proud. Yes, we have challenges – but South Africans operate world-class plants of world-class scale, and that in locations that are significantly removed from upstream support systems.

Logistics also has value to support service value chains, best illustrated in terms of social services. To provide health care or education, specific products need to be made available to support the service required by the beneficiary. The logistics system that supports medication and books is probably less effective than we aspire to. Measuring the value of logistics, the South African state of social services logistics is thus not world-class. Understanding that logistics is about much more than costs and challenges provides the impetus to drive improvement in these value chains.

INTEGRATOR OF BUSINESS FUNCTIONS

In addition to providing product availability, logistics as a science has a very important value to integrate business functions. The CSCMP definition of logistics boundaries and relationships include that "logistics management is an integrating function, which coordinates and optimizes all the logistics activities". This means that logistics is not merely about achieving the lowest transport or storage costs, but it is about finding the lowest overall costs for the operation. Given that any system operates best if all the variables are considered holistically, we

should understand that logistics has a large contribution to make towards overall operational efficiency.

To illustrate, some logistical trade-offs are worth considering:

- In general, we accept that inventory provides buffers between operations and locations to facilitate transport utilisation and efficiency. Simplistically, that means we create unit loads (pallets) and we fill vehicles with more products than required immediately at the forward location. The costs of the incremental inventory and storage are lower than the transport savings (for when smaller and/or half-empty trucks would have been used). The challenge is to avoid having too much inventory and product storage in order to ensure transport utilisation, thus compromising the balance of integration.
- Balancing the load of activities in logistics operation provides the opportunity to achieve the most output with the least resource inputs. Typically this means multiple shift factory operations or relief drivers on long-distance trucks. The shift allowances may well increase the costs of the specific function, but the overall value chain achieves higher output and thus lower costs per unit. An interesting challenge is to achieve 24/7 operation in all elements of the consumer value chain, allowing us to relieve capacity pressure on our road infrastructure.

Understanding that the state of logistics should be measured in terms of consumer satisfaction and the total effectiveness of the value chain provides valuable guidance to logisticians and supply chain professionals.

Logistics (and supply chain management) cost drivers

De Swardt A[14]

INTRODUCTION

The year 2008 was volatile and the global economy experienced one of its worst years in history with oil and fuel prices roller-coasting. The prospects of supply chain disruptions forced manufacturers worldwide to take a closer look at their risk management strategies.

Bearing in mind that opportunities exist despite these challenges, Winston Churchill said: "The optimist sees opportunity in every danger; the pessimist sees danger in every opportunity." Surviving and thriving in the logistics and supply chain management industry in and beyond 2009 will require skilled and experienced practitioners who recognise the dangers and who are able to spot the opportunities turning it into profitable business. The logistics industry will be characterised by a number of trends, including an aggressive approach towards restructuring supply chain operations, increased outsourcing and risk management – all to reduce costs and mitigate risks in the prevailing and unpredictable economic situation.[15]

In the context of this environment, considering logistics (and supply chain management) cost drivers, the spotlight falls on three aspects: fuel, skills development (people) and collaboration (the key to controlling and optimising logistics costs).

FUEL

The oil price reached a high of $147 a barrel in July 2008 after steep increases during the first half of the year. The economic crisis with a subsequent reduction in demand for oil pushed the price down to a low of $36 a barrel in January 2009.[16] The rising fuel price in 2008 has in part driven logistics costs to unprecedented levels (Figure 12).

14 Imperial Logistics
15 Outsourced Logistics – Look Out For 2009 – 1 December 2008
16 Reuters - Oil falls $1 to near $36 as major economies sink – 15 January 2009

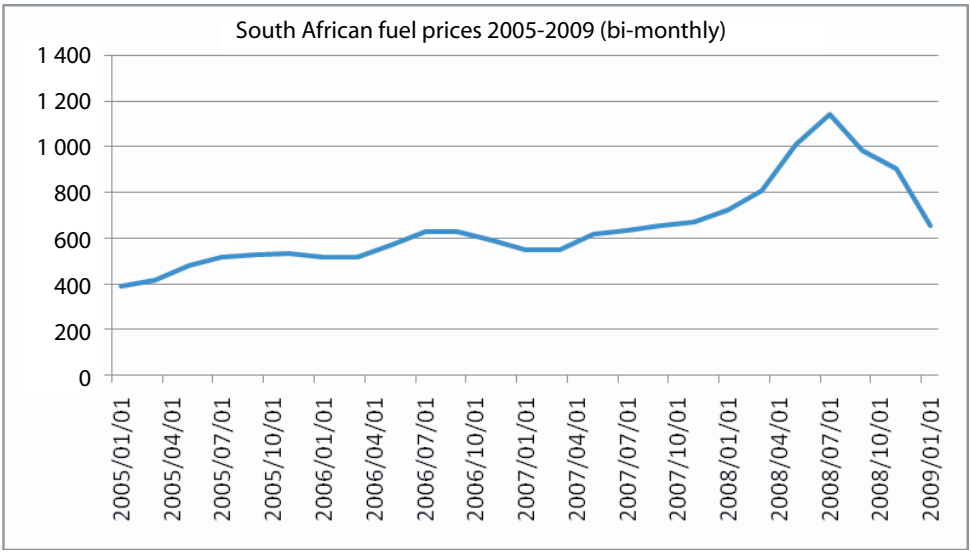


Figure 12: South African fuel prices from 2005 to January 2009[17]

In managing risks due to increases in fuel prices, logistics companies need to pro-actively search for innovative ways to reduce the impact of fuel costs on their supply chains. Consuming less fuel leads to lower costs, however small improvements can make a significant difference, especially when economies of scale come into play. Optimising fleets and improving driver skills can have a significant impact on lowering fuel consumption. In addition, companies need to have efficient fuel consumption programmes in place whilst evaluating the benefits of alternative fuels.[18]

Fuel procurement is critical and needs to be evaluated continuously to ensure best sourcing options and exchange rates. The challenge remains to achieve the right balance between procuring at spot-prices versus securing prices over a longer period to take advantage of bulk procurement.

South Africans can also circumvent this phenomenon by the development of its rail infrastructure, as approximately only 13% of transportation currently takes place by rail. Additionally, transport costs by road contribute roughly 55% to total logistics costs, while transport by rail makes up about 20% of the logistics cost component.[19]

17 SA Petroleum Industry Association
18 Modern Materials Handling Blog - Logistics: The UPS recipe for risk reduction. 9 January 2009
19 Association of American Railroads, Washington – What's more fuel efficient than the newest hybrid car? A freight train. 21 May 2008

Transnet planned to invest more than R9 billion in rail infrastructure projects by 2009 that will improve the situation.[20] However, logistics service providers (LSPs) need to expand and enhance their capability to integrate with rail and convince customers to move certain cargo to rail. Collaboration will again be pertinent in ensuring long-term sustainability, reliability and cost-effectiveness.

While increases in fuel prices are bad news for all, it also exerts positive pressure on supply chain professionals to review collaboration together with LSPs and to find intelligent solutions, decreasing the high demand for transportation and reducing logistics costs.

SKILLS DEVELOPMENT

People remain a big cost in any logistics operation and skills development is therefore critical to improve the effectiveness of these resources. However, skills development remains a huge challenge in South Africa.[21] Each year the country is falling further behind its counterparts in tertiary education and training. The growing lack of skills not only impedes development, but also has a significant cost attached to it. Improving the nation's capability to leverage continental and international trade opportunities supported by best practices, supply chain management skills development needs serious attention.[22]

Maintaining and improving their competitiveness, world-class companies typically spend 3% of turnover on skills development and training. The Wisconsin Next Generation Manufacturing Survey found that 70% of world-class companies ensure that their employees get at least 20 hours of specialised skills training every year. These companies focus strongly on improving supply chain management and collaboration skills as efficiency, flexibility, response time and delivery standards are increasingly becoming differentiating and cost-saving factors.

Although the benefits of best practices, improved operations, increased productivity and profitability far out-weigh input costs, South African companies on average still spend only less than 1% on training. The development of the logistics industry is increasingly driven by knowledge and technology innovation. As education and training go hand in hand with industry development, it is vitally important for South Africa to increase investment in tertiary education and skills development to improve the country's competitiveness in the global logistics market.[23] It is therefore imperative that industry and government work much closer together.

20 Driving down costs is key for SA's Logistics success. M Donohoe. 24 November 2008
21 Engineering News – Local industry lagging – lack of skills to blame. S Haskins. 16 November 2007
22 Outsourced Logistics – Skilling the existing workforce. 16 December 2008
23 Ibid.

COLLABORATION

Outsourced logistics has experienced substantial growth and promises further growth.[24] The major drivers behind this trend include improved efficiency and effectiveness, better risk management, improved service and reduced logistics costs. However, achieving measurable, sustainable results in challenging times requires a collaborative effort between supply chain executives and their LSPs.[25]

Although the South African outsourced logistics market is relatively small in global terms, many manufacturers and retailers realise the benefits and are increasingly looking to outsource their logistics services to LSPs that can best manage the processes and underlying costs in the supply chain. However, some companies still do not understand the supply chain sufficiently and underestimate their logistics costs. The harsh reality of increasing costs due to increased supply chain complexity and increased fuel prices drives industry towards an approach of collaboration.[26]

Supply chain collaboration is characterised as a joint effort between multiple parties in the supply chain to achieve specific goals, including optimisation and profitability. It is critically important to understand the source of and unlock the real costs and profitability within the supply chain.[27] It is not a matter of cutting rates, collaboration focuses on optimising total logistics and supply chain costs focusing on the right things. This is where the value proposition for experienced LSPs comes to the fore.

In turbulent times, supply chain executives demand more value from their LSPs and depend on their expertise to keep afloat and to enhance competitiveness. Various types of LSP models exist and one needs to determine the application fit for purpose, e.g. third party logistics (3PL), fourth party logistics (4PL) and/or lead logistics provider (LLP).

Significant cost savings and improved efficiencies are achieved through effective supply chain optimisation. This is supported by the implementation and use of appropriate technology. An example of this is through track-and-trace technology whereby real-time information determines whether distribution points have the right inventory and right inventory levels.[28] Real-time information creates visibility and details of individual lanes, routes and facilities become apparent. The success of supply chain collaboration is built on information. All parties need to have visibility and sufficient information to make the best decisions.[29] Optimising

24 Hindu Business Line – Contract Logistics gaining ground. 22 December 2008
25 Logistics News – Collaboration – Key to controlling rising logistics costs. September 2006
26 Ibid.
27 SupplyDemandChain Executive – Supply Chain Cost Reduction – Approach with Aggression, Intelligence. 13 January 2009
28 Dutton G – The rise of the 4PL. 5 January 2009
29 Logistics News – Collaboration – Key to controlling rising logistics costs. September 2006

the supply chain is no longer a question of getting the best rate between points A and B. Instead, the question arises as to why and how products are being shipped between points A and B at specific given times.[30] Factors such as transportation modes, operating hours, peak times and congestion as well as turn-around times are taken into account. This creates an environment whereby the supply chain becomes a competitive advantage and ensures improved profitability for all parties.

Partnerships with LSPs mean that companies can focus on doing what they do best. With outsourcing, control could be lost and it's therefore important to work closely with LSPs to ensure the right level of detail and cultural fit are achieved.

CONCLUSION

Given the changes in supply chain economics due to industry development on the one hand and disruptions on the other, it is apparent that companies are looking for smarter ways to operate and manage their logistics and supply chains. The rising cost of logistics alone is a catalyst for companies to reassess their priorities, shed non-core activities, outsource logistics services and work closely with LSPs to find innovative and clever ways to manage risks and increase competitiveness.

This trend is likely to persist, which provides LSPs with opportunities to upgrade their capabilities, offer value-added services through a collaborative approach to improve performance, efficiency and effectiveness.

30 Dutton G – The rise of the 4PL. 5 January 2009

Skills in logistics – An uncertain future

Havenga JH[31]

INTRODUCTION

Infrastructure as an important production factor received significant attention in the previous surveys and justifiably so, for failings in infrastructure delivery and maintenance hamper growth and constrain logistics performance. South Africa, by all known global competitiveness measures,[32] is in serious trouble as far as the labour production factor is concerned and programmes to address labour and training issues have been less than successful.[33] In order to understand this situation better current productivity should be researched and future needs analysed, but scant information is available as is common for most studies in the logistics field.[34]

CURRENT PERFORMANCE

Current performance in terms of skills for the transport, storage and communications (TSC) sector can be considered by looking at employment demand, employment supply, skills levels and labour productivity factors.

Demand

Figure 13 depicts formal employment growth according to official statistics.

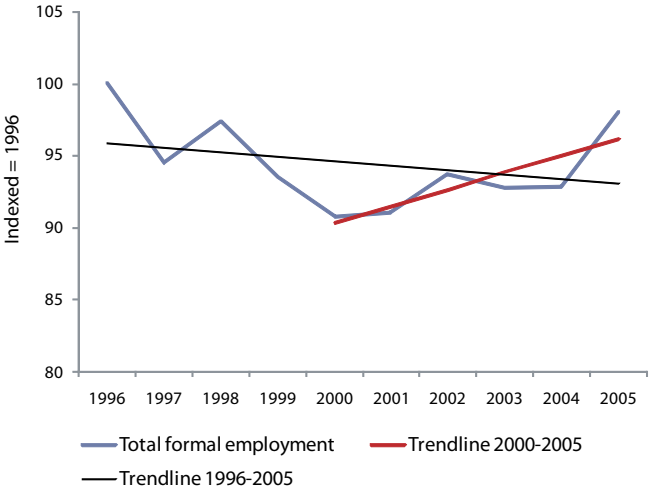


Figure 13: Formal employment growth for the TSC industry 1996—2005[35]

31 Stellenbosch University: Department of Logistics and Centre for Supply Chain Management (CSCM)
32 Global Competitiveness Report. Available at: http://www.gcr.weforum.org
33 Mail&Guardian, 24 April and 30 July 2007
34 Department of Transport (DoT), Moving South Africa, 1998, p 3, 5, 11, 178-179
35 StatsSA OHS (October Household Survey), LFS (Labour Force Survey)

After an initial decline up to the year 2000, formal employment has risen steadily, but is still below 1995 levels.

Employment according to the three TSC subsectors is depicted in Figure 14.

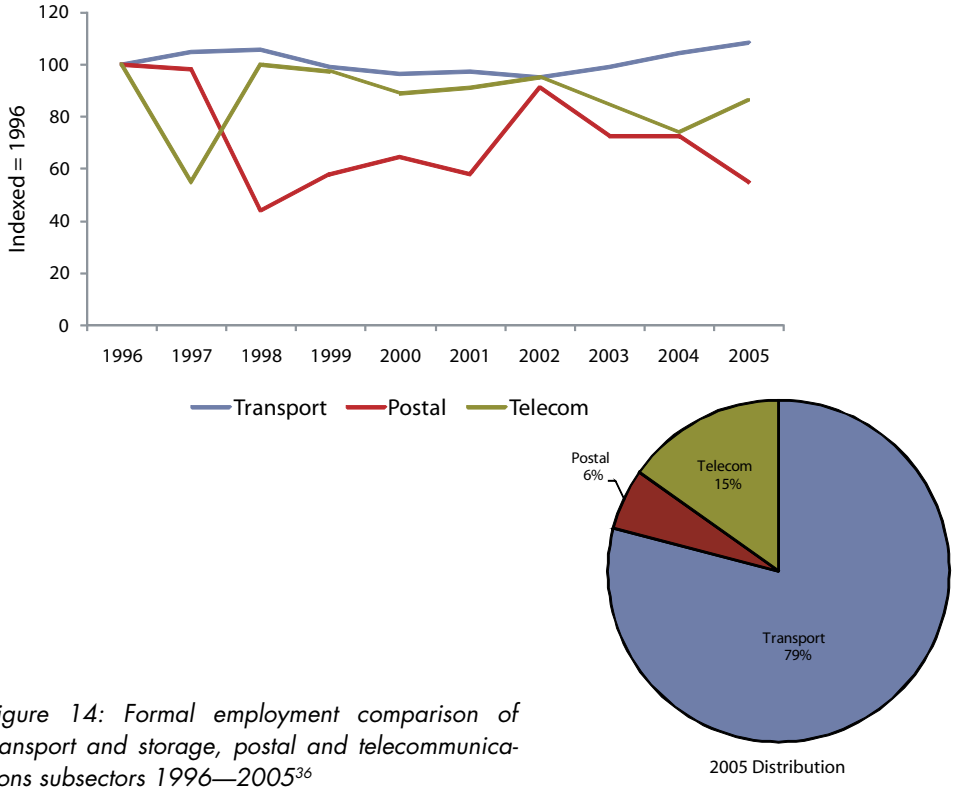


Figure 14: Formal employment comparison of transport and storage, postal and telecommunications subsectors 1996—2005[36]

Only the transport subsector grew to levels higher than a decade ago. The telecommunications subsector has shown considerable technological and economic growth (driven by new technologies), but with lower employment. South Africa's transport subsector benefits less from global improvements and is experiencing serious congestion, cost and capacity challenges. This situation might explain why transport employment growth is faster than for the other two subsectors where automation is more prevalent. Postal employment is declining as a result of the declining nature of the original technology for postal services. Advances in postal technology are included in the telecommunications subsector and sometimes even in business services.

36 StatsSA OHS and LFS

The transport subsector is further disaggregated in the freight and passenger utilities as depicted in Figure 15.

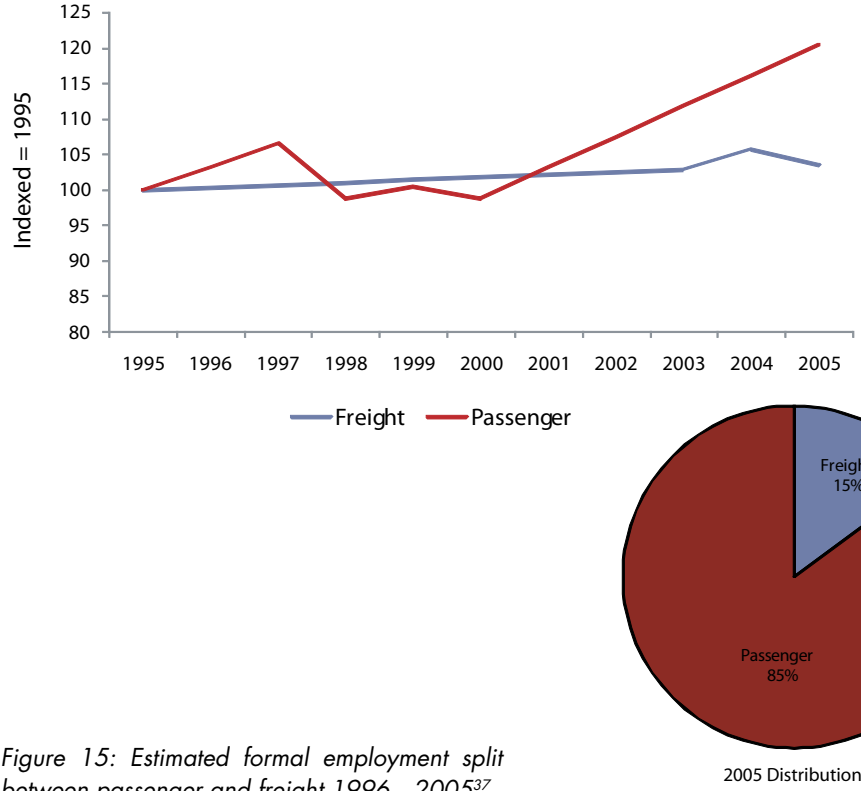


Figure 15: Estimated formal employment split between passenger and freight 1996—2005[37]

Passenger transport is driven by a growing second economy supported by migrant labour and porous borders. Freight transport remains constant as a result of structural problems in the freight transport market that have not yet been addressed.

Informal employment in the transport subsector is high but only a small portion of this is reported in recorded official statistics. Unrecorded statistics (such as statistics for taxis) suggest that 10 times more people work in road passenger transport than what is officially reported and that total informal employment for TSC is around 50%.[38]

37 Stellenbosch University modelling, 2008, Statistical Release P7101, 2002, unpublished Transnet statistics, De Wet, 2003, p 19

38 StatsSA. P7000. 2005 and Ntuli Z. 2005. Move to regulate taxi industry. Available at http://www.southafrica.info/what_happening/news/taxidrivers.htm

Transformation strategy successes are mixed. Female employment is rising fast and an overall level of 22% was reached by 2005 (by 2005 less males worked in the industry than 10 years ago, but the number of females grew by 60%). The employment distribution for all races has remained flat except for Indians where the number has doubled from a low base (by 2005 6% of all workers were Indian). Between 1995 and 2002 the workforce became progressively older, but this trend was reversed in the last three years.

In summary, demand side analysis indicates that employment figures remained mainly flat or even declined slightly for TSC, driven by declines in postal and telecommunications employment. Transport employment is growing slightly but mostly because of passenger transport employment growth, which is the area with the most informal employment. The informal nature of employment (around half of employment in TSC and almost all employment in passenger transportation are not measured) is disturbing and a major challenge for planning. Female and Indian employment is rising, but other transformation challenges are not met.

Supply

Supply-side challenges manifest themselves to a large extent in the mismatch of skills, in so far as the characteristics of the available pool of potential employees do not satisfy labour demand regarding specific qualifications and skills. This is the result of, among others, the debatable quality of training institutions and teaching capital, incorrect and/or inappropriate fields of study offered by training institutions, the lack and/or incompleteness of overarching management information on the labour market (this is fragmented and incomplete), the inability of learners to make the transition from school to further education and training facilities, universities and technikons, as well as insufficient communication and collaboration between enterprises and training institutions.

While approximately 25% of South Africa's budget is awarded to education, some schools still lack basic services, learning materials and teachers.[39,40] A major deficiency is teacher skills; a substantial number of South Africa's public school teachers are underqualified and only 12% have a postgraduate degree. The number of teachers has increased by 12%, but the percentage with only grade 12 has increased by 17% and the percentage with a postgraduate qualification has decreased by 6%.[41]

Grade 12 pass rates have been improving steadily, though recent decreases have been recorded. The training levels caused by poor teacher skills is a bigger concern and the actual number of learners who passed mathematics decreased to very low levels between 1995 and

39 SAPA 2007. Skills survey slams SA education. Available at http://www.iol.co.za/index.php?set_id=1&click_id=105&art_id=nw20070620131754606C434318 [20/06/2007]

40 The Presidency. 2007. Development Indicators Mid-term review. RSA, June 2007. Available at www.info.gov.za/otherdocs/2007/developmentindicator/education.pdf

41 Skills and Vacancies project. 2006. Available at http://www.da.org.za/da/Site/Eng/campaigns/DOCS/SkillsVacancies_Project_2006.doc

2005.[42] Science, engineering and technology (SET) pass rates are better and higher grade pass rates improved from 15% to 25%, which means that the actual number of SET graduates increased from under 4 000 in 2001 to over 11 000 in 2005.[43]

It is often argued that the quality of South Africa's grade 12s is not acceptable in a global context and could have negative effects on the economy and is also one of the causes of unemployment of school leavers. Many school leavers do not have marketable skills or enough training opportunities. While young people suffer debilitating unemployment, there are half a million job vacancies that cannot be filled.[44,45] Grade 12-level unemployment rates have increased from 25% to 40% since 1995 and tertiary-level unemployment rates from 6% to 15%.[46]

Once grade 12s leave school, the next challenge is to receive a postgraduate science and technology education. Businesses often report having to bring in skills from abroad for major projects, not because South Africa lacks the relevant skills, but because the quality of those skills is so poor that people need to be retrained (Skills and Vacancies project, 2006).

Figure 16 reflects the fields of study that have contributed to graduate output from universities and technicons over the past decade.

The growth rates for all fields (except marine engineering that is growing fast from a low base) are unacceptable and for many disciplines lower than the growth rate of the economy over the same period. The percentage of students who obtained a postgraduate qualification did, however, improve. The relative portions of African and female graduates are improving as well.

42 The Presidency. 2007. Development Indicators Mid-term review. RSA, June 2007. Available at www.info.gov.za/otherdocs/2007/developmentindicator/education.pdf
43 Department of Labour. 2006. State of Skills in South Africa. Available at www.labour.gov.za
44 Pandor N. 2005. Address by the Minister of Education at the launch of the National Qualification Framework Support Link. Pretoria. 6 June 2005. Available at http://www.saqa.org.za/show.asp?include=docs/sp/sp0606-05.html
45 SAPA. 2007. Boost for Maths and Science. Sunday Times. 19 August 2007
46 JPC International. 2005. Employment Trends in South Africa

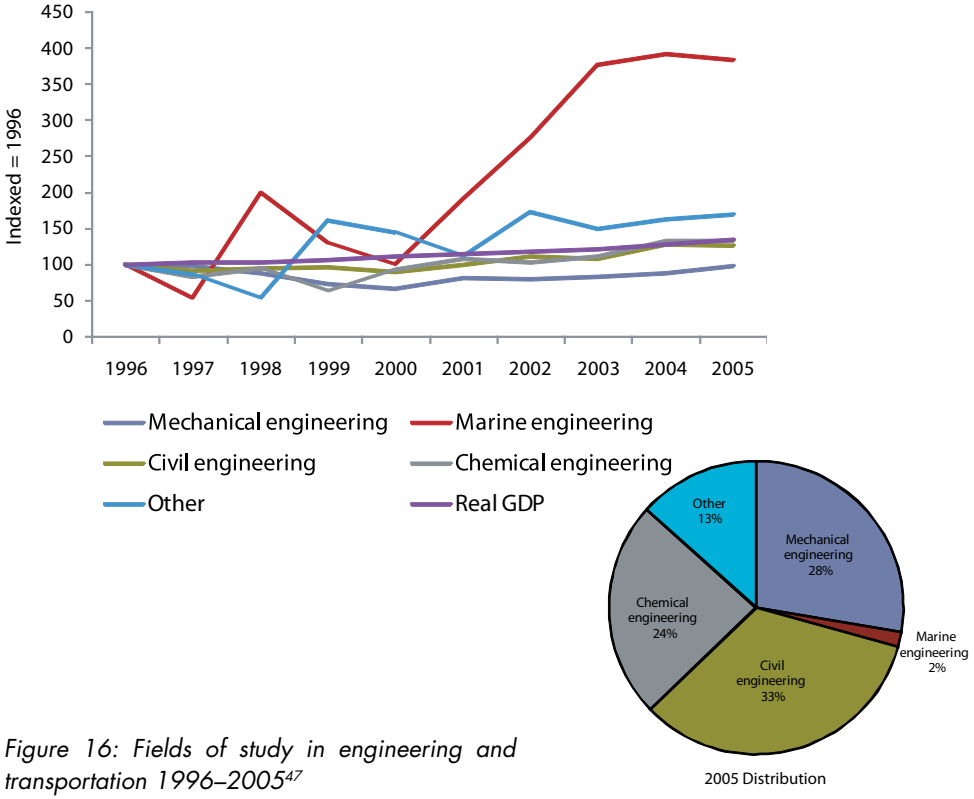


Figure 16: Fields of study in engineering and transportation 1996–2005[47]

In summary, supply side analysis suggests that all indicators, in relation to the economy, are declining. Grade 12 teaching inputs are poor and mathematics pass rates are still unacceptable. Engineering higher education and training graduates are far below what is needed in the economy and the gap between current growth, required growth and what is actually delivered is widening. At the same time life expectancy is lowering and net migration worsening over time. TSC is, in fact, critically undersupplied in terms of skills.

Skills levels

Skills levels refer to current skills of workers already in the industry. Skill bands have been identified in accordance with the NQF schema by Kraak.[48] The data drawn from the OHS and LFS surveys indicate that half of the collective workforce holds less than a Grade 12 certificate, whilst 44% hold a Grade 12, college and/or a technikon national certificate and/or diploma. The remaining 6% hold a higher educational qualification (i.e. one or more degrees).

47 HEMIS (Higher Education Management Information System)

48 Kraak A. 2005l. Human resources development and the skills crisis in South Africa: the need for a multi-pronged strategy. Journal of Education and Work, Vol. 18(1), p 57-83

Figure 17 reflects the distribution of the average skills presented over the 10-year period.

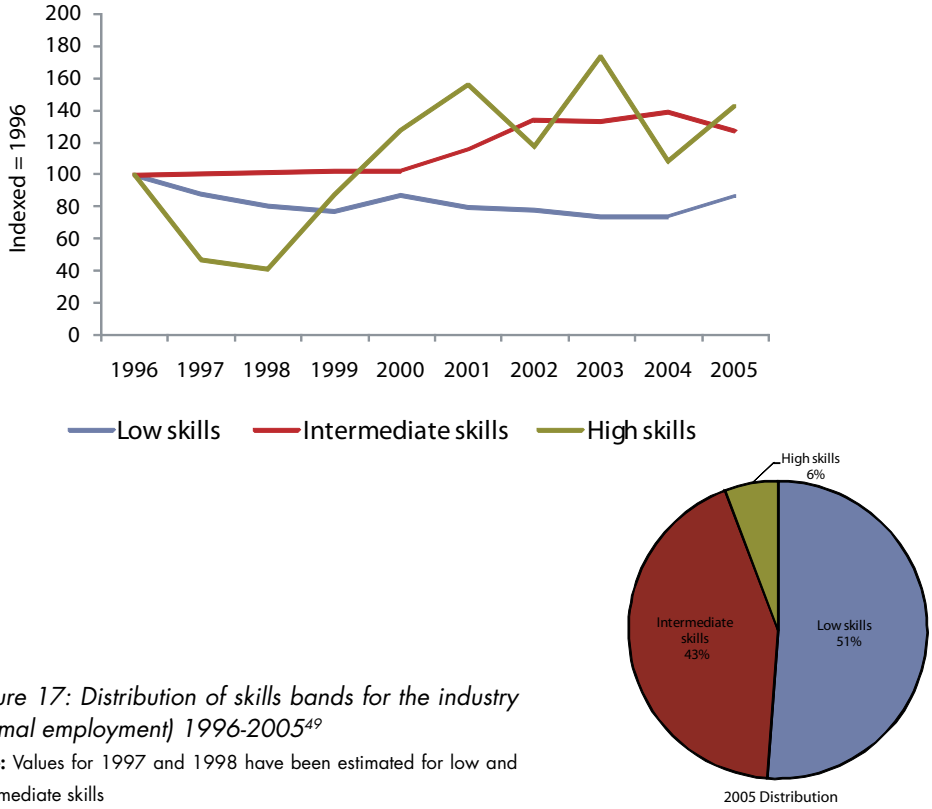
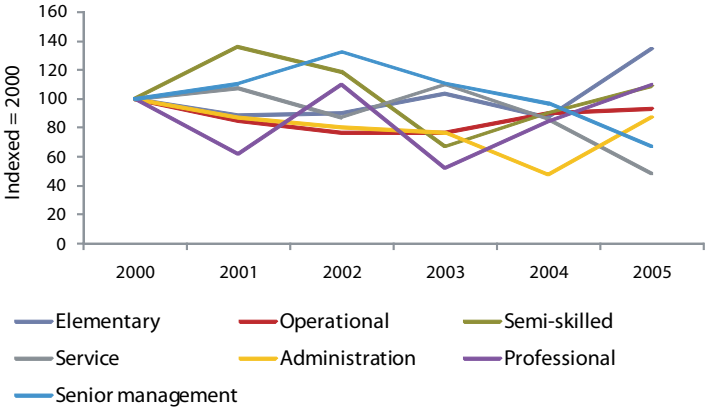


Figure 17: Distribution of skills bands for the industry (formal employment) 1996-2005[49]

Note: Values for 1997 and 1998 have been estimated for low and intermediate skills

The relative level of high skills has been improving since 1998. The persisting number of workers with low skills is a concern and requires consideration. This is also reflected by occupational category (Figure 18).

49 StatsSA OHS and LFS



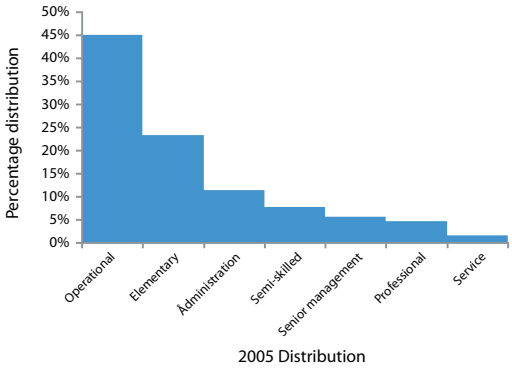


Figure 18: Low skills: Distribution of occupational category for the industry (formal employment) 1996—2005[50]

The low skills level of especially the large volume of operational employees that includes drivers, engineers, machine operators and technicians, is of great concern.

Labour productivity

Scant data exist but it is possible to create freight and passenger transport productivity data with statistics from different sources and some modelling.

Freight transport labour productivity can be analysed by looking at road and rail freight ton-km produced per employee (Figure 19).

50 Ibid.

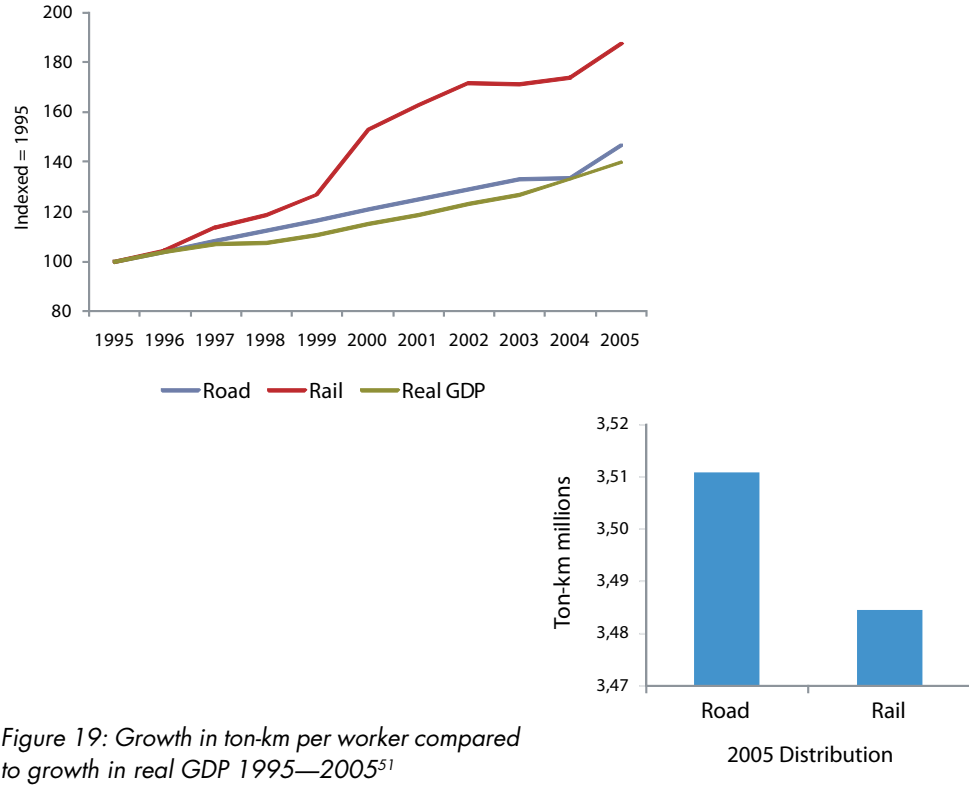


Figure 19: Growth in ton-km per worker compared to growth in real GDP 1995—2005[51]

The gap between rail and road freight productivity (half a million ton-km in 1995) has decreased to merely 20 000 in 2005. When it is considered that rail freight input includes the infrastructure development and maintenance of the mode (which is not the case for road), rail freight employment productivity has improved the most and is now probably much better than for road. Rail's capacity for automation is much higher than road, and as South Africa faces unique challenges in the following 50 years this could have a unique skills set challenge. This means that South Africa's freight transport system is currently focused on a highly effective road transport system, but this is not sustainable and growth in railway traffic would eventually have to be engineered.

The best available benchmark for overall economic productivity would be GDP produced per formal worker in South Africa compared to ton-km output for surface freight employment. In this regard surface freight employment labour productivity outstrips overall economic productivity by far (Figure 20).

51 Stellenbosch University modelling, 2008 and Havenga, JH 2007, p 147

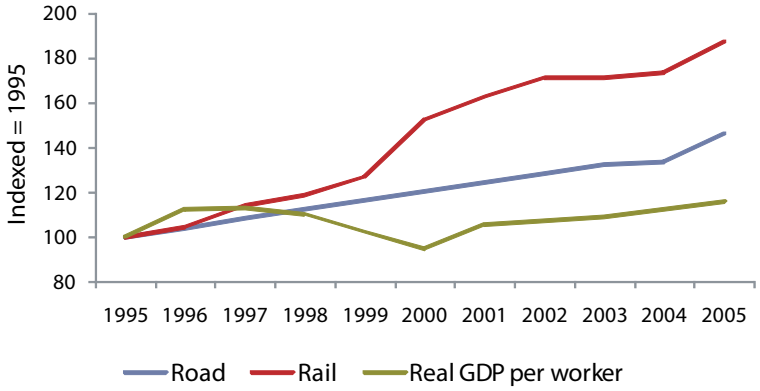


Figure 20: Growth in ton-km per worker compared to growth in real GDP per worker 1995—2005[52,53]

Whereas overall labour productivity in South Africa has declined (which in this case, unfortunately, has to be measured financially), road freight transport employment output has tracked real GDP and rail freight employment output has surpassed it.

FUTURE CHALLENGES

Land freight transport

As industries in die third world mature, power in the value chain moves downstream. Consumer demand increasingly dictates flow through the value chain and primary producers such as mining and agriculture and even manufacturers (beneficiates of primary products) have less control over prices and delivery of products.

This trend increases complexity in the logistics system, which has a significant impact on transport. It requires more reliability, higher speed and lower costs from South Africa's transport system, which is already under severe pressure because of historical imbalances.

The current structure of freight transport in South Africa, together with its future challenges, is informed by its history where intrinsic geo-spatial considerations played a smaller role than in most countries in the world. Developments in most countries are aligned to natural physical characteristics of the geography where the positioning of rivers, valleys and mountains, the availability of drinking water and arable land inform such development. In South Africa, however, some harbours are not positioned in the right place, most of the population and

52 Ibid
53 StatsSA. 2007. Gross Domestic Product, A statistical release

industry are incorrectly located with major population concentrations far away from water sources. This situation arose because infrastructure development was driven by extrinsic factors rather than geography.

Today South Africa generates 0,4% of the global GDP, but consumes 2,2% of the world's ton-km and 6% of maritime ton-miles. The current *status quo* of the mode structure of South Africa's freight transport market is not tenable. Forecasts indicate that freight transport demand will grow by between 200% and 250% over the next 20 years.[54] Some corridors, such as the corridors between Gauteng, Johannesburg and Cape Town (which amount to 50% of all corridor transport) will densify even faster than this. Even in a low-growth scenario the challenges of alleviating congestion in metropoles, providing cheap corridor transport and developing rural infrastructure cannot be met with the current configuration.

Freight transport by road over long distances is too expensive and it is clear that a shift from freight transport by road back to rail could solve some of the high cost-related problems and provide opportunities for a more competitive position for South Africa as a whole.

Long distance truck travel also contributes to socio-economic problems within the driver population as is evidenced by the prevalence of HIV/Aids and other social issues among truck drivers.[55] The road freight transport subsector acknowledges in discussions that required future adherence to SHEQ (safety, health, environment and quality) standards and RTQS (road transport quality standards) will put more pressure on the subsector in terms of driver education and working conditions.

The debate around how and when this change in modal shift will be facilitated is not the subject of this article, but the fact that a shift is required back to the railway corridors, the need for rail-dedicated metropolitan solutions and more effective rural road infrastructure with intermodal nodes, cannot be disputed. Interestingly enough, the road transport subsector reports in interviews that the shift is possible and might become a reality as soon as the middle of the next decade.

The above-mentioned shift will require that the industry's sector skills plan (based on skills shortages and training needs identified by the Transport Education Training Authority through analyses and aggregation of company workplace skills plans) will have to be aligned closely with a number of national plans to support a skills demand shift from long-haul road to long-haul rail. These plans include the Transnet national infrastructure plan, the Department of Transport's (DoT) national transport masterplan and the deployment of Moving South Africa as well as the national freight logistics plan. Although the timing is not yet clear, more certainty

54 Creamer, T. 2008. Transnet mulls new container options at both Durban and Richards Bay, in Engineering News, 13 June 2008. Available at http://www.engineeringnews.co.za/article/transnet-mulls-new-container-options-at-both-durban-and-richards-bay-2008-06-13

55 Fleetwatch. September 2002

is expected to emerge over the next five to 10 years. At present, however, the required shift is not widely recognised (for various reasons – including a shortage of strategic planning skills, insufficient integrative master planning thinking between the two infrastructure owners, i.e. Transnet and the DoT and the scarcity of market intelligence), which makes it challenging to prepare for this and deters current operators from sounding the necessary alarms.

A skills demand shift from long-haul road to long-haul rail transport will have a specific impact on skills categories. As market demand grows and even where different skills will be required because of a supply side shift in modality, it is still relatively easy to reskill elementary, service and administrative employees. It's more difficult to reskill operational, professional and senior management employees. Within this group, operational is the most critical problem as the current levels of skills are very low and the degree of shift expected very high.

Future solutions for South Africa's surface freight transport problems will have to consider a return to rail. This means highly technical skills development in an area where the country is already behind and falling increasingly behind over time.

In South Africa a large gap is opening up between the demand and supply for technical/ operational skills for all industries in general. In some cases, however, industries change because of external factors and sudden demands for some skills will grow exponentially (not merely in line with GDP) and significant shortages could be expected. This industry is in such a position and strategic planning is required to address the situation.

The potential costs of bad roads in South Africa

Steyn WJvdM[56], Bean WL[57] and Monismith CL[58]

INTRODUCTION

The riding quality of a road has, for many years, been used as the primary indication of the condition of a road. This is mainly due to findings that most of the deterioration in the road structure ultimately translates to a decrease in the riding quality of the road. The decrease in riding quality can be attributed to increased vibrations caused by lower quality roads.

The riding quality of a road can affect the experience of the road user significantly. The surface profile of the road translates through the tyres and suspension of the vehicle to the body of the vehicle and then to the driver, occupants and cargo. In vehicle engineering a major focus area is the improvement of the vehicle's tyres, suspension and the entire vehicle body to respond better to changes in the road surface. Despite these improvements to the vehicle, changes in the road surface still directly affect the vibrations experienced by the occupants and cargo. Therefore, the road surface profile is still a major consideration in the riding experience of road users.

Various studies about the effect of the riding quality of roads on the vibrations and responses in vehicles have been conducted in the past[59,60,61,62,63]. The main conclusions from the studies are that a decrease in the riding quality of a road is a major cause of increased vibrations and subsequent structural damage to vehicles. The structural damage increases the transportation costs of companies and can potentially have a negative effect on the broader economy of a country.

56 CSIR Built Environment – Infrastructure Engineering
57 CSIR Built Environment – Logistics and Quantitative Methods
58 University of California, Berkeley (UCB)
59 Jarimopas B, Singh SP and Saengnil W 2005. Measurement and analysis of truck transport vibration levels and damage to packaged tangerines during transit, Packaging technology and science, 18(4), pp 179 – 188
60 Weigel TG and Marshall SW 1999. The effect of pallet connection stiffness, deck stiffness and static load level on the resonant response of pallet decks to vibration frequencies occurring in the distribution environment. Packaging Technology and Science, 12(2), pp 47 – 55
61 Steyn, WJvdM and Visser AT 2001. Guidelines for incorporation of vehicle-pavement interaction effects in pavement design. SAICE Journal, 43(1), pp 34 – 39, ISSN 1021-2019
62 Singh SP, Antle JR and Burgess, GG 1991. Comparison between lateral, longitudinal, and vertical vibration levels in commercial truck shipments. Packaging Technology and Science, 5(2), pp 71 – 75
63 Nisonger RL and Ervin RD 1979. Measurement of ride vibrations on semi-trailers incorporating different suspensions. Technical memorandum, University of Michigan, Highway Safety Research Institute. Available at: http://deepblue.lib.umich.edu/bitstream/2027.42/517/2/42600.0001.001.pdf

POTENTIAL EFFECTS ON THE ECONOMY

The potential effects that worsening road conditions can have on the broader economy are shown in Figure 21.

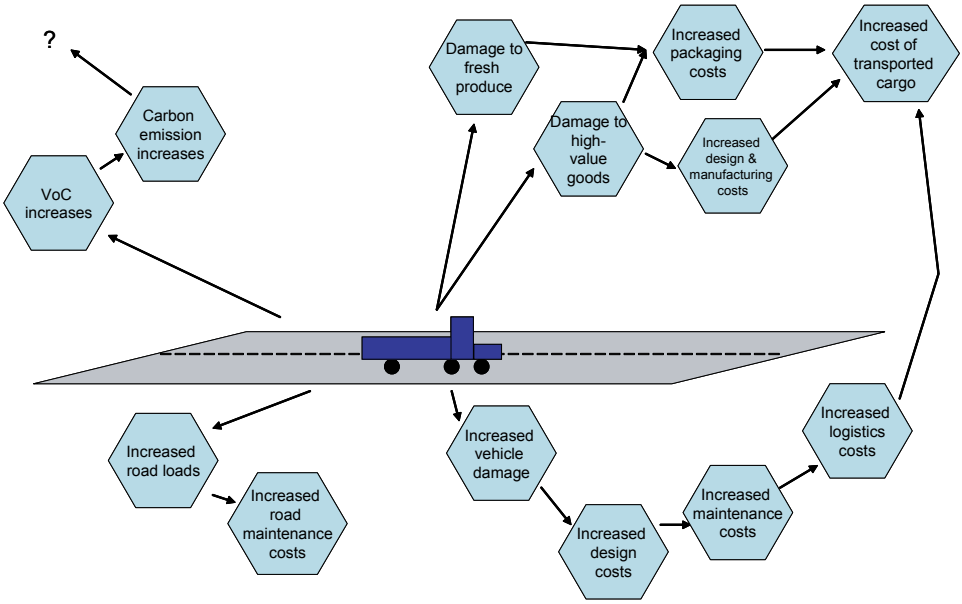


Figure 21: Potential effects of deteriorating road quality on the broader economy

Vehicle damage and costs

Potential vehicle damage for vehicles traveling on uneven roads can be addressed only by mechanical engineers through the improvement of vehicle design. This immediately multiplies the costs to a huge number of individual solutions. The low quality of the road in this case therefore has an increased cost effect on the vehicle and vehicle component design costs, manufacturing and maintenance costs. All these costs are typically incorporated into the costs that the vehicle owner charges to the customer for transporting cargo, and therefore it increases the logistical costs and ultimately the final costs to the customer.

Vehicle operating costs (VoC)

Driving on an uneven road surface affects the speeds at which the vehicle can travel safely, which immediately affects the logistics of delivering goods at optimum times to a customer. It also increases the fuel consumption of the vehicle, leading to more carbon emissions for

the same amount of cargo delivered. The carbon footprint of a transport operation will in future play a significant role in directing consumer preference and choice, with green logistics becoming increasingly important.

Road damage and costs
A decrease in the riding quality of a road causes a direct increase in the road maintenance costs. It also shortens the potential lifespan of the road due to the increased vibration of vehicles, which in turn increases the dynamic component of vehicle loads on the road. This causes a cycle where the lower riding quality of a road causes faster deterioration of the road surface for the same amount of cargo transported.

Damage to transported cargo
The vibrations from the road are translated to the transported cargo, which results in damage to the cargo. Potential solutions to this problem include improvements to the packaging or improvements in the design of the cargo. Both these potential solutions increase the logistics costs of the operation, since every piece of cargo requires improved design or packaging with the sole objective of protecting the cargo for the trip between the supplier and the customer. This does not add any direct value to the product, but merely adds additional costs.

Environmental damage and costs
Decreases in riding quality has an effect on the environment and increases environmental costs such as increased emissions due to slower speeds and longer durations of transport. Lower quality roads also increases the use of resources, since better design requirements result in an increase in the materials required to construct the same goods. More materials are also required to reconstruct or repair badly maintained roads. All of these translate into an increase in environmental costs.

Congestion and safety
Another matter that requires attention is the effect of traffic congestion on freight movement and traffic safety. High congestion levels have an effect on travel times, fuel consumption and emissions released into the environment. Congestion and the overloading of a road decrease the riding quality of that road faster and affect traffic safety for smaller vehicles, since the relative mass and speeds between vehicles differ greatly, causing more accidents due to small judgement errors.

CASE STUDY

A limited case study was conducted at a transportation company in South Africa to investigate the potential effect that bad road surfaces could have on vehicle damages and costs. Anecdotal evidence was analysed to obtain an indication of the potential effect that the road condition could have. The evidence was obtained from a database of vehicle operating costs for a fleet

of 577 trucks transporting cargo over a range of different road conditions. The trucks in the database were similar in terms of type, drivers and cargo transported. The information in the database was accumulated over a nine-month period, between January and September 2008.

A subjective classification of the road condition was awarded to each truck route in the database. The classification varies between one and five, where one is an excellent road condition and five is very bad. No road conditions of the routes in the database were classified as either excellent or very bad, with only values between these two extremes used during the analysis.

The analysis indicated that the trucks travelling on the roads with worse riding conditions experienced an increase in cost of between 684% and 1 560%, respectively, with road condition two as the baseline and moving to a condition of three and four (Table 6). This significant increase in cost was mostly due to breakages of suspension and trailer components.

Table 6: Potential increase in vehicle damage costs under deteriorating road conditions

Road condition	% Total vehicle damages	% Total costs of vehicle damages	% Increase in costs
2 - Good	5,2%	3,9%	
3 - Average	17,4%	30,8%	684%
4 - Bad	77,4%	65,2%	1 560%

The findings are based on data of only one transportation company and are by no means absolute. The focus of the analysis was merely to investigate the potential effects of bad roads on vehicle damages and costs. The potential effects appear to be quite significant and worth researching further for more accurate indications on the effects that deteriorating riding quality could have on transportation, logistics costs and the broader economy of South Africa.

The green supply chain – cost burden or value creator?

Schoeman C[64]

INTRODUCTION

South Africa emits 1% of the global annual CO_2 emissions[65], but has an energy intensive economy. Both its green house gas (GHG) emissions per capita and GHG emissions per unit of GDP (emissions intensity) are nearly double that of the world average. Furthermore, South Africans, especially poor communities, are particularly susceptible to countless potentially catastrophic climate outcomes.[66] Therefore, even though the Kyoto protocol does not currently constrain developing countries, South Africa has an obligation for mitigation.

> *"It is clear that without constraints our emissions might quadruple by 2050. This is, in the most literal sense, not sustainable: If we continue with business-as-usual, we will go out of business. The alternative is a very challenging scenario – to make it our goal to achieve what is required by science of a developing country."* – The Minister of Environmental Affairs and Tourism (DEAT), M van Schalkwyk, 2008

For South Africa to grow and develop to reduce poverty, while simultaneously retooling its economy to reduce GHG emissions, three areas need to be brought together in a coherent vision to be implemented:[67]

Technology	Investment	Policy
Wider deployment of existing climate-friendly technology is necessary, together with commercialisation of emerging technologies and spending at scale on research and development of new technology	The sources, mechanisms and extent of investment in a low-carbon society need to be found and actively pursued	The country will need clear guidance through policy frameworks that send sustained and legally-enforced messages to markets

In 2006 the Department of Environmental Affairs and Tourism (DEAT) commissioned a process to examine the potential for mitigation of South Africa's GHG emissions, which culminated in the long-term mitigation scenarios (LTMS) – a study to define and quantify the mitigation

64 CSIR Built Environment – Logistics and Quantitative Methods
65 In 2004 the world produced about 49 000 Mt CO_2-equivalent of which South Africa emitted 440 Mt CO_2-equivalent, roughly 1%. – Scenario Building Team (SBT), 2007
66 SBT, 2007. LTMS: Strategic Options for South Africa. DEAT http://www.erc.uct.ac.za/Research/publications/07Scenario_team-LTMS_Scenarios.pdf
67 Ibid

options and associated costs under several energy and economic futures. The mitigation options quantified by the LTMS included:

- Energy efficiency, in industry and other sectors
- Electricity supply options
- Carbon capture and storage
- Transport efficiency and shifts
- Mitigation by changes in industrial processes, agriculture, land use and afforestation.

As can be seen in Figure 22, transport was responsible for 13,1%, and industry (excluding forestry and agriculture) for 19,4% of global GHG emissions in 2004.

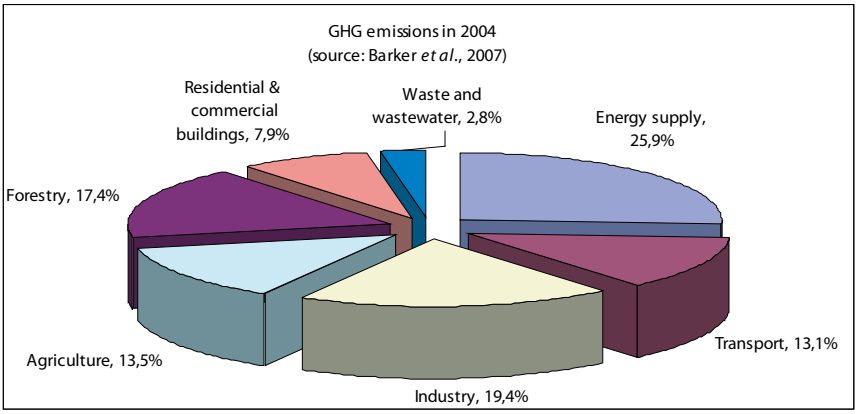


Figure 22: Global GHG emissions contribution per industry

In South Africa, up to 75% of most companies' carbon footprints come from transportation and logistics.[68] This places a heavy burden on the supply chain to accept responsibility, invest and take the required measures towards a green supply chain.

A green sustainable supply chain can be defined as "the process of using environmentally friendly inputs and transforming these inputs through change agents – whose by-products can improve or be recycled within the existing environment. This process develops outputs that can be reclaimed and re-used at the end of their life-cycle thus creating a sustainable supply chain."[69]

68 Van Kerken O and Katz V: Sustainable Supply Chains – Paper presented at SAPICS Conference 2008
69 Material Handling Industry of America. The Green Supply Chain, 7 Aug 07, Sustainability can be a Competitive Advantage www.mhia.org/news/industry/7056/the-green-supply-chain

TRANSPORT

For South Africa to meet the 'required by science' targets – i.e. reducing annual emissions by 1 300 Mt CO_2-equivalents per year by 2050 – its transport sector will have to be transformed boldly.[70] In its Energy Efficiency Strategy of 2005, government advocates a 9% final energy demand reduction for the transport sector by 2015.[71]

Transport is the fastest growing emitting sector. It poses the most complex challenges, because it encompasses fuels, vehicle technology, infrastructure, as well as behavioural changes. Biofuels alone cannot solve the problem at any scale. An overall package needs to be designed, addressing a range of interventions in the sector. This package would have to look at the two large mitigation wedges as principal motivators:[72]

- Modal shifts in the way human and freight movement is achieved
- Technology transfer away from petrol and diesel.

THE SUPPLY CHAIN

The motivation to re-engineer supply chains to become green is driven by factors such as[73]:

» Sustainability rationales » Shrinking resource availability, especially fuel and energy » Government mandates and regulations » Competitors – without investing in green initiatives companies will lose market share as competitors gain the early-adopters advantage	» Company internal persuasions, such as: • cost reductions • improved efficiencies • waste/pollution elimination • corporate social responsibility • brand reputation enhancement » Consumer pressure - a green supply chain constitutes competitive differentiation in the eyes of the customer » Market forces

The perception persists that transforming to a sustainable, green supply chain results in reduced profit margins, by increasing the cost burden faced with new ecofriendly equipment

70 SBT, 2007. LTMS: Strategic Options for South Africa. DEAT http://www.erc.uct.ac.za/Research/publications/07Scenario_team-LTMS_Scenarios.pdf
71 Presentation at the TransportSig Forum, Nov 2008: Energy Optimisation in Residential, Industrial, Building, and Transportation Sectors — A Control Engineering Approach, Professor Xiaohua Xia, University of Pretoria
72 SBT. op.cit.
73 Consolidated from various literature sources and presentations

and technology, and additional process measures. However research and case studies of actual business implementations are proving opportunities to increase value and save money by reducing energy consumption and waste, and improving efficiencies and performance – i.e. return on green investment (ROGI).

Many of the opportunities to reduce emissions carry no net life-cycle costs – the upfront investment more than pays for itself through lower energy or material usage. – Climate change and supply chain management, www.mckinseyquarterly.com

GreenSCOR is a modification of the Supply Chain Council's SCOR structured model that integrates environmental considerations (processes, metrics and best practices) into the supply chain management (SCM) process and focuses on the impacts of SCM in each stage of the product life cycle. Figure 23 indicates examples of green best practices for reducing the environmental footprint in each (SCOR) stage of the supply chain.

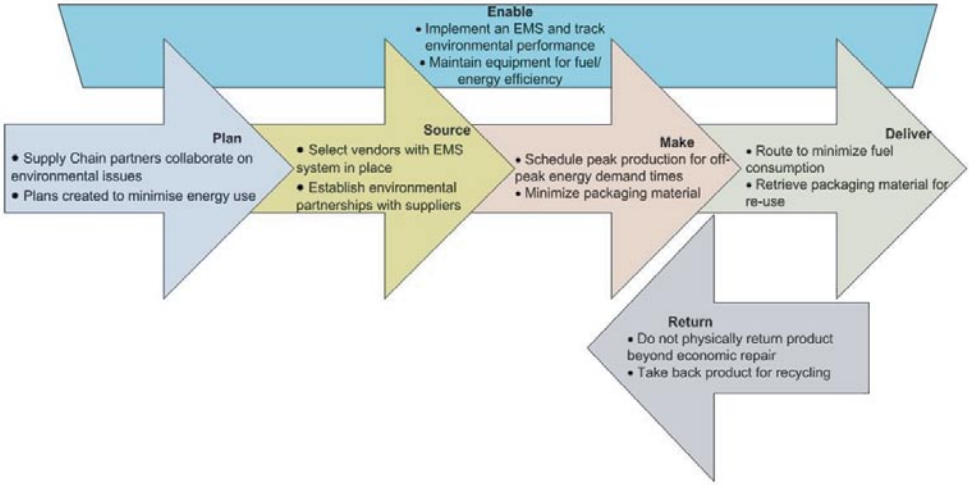


Figure 23: Green best practices[74,75]

To assess and benchmark the environmental footprint of the supply chain and the effect of green improvements, accurate standardised metrics are required. Figure 24 specifies example green metrics for each (SCOR) stage of the supply chain.

74 GreenSCOR, Supply Chain Council 2008
75 EMS – Environmental Management System

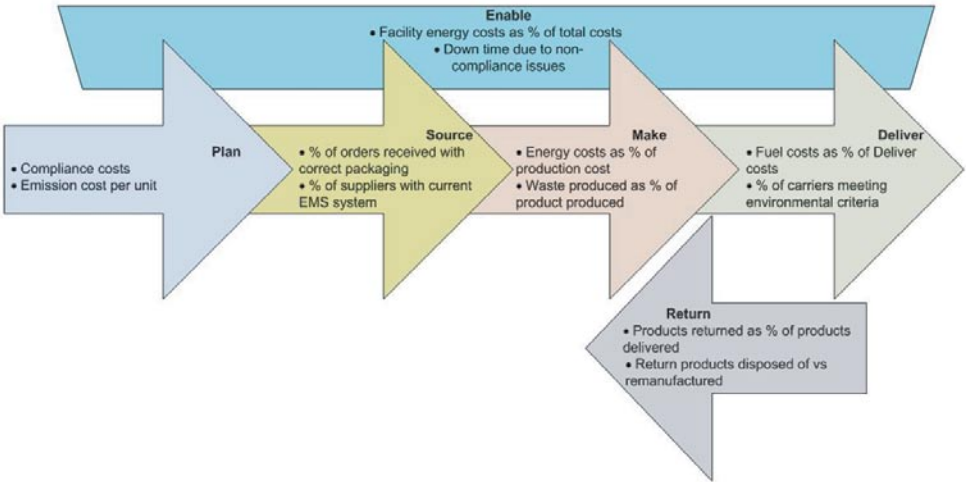


Figure 24: Green metrics[76]

The effective greening of the supply chain necessitates a holistic systems and network assessment that leads to life cycle optimisation. The entire supply chain is analysed for inputs and outputs at each stage, right back to the (product/process) design stage (where the big scale long-term impacts can be most effectively achieved) and forward to customer use and disposal. Raw material, energy and financial inputs to the system as well as waste outputs are minimised, while production and financial outputs are maximised. The desired result is Green-Gold, where green supply chain management drives cost savings and process improvement.

76 GreenSCOR. op.cit.

AISI – Adding value to the South African aerospace industry

Botha M[77]

INTRODUCTION

The Aerospace Industry Support Initiative (AISI) is a fully government-funded mechanism that exists to support South Africa's local aerospace industry in its drive to become an active and valued player in the global aerospace manufacturing industry.

Globally, governments have recognised the aerospace and defence industries as pervasive generators of wealth, expertise and technologies that have many applications in other areas of their economies. This has led to the South African aerospace industry being designated as a high priority sector since 2003 and the sector is expected to follow a similar growth and consolidation path to that experienced by the automotive industry. It is also expected that it will become more integrated into the global aerospace community through significant new developments, such as the Airbus A400M programme.

South Africa to a large extent holds the building blocks of a world-class aerospace and defence industry. Significant interventions are however required for the industry to successfully meet the challenges facing the country and the global market place that it wants to serve. Housed at South Africa's Innovation Hub in Pretoria and project-managed by the CSIR on behalf of the Department of Trade and Industry (the dti), the AISI is mandated to manage these interventions.

The AISI therefore serves to assist industry by seeding and undertaking focused development programmes on behalf of industry, thus aligning itself with government key objectives by undertaking to:

- Increase the contribution of small enterprises in the economy
- Significantly enhance broad-based black economic empowerment (B-BBEE)
- Raise the levels of direct investment overall, as well as in defined priority sectors
- Increase market access opportunities for, and export of South African goods and services
- Contribute towards building skills, technology and infrastructure platforms
- Reposition the economy in higher value-added segments of the world market
- Contribute towards building a single economy that benefits all, effectively bridging the divide between the first and second economies
- Contribute towards the economic growth and development of the African continent within the NEPAD framework

77 CSIR Built Environment – Logistics and Quantitative Methods

» Ensure an efficient, effective and accessible organisation aimed at achieving these outcomes in a sustainable and economic manner to the benefit of the country.

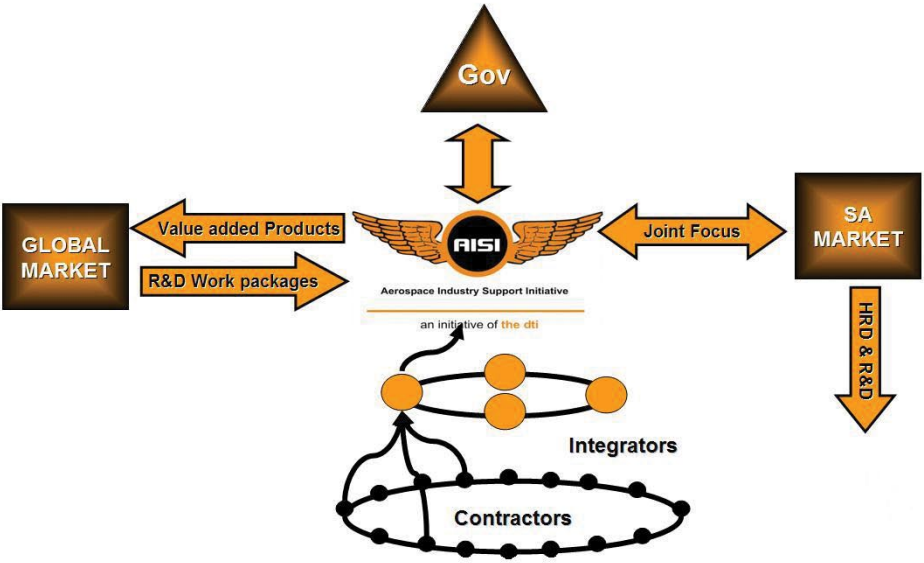


Figure 25: AISI role

The deliverables of the AISI can be summarised into three main areas, namely linkages, leverages and learning, which entail the following:

Linkages – Creating the necessary relationships with global stakeholders as a means to acquire the necessary technologies and skills
Leverages – Moving beyond the static client-contractor type of relationships to a new paradigm where the client is seen as a partner
Learning – Using these partnerships to improve the existing technologies whilst simultaneously mastering the production and process-related technologies needed to build new sustainable platforms.

NATURE OF AEROSPACE INDUSTRY LOGISTICS

The barriers to entry into the global aerospace industry are significant and numerous safety and quality standards have to be complied with. This emphasises the need for government involvement by supporting industry to comply with these standards. A further aspect that characterises the aerospace industry is the relatively small number of original equipment

manufacturers (OEMs) and their geographic location, mainly concentrated in Europe and the United States of America. This results in long supply chains that have to be overcome through local integrators linking with international OEMs. South African local integrators include partners of the AISI such as Collaborative Xchange, the AIDC, Denel Aviation, Aerosud Holdings and Aerotechnic. These integrators form part of the core AISI team that undertakes the AISI programmes. The necessity for efficient and effective local supply chains also stems from this. The industry requires a giant leap in manufacturing efficiency to comply with the standards determined by the international OEMs.

Other characteristics of the global aerospace industry include:

- Consolidation/Mergers at the turn of the century
- Fewer new, but significantly more costly, aircraft programmes
- Long supply chains to comply with global requirements.

The South African aerospace industry has to move from its original role, where industry merely built to print, to a more innovative role in the worldwide market. This is illustrated in Figure 26. To obtain this goal, industry has to negotiate the international characteristics of the aerospace industry. The gap has been bridged in the past with the Rooivalk, and industry is once again moving in the right direction with limited design authority on the Gripen aircraft. Typically a mere 15% of turnover is spent on R&D high value-added items worldwide, which brings with it competition but also opportunity.

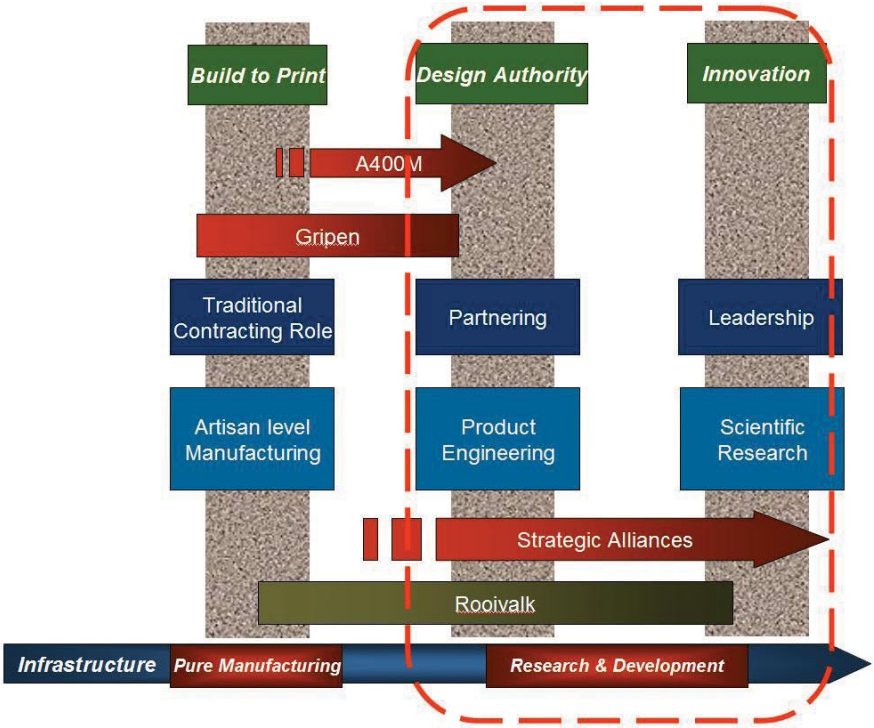


Figure 26: South African aerospace industry operating areas

AISI PROGRAMMES

The role of the AISI as a national initiative requires that its mandate and offerings be aligned with the imperatives of all relevant government departments as well as be promoted and introduced to the industry at large through a range of programmes as follows:

- Industrial and governmental coordination, promotion and awareness
- Technology advancement
- Human resource development
- Optimisation and utilisation of national facilities
- Providing the resources and overseeing the implementation of cardinal projects
- Supply chain improvement.

Currently most of the AISI's effort is focused on the aerospace supply chain improvement programme (ASCIP), as it was identified that South African industry would not be able to

compete in the international market if its supply chain was not able to overcome the obstacles that characterise the global aerospace industry. The success of the AISI relies on private-public partnerships (PPPs). The AISI has established partnerships with two of South Africa's OEMs, namely Aerosud and Denel Aviation. These two companies are first-tier suppliers to larger global OEMs. Smaller companies known as second-tier suppliers feed into the first-tier suppliers and cover a broad spectrum of manufacturing in metals and composites, maintenance repair and overhaul (MRO), interior equipment and tooling. The reasoning behind ASCIP is to support the lower-tier suppliers, thus optimising the operations of the first-tier suppliers of South Africa. Any additional programmes are designed to support this line of thought.

Supply chain improvement

The success of ASCIP depends squarely on collaboration among South African industry players. With this in mind, a steering committee consisting of suppliers of all tiers of South African industry has been set up to aid the AISI in determining which direction to follow. The steering committee meets on a quarterly basis to give feedback on progress made in the programme, and to get input for future endeavours.

The initial focus of ASCIP was on a web-based supplier portal to create a standardised, electronic form of communication between the South African OEMs and their suppliers.

Web-based supplier portal

In November 2006 a pilot project was launched with Aerosud and 15 of its suppliers. The ASCIP web-based portal is a business and information portal solution for the South African aerospace industry, which entails a single application electronic system that provides a central message standard. The South African market is unique in that most suppliers do not solely supply to the aerospace industry, and suppliers are often a small organisation that does not make use of an electronic data interchange (EDI) system, but rather more basic solutions such as an Excel spreadsheet. Apart from this, the international aerospace market is looking for improved supplier performance, on-time delivery, increased visibility, reduced delivery and part costs, as well as reduced inventory, while chasing an increased profit. This results in increased complexity in the supply chain while aiming to become more flexible. These factors contributed to the AISI establishing the web-based supplier portal.

The AISI and Collaborative Xchange leveraged the web-based portal from the automotive industry where a similar solution had already been implemented with great success.

Figure 27 demonstrates the functionality of the web-based portal. During the pilot project, Aerosud would create a purchase order (PO) in Syspro, its EDI system. This would automatically be retrieved by Collaborative Xchange (CX) and published on the web-based portal. The supplier would receive a notification that an order had been published and at that stage, would access the internet and log onto the portal. As soon as that happened, the PO was

automatically updated to the 'viewed', status which served as an acknowledgement of receipt of the order. The supplier then changed the order status to 'accepted' or if 'pending', an error report had to explain the reasons why. As soon as the goods were ready to be shipped to Aerosud, an advanced shipping notification (ASN) was created on the portal, stating among others the goods to be received as well as the expected time of delivery. This document was electronically sent to Aerosud *via* the portal, and a hard copy accompanied the goods to be delivered. As soon as the goods were received by Aerosud, it was inspected and a goods received notification (GRN) was created in Syspro, which was then again published on the web portal. The supplier received an email notification of this and logged onto the internet to retrieve it. Invoicing was then processed in the traditional method.

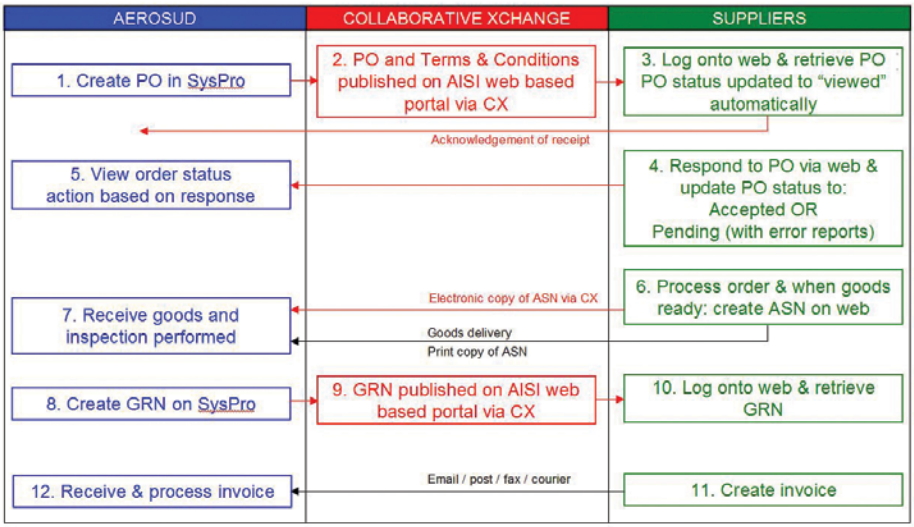


Figure 27: Electronic purchase order process

The benefits and value of a standardised industry platform and standard communication process such as the web portal are:

» Improved operational efficiency and simplified processes
  - reduced paper dependency and duplication
  - standardisation for both data and format
  - improved processing time
  - efficient use of resources and increased productivity
» Improved communication between trading partners
  - electronic updates

  - tracking and maintaining a record of processes
  - secure business-to-business communication
- Common OEM/supplier forum
  - common direction within the industry
  - shared knowledge, reduced risks
  - identify opportunities and industry needs
  - mobilisation
- Reduced costs
  - shared infrastructure – economies of scale
  - one system *vs.* several integration points
  - reducing the investment requirements for hardware, software and expertise (making effective use of the internet for low-tech user access) at all points, which are all centrally managed.

Although the web-based portal is an excellent tool, it does have shortcomings that were identified during the pilot project. One of these was that the aerospace industry has relatively low volumes of orders compared to the automotive industry, which has an effect on the economies of scale, thus making it more costly to maintain the web portal. Another issue was that the web-based portal creates some duplication for suppliers, as they have to feed orders into their personal system, as well as manage it on the portal.

AMS software development

Aerotechnic is a second-tier supplier and forms part of the AISI steering committee. Aerotechnic stocks and distributes aircraft spare parts (new/overhauled/repaired) for commercial aircraft in the civil aerospace industry. It developed its own aerospace-specific EDI system, Air Management Solution (AMS). This software takes into account aerospace-specific configurations. The need for a complete system-to-system (C2C) solution was identified as a next step in ASCIP and Aerotechnic volunteered for the project to be piloted on it.

The pilot project entails the creation of a C2C link between Aerosud and Aerotechnic. The envisioned result is a complete automated system between OEMs and their suppliers. There will be no need to access the internet or the web portal, although the web portal will serve as a back-up of purchase orders transferred between the OEM and the supplier. The pilot started in August 2008 and will run until May 2009.

In addition, the AMS software will be distributed to other suppliers to create a C2C solution, once the pilot is completed. This has two benefits; South African aerospace industry suppliers will have a C2C solution that will streamline the supply chain communication process, while giving smaller organisations the opportunities to have access to an aerospace-specific EDI solution. In future, the AISI will assist in developing a manufacturing module for the AMS

software to create additional value to the web-based portal. This will enable OEMs and suppliers to communicate in real time with regard to manufacturing work and specifications.

Supplier development

In looking at the supply chain improvement of the aerospace industry, the AISI soon came to realise that organisations, specifically SMMEs, should improve their own internal processes before competing in the global market. The AISI assisted industry by implementing supplier improvement processes, by undertaking focused interventions in quality processes and assurance, LEAN manufacturing and human capital development.

Phase I of supplier development was undertaken during October 2007 and was concluded in March 2008. Its basic aim was to identify the gap between the requirement and the current state of the suppliers in the South African aerospace industry. As a baseline study, 17 of Aerosud's suppliers were audited on the aerospace-specific standards ISO9001 and AS/EN9100. The results of this audit can be seen in Figure 28. Three major areas of concern identified are resource management, quality management system requirements and management responsibilities.

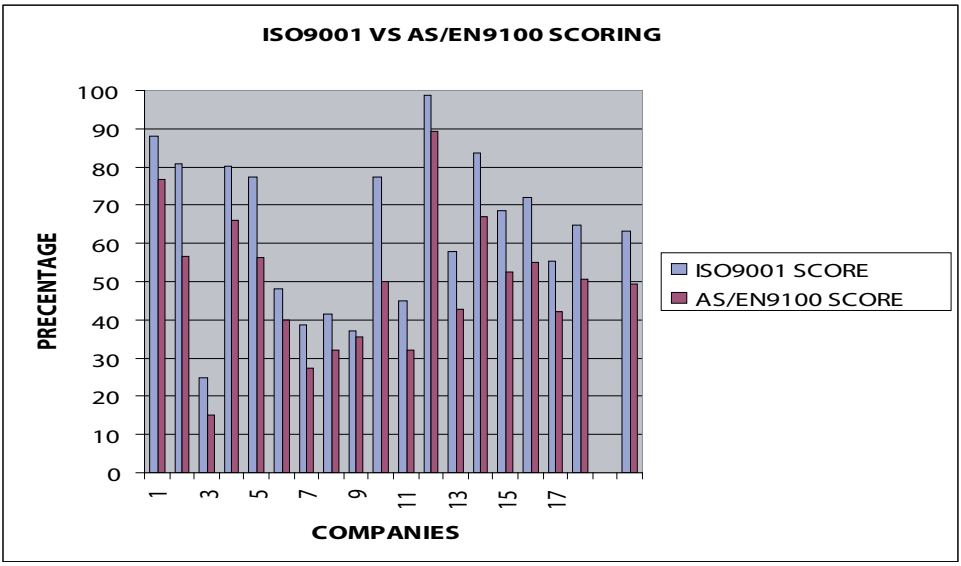


Figure 28: Supplier audit results

With this in mind, a two-year Phase II supplier development implementation plan has been developed. This commenced in January 2009 and will run until 2010, covering five areas as determined by the AISI and its steering committee members, namely:

1. Continued assessment of quality management systems of suppliers, which will be extended to Denel Aviation's suppliers. This will involve an audit similar to the audit conducted in Phase I on ISO9001 and AS/EN9100 standards.
2. Implementation of ISO9001 on SMME companies that took part in Phase I, where it was determined that said company has potential to reach the certification level.
3. Implementation of AS/EN9100 on SMME companies identified through Phase I as having potential to reach certification.
4. Implementation of a LEAN manufacturing cluster on a number of SMME companies as well as Denel Aviation.
5. Maintaining a high level of steering committee interaction to determine the success and direction of the supplier development project.

Complementing ASCIP are the remaining three programmes of the AISI, which will be discussed briefly.

Coordination and awareness

The AISI has played an active interdepartmental coordination role over the three-year period it has been operating and has, in partnership with the Department of Science and Technology's Advanced Manufacturing Technology Strategy (AMTS), developed an operational value chain that defines and demarcates the roles and responsibilities of the various programmes. These well-defined roles have allowed for the correct allocation of initiatives between the various programmes.

Likewise, within its role as the overarching coordinator of aerospace activities, the AISI has strong institutional links with the National Aerospace Centre of Excellence (NACoE) and the Centurion Aerospace Village (CAV), with each taking on a unique, focused role within the combined activities, namely:

- NACoE's human capital development and technology advancement
- CAV's physical supplier space development.

An example of the overarching role of the AISI was during the African Aerospace and Defence (AAD) Show 2008 in Cape Town, where the AISI sponsored 17 SMMEs to participate in the event. This created the opportunity for smaller organisations to interact with the larger international OEMs. All three entities operated under one banner as the AISI. The AISI, NACoE and CAV have all three been co-branded and were launched jointly in August 2007 by the Minister of Trade and Industry.

The AISI has also over this period drawn upon expertise inherent within the Automotive Industry Development Centre (AIDC) to develop cross-sector coordination projects that build on work

already done for the automotive industry through the Motor Industry Development Programme (MIDP) and AIDC efforts.

Technology advancement
The technology component of the strategy addresses the technology application challenges faced by the industry through identification of focused research areas, defining phased implementation programmes and innovation networks and technology validation programmes.

The AISI focuses on the technology application and advancement, not the actual development of the technologies. It investigates and incorporates existing technologies but does not fund new developments – this role is left to other government departments and funding streams such as the AMTS. The AMTS therefore plays a very active role through its technology interest groups and associated flagship projects.

Human capital development
The AISI is working towards ensuring structures and provisions are in place for education, training and lifelong learning mechanisms (continued engineering education in industry) to meet the future needs of the industry. This is done with the aim of ensuring that industry adopts the following measures:

- Best practice in learning
- People management
- Continuous professional development.

FUTURE INTERVENTIONS

As part of the national infrastructure programme, the AISI will conduct a national infrastructure audit to establish the South African industry's capabilities for both industrial services and academic level. The aim of this project is to create a national register of the infrastructure available to the aerospace industry, where to access this infrastructure, the procedure that needs to be followed to use this infrastructure and, if necessary, give aid to participants who might need it.

Linking into the national infrastructure audit is an industrial questionnaire that is being developed to obtain a large range of data that have to date been lacking in the aerospace industry. The full extent of the South African aerospace industry is not known, as most firms and companies also operate in other industries. It is of the utmost importance to determine the size of the aerospace industry and what expertise each organisation has access to.

The AISI has two new projects to be undertaken during 2009, namely:

1. Quality auditor recertification course: During Phase I of the supplier development project, it was determined that quality auditors in South Africa are not up-to-speed with the ever changing quality standards, especially the AS/EN certifications. A course will be hosted by the AISI to improve the quality auditors' standards.
2. Firm level competitiveness modelling: The AISI, in partnership with the University of the Witwatersrand, aims to build a relationship with the University of Cambridge and other universities in the United Kingdom by undertaking joint evaluations of aerospace organisations in South Africa and the UK. The aim of this model will be to identify gaps in aerospace organisations' supply chain and firm level competitiveness, as well as recommend solutions to overcome these gaps.

The last intervention planned for the immediate future is a higher level of coordination and awareness domestically and especially internationally. The AISI partners have realised the importance of collaboration, and through close collaboration a complete aerospace industry solution can be marketed globally. A corporate DVD and brochure will be released marketing and branding the AISI and the South African aerospace industry as a complete packaged solution.

CONCLUSION

The South African aerospace industry faces supply chain challenges that are definitely not unique, but might be exaggerated. Similar to the automotive industry, the aerospace industry realises the necessity of domestic collaboration. The South African aerospace industry should strive to compete as a unit internationally and this requires buy-in from all South African organisations involved in the industry. This creates the opportunity to convince international OEMs that, despite the unfavourable geographic location of South Africa and higher perceived costs than other developing countries, a value-added product is created through a streamlined supply chain at a reasonable cost. South Africa is seen as a small emerging market and collective work is required to change this perception. In an age where reliability and service are more important than costs, this should be used as South Africa's entry ticket into the global aerospace market.

NOTES

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