

## **PART A: INTRODUCTION**

## **1 The role of SQAM in the environment and society**

The Standards, Quality Assurance and Metrology (SQAM infrastructure) of any country has an extremely valuable role to play in underpinning the ability of a nation to conduct trade (domestic and international) as well as in the ability of a nation to build world-class competitive business entities that can compete effectively on the international stage. The responsibility of the infrastructure with respect to consumer and community safety and health is also without peer.

Regrettably the SQAM infrastructure is often low profile and the role largely unknown to members of the wider community. This is changing especially due to the increasing roles and responsibilities of the infrastructure in creating and facilitating the ability of a country's businesses to conduct international trade. A well established, efficient and internationally recognised infrastructure is critical to a country's ability to be a world player.

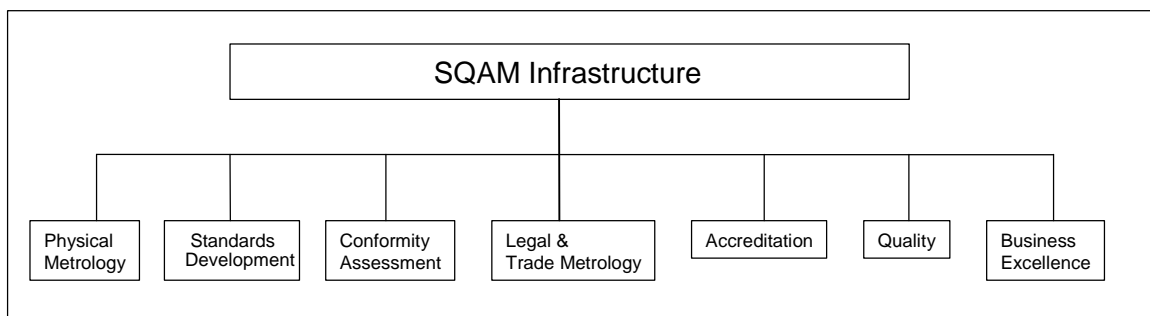
The Standards, Quality Assurance and Metrology Infrastructure has as its main purpose the following objectives:

- The effectiveness and competitiveness of industry.
- The access of South African products and services to international markets.
- The reduction of technical barriers to trade.
- Public health, safety and protection.
- Quality of goods and services.
- Effectiveness of public infrastructure services in construction, energy, water and gas supplies, defence, transportation and communication systems.
- Consumer protection through control of unfair trading practices.
- Credibility of forensic services and justice systems.
- Interoperability of products and systems.
- Implementation of regulatory processes.
- Quality of the urban and natural environment.

- Transfer of technology and world's best practices in technical, productivity, quality, business excellence and management systems arenas.

The SQAM Infrastructure in South Africa can be regarded as consisting of seven systems, operating in both the regulatory and voluntary domain. These systems are depicted in the figure below.

**Figure 1: Systems of the South African SQAM infrastructure**



These elements are described in more detail below, but can be briefly described as:

- **Physical Metrology:** Establish, maintain and disseminate physical standards of measurement which are traceable to international standards. Any legally required measurement must be traceable to the National Measurement Standard. Industry and commerce also require access to measurement standards of known accuracy and international equivalence.
- **Standards Development:** Development of regulations and voluntary standards for goods, services and systems.
- **Conformity Assessment:** Testing and certifying that the characteristics of products, services, management systems and personnel meet established standards or specifications.
- **Legal and Trade Metrology:** The system is aimed at approving designs of equipment (pattern approval) and monitoring such equipment used in trade, to ensure fair weights and measures are used in day to day commerce. In a broader sense legal metrology embraces all measurements that may have a bearing on compliance with the law.

- **Accreditation:** Accreditation is the determination of competence aimed at ensuring that laboratories and other providers of conformity assessment services are able to produce reliable test data and valid attestations of conformity.
- **Quality:** Promotes quality of product, services and systems as a philosophy to improve business performance. Quality refers to “fitness for purpose” but is often used in the sense of reliable compliance with standards. It is often associated with the concept of “reliability”.
- **Business Excellence:** Promote management excellence as a philosophy to improve business performance. It takes the concept of “quality” and extends it to a broader concept of “Business Excellence”. It involves a self-assessment model used by business and the rewarding of excellence through a system of awards.
- **Regulatory Regime:** In a SQAM context the regulatory regime consists of all legislation that refers to technical regulations, the parties responsible for demonstrating compliance with such regulations and the processes for monitoring and enforcing compliance.

## 1.1 Physical metrology

*Metrology is the science of measurement and includes all aspects of activity, both theoretical and practical, with reference to measurements, whatever their uncertainty and in whatever fields of science or technology they occur.*

The key function is to establish and maintain physical standards of measurement. The national primary standards must be traceable to international standards if the measurements are to have credibility in the international economy. This is translated into acceptance of local products in international markets. These primary standards must be able to be reproduced as secondary and working standards that can be spread throughout the industry as the operational basis for measurement in the economy.

Measurement is critical to the standards and conformance components of the infrastructure. Accuracy and reliability of measurement is demanded in many fields e.g. manufacturing, medical diagnosis etc.

The issue of measurement traceability is critical if shop floor measurements are to be credible. This traceability is established if all the equipment or standards used in the chain have valid calibration or testing provided by a competent laboratory or testing authority.

## 1.2 Standards development

*Standards play an essential role in facilitating interconnection and interoperability. They assist consumers in making choices about products and services in the marketplace.*

Most standards are for voluntary adoption by businesses so they can communicate regarding the quality of their products but governments frequently make suppliers meet standards in order to ensure the safety, health and environment of the consumer and community. Many industries are highly dependent on the use of standards to ensure effective manufacture and to drive down costs through economies of scale. A good example of this is the motor vehicle industry.

Standards may include design or product specifications, performance requirements, procedural requirements, methods of test and codes of practice.. They may be written by various bodies including industry associations, national standards bodies, regulatory authorities and international bodies. They fall into four main categories<sup>1</sup>:

- **Product standards** – specify the requirements e.g. design or performance characteristics, to be fulfilled by a product or group of products, to establish fitness for purpose ( including facilitating manufacture, interoperability and quality control). A product standard may include aspects such as terminology, sampling, testing, packaging, labelling and sometimes processing requirements. Product standards are the basis of certification schemes where an independent third party checks and certifies that a product complies with the standard.
- **Technical specifications** – describe technical requirements to be fulfilled by a product, process or service.
- **Codes of Practice** – recommend practices or procedures for the design, manufacture, installation, maintenance or utilisation of equipment, structures or products. They are often used in the construction and service industries.
- **Process standards** – specify requirements to be fulfilled by a process. At a high level, the ISO 9001 quality and the ISO 14001 environmental standards can be considered as process standards, but they are more usually referred to as management system standards.

In addition **technical regulations** are<sup>1</sup>:

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<sup>1</sup> Based on the definitions in ISO/IEC Guide 2:1996 Standardization and related activities -- General vocabulary.

- Regulations that provide technical requirements, either directly or by referring to or incorporating the content of a standard, technical specification or code of practice.

### **1.3 Conformity Assessment**

*Conformity assessment relates to the demonstration of compliance of products or services to standards or technical regulations. It takes many forms, but is often a combination of testing, inspection and certification. Standards may be company, national or international, or technical regulations of the market, into which the product is being sold. Attestations of conformity range from manufacturer's declarations (with or without any accreditation or other third-party intervention) to testing and certification by a third-party certification body.*

Conformity assessment is the process of assessing whether or not a product or system meets a required standard and it includes activities such as inspection, laboratory testing and product and quality systems certification. The value of conformity assessment is that it provides buyers/suppliers with certainty that the product meets a particular standard.

Assessment can be divided into three categories:

- First party assessment – assessed by supplier itself.
- Second party assessment – assessed by buyer.
- Third party assessment – assessed by independent third party.

Conformity assessment can be performed by a wide range of service providers in both the private and public sectors.

### **1.4 Accreditation**

*Accreditation is the procedure by which an authoritative body gives formal recognition that a body or person is competent to carry out specific tasks.*

Accreditation systems have been developed to give purchasers confidence in the competence of third party testers (testing laboratories, calibration laboratories, inspection services). This implies that the test results and assessments made by these parties can be relied upon. Accreditation to recognised criteria reduces or eliminates the need for multiple testing.

In recent years there has been huge demand for quality systems certification and it has led to increased competition in the marketplace between certifiers. This has led to a need for accreditation systems to establish the competence for quality system certifiers.

Accreditation programs can extend the chain of confidence internationally and the development of national systems of accreditation means that opportunities exist to conclude Mutual Recognition Agreements between accreditation bodies which further provide the basis for agreements between governments on conformity assessment. These MRAs mean that products do not need to be tested in both the country of origin as well as the country of destination – this saves costs.

## **1.5 Legal and Trade Metrology**

*Trade metrology traditionally controls measuring equipment that is used in trade. Internationally, trade metrology is normally encompassed in the more general field of “legal metrology”, which includes all measurements for legal application such as speed measurement and blood alcohol tests.*

Uniform weights and measures are essential to trade in a modern industrial economy. The area of trade metrology deals with the use of measuring instruments in trade and the testing of these instruments. A number of examples illustrate the importance of this in the economy:

- Correct measurement of electricity consumption ensures that consumers do not overpay for electricity use.
- Temperature variations can result in the varying quantities of petrol being delivered to service stations.

The trade metrology area has a number of functions:

- Pattern/ type approval .
- Accreditation of verification laboratories.
- Inspection and enforcement.

## 1.6 Quality

The quality movement has as its main goal the promotion of the quality concept as a business philosophy and the creation of a culture amongst consumers to demand quality products and services. The concept of quality is far reaching and can take many forms ranging from quality of product through to quality of process. It often manifests itself in ISO 9000 or similar certification which frequently gives the consumer an indication that the supplier has the ability to follow a well-defined and rigorous process in delivering their products and services. The issue with quality does not lie in the ISO 9000 qualification itself since frequently organisations obtain the ISO 9000 certification but do not embed the processes and philosophies in their business which means that the value of the approach is not attained.

A country which has a vibrant and successful quality movement which is fully supported by an industry which adopts its philosophies and approaches will find that it has increased capacity to adopt best practices and for its industries to become world competitive.

## 1.7 Business Excellence

Business Excellence is the main focus of the Excellence Frameworks and is *defined as the successful adoption of "best practice" management principles which include, (but are not restricted to): leadership and innovation, new strategies and planning processes, data, information and knowledge, people, customer and market focus, processes, products and services, business results*".

While business excellence may be regarded as being allied to the quality movement it does nevertheless represent something quite different. Business Excellence is aimed at promoting quality of management as a business philosophy. In most countries this is achieved through the development of a business excellence model which can be used as the basis of an organisational excellence diagnostic and the creation of an award scheme which recognises business excellence. The concept of business excellence is typically focused on the chief executives and leadership of the organisation rather than on the quality of products and services. The excellence domain started with the Deming awards in Japan in the 1950s and now over 60 countries have similar award systems.

A culture of business excellence in a country will result in better managed corporations which should achieve greater levels of performance and competitiveness. The creation of this culture nevertheless remains a complex task and it needs to permeate all levels of the business society.

## **1.8 Regulatory Regime**

In a SQAM context the regulatory regime consists of all legislation that refers to technical regulations, the parties responsible for demonstrating compliance with such regulations and the processes for monitoring and enforcing compliance. Most of the major SQAM institutions have actual or potential interaction with an economy's regulatory regime through the drafting of standards, establishing compliant measurements, by assessing conformity with requirements or accrediting competence of the various role players.

## 2 Background to the review of the South African SQAM infrastructure

### 2.1 Objective and scope

The objective of the review, as specified in the Study Terms of Reference (Appendix A) is:

“to improve and enhance the competitiveness of South Africa's suppliers of products and services by ensuring that the technical SQAM infrastructure operates at optimum efficiency”

It is obvious that this stated objective is somewhat constrained in its scope in that it primarily reflects the objectives of industry. It was therefore understood and agreed by all parties involved that the objective should be expanded to reflect the socio-economic needs of a broad range of stakeholders. The objective was therefore broadened as follows:

“to improve and enhance the competitiveness of South Africa's industry, to ensure the health and safety of consumers, and to improve the overall socio-economic conditions of South Africa by ensuring that the technical SQAM infrastructure operates at optimum efficiency”

The technical objectives and scope of the review are:

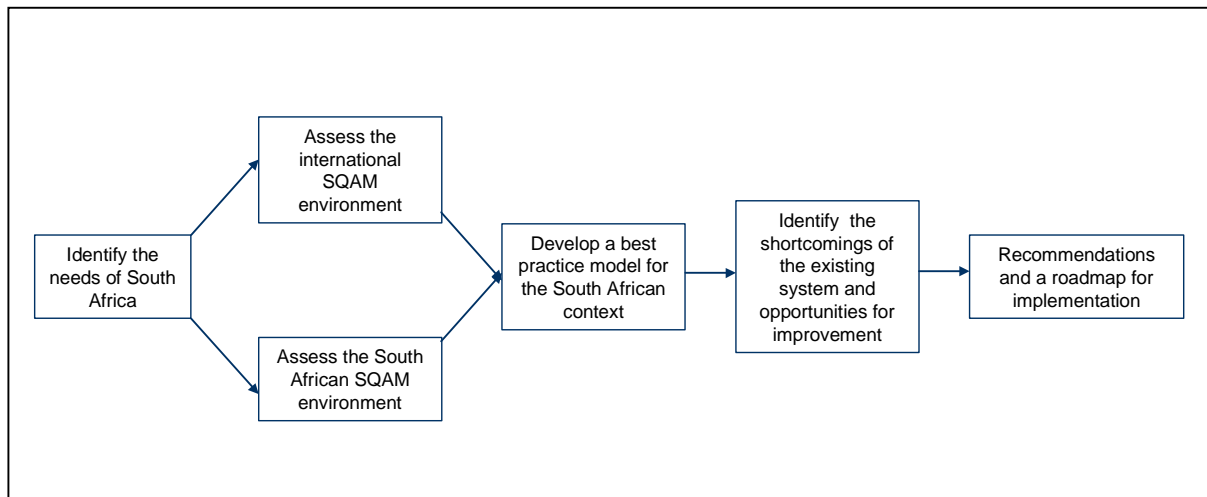
- The evaluation of the South African SQAM infrastructure with a view to identifying shortcomings and recommending improvements to meet the needs of SA commerce, industry and government. **The study relates only to products and services. Other areas such as environmental safety, eco-labelling, general health issues and non-product related legislation are not covered.**
- Establish what financial, effectiveness and efficiency constraints, if any, hamper the development of the SQAM infrastructure.
- Level the playing field by removing obstacles to competition where appropriate.

The results will be used to advise Business, Labour and Government on the formulation of a holistic national SQAM policy and the relevant roles of the above mentioned groups in implementing this policy.

## 2.2 Approach

The approach to this review was based on the fundamental techniques of building understanding of the issues at hand, the gathering of required information, in depth analysis and the formulation of recommendations as appropriate.

**Figure 2: Approach to the review of the South African SQAM infrastructure**



### 2.2.1 Identify the needs of South Africa

The needs of South Africa from its SQAM infrastructure are the underlying factors that had to be considered in the assessment of the domestic and international SQAM landscape, to thus develop proposals for an optimum SQAM infrastructure. The needs of the country were determined from four perspectives:

- International trends and developments, i.e. international factors that will have an impact on the SQAM infrastructure as well as the environment in which it operates. An international assessment of key drivers was therefore conducted as part of this review.
- National imperatives, which are the overall socio-economic objectives and conditions within the country. This was established by an assessment of the overall economic and social environment of South Africa.
- The needs of stakeholders. It is the specific needs of the various stakeholders groups, and include the Government, Industry (with specific attention to SMMEs), Labour, Consumers, and the SQAM institutions and organisations active in the SQAM arena. The needs of stakeholders were established through a variety of mechanisms:

- Public hearings.
- Formal submissions on the Study Terms of Reference.
- A questionnaire based industry survey.
- Discussion sessions with the primary institutions.
- Round-table discussions with industry representatives.
- An assessment of prior research conducted.

A total of 115 individual stakeholders, representative of all stakeholder groups, provided input through one or more of the above mentioned mechanisms. The complete list of organisations and individuals that participated in the Review is contained in Reference Document A “SQAM Review – The South African SQAM Landscape”.

- The current situation in terms of the status of SQAM development and performance had to be considered. The identification of the “baseline” situation is imperative for the identification of strengths and weaknesses, and the development of appropriate recommendations. Various practicalities and realities that impact on the viability of recommendations were considered.

Reference Document B “SQAM Review – South African Country and Stakeholder Needs Report” contains a complete report on the needs of South Africa and its stakeholders.

### **2.2.2 International and domestic assessment**

An extensive assessment of the international and domestic SQAM infrastructure was conducted. It was conducted from both a broad perspective that included an assessment of fundamental issues relating to strategy, governance, functions, funding, and performance, as well as from a narrower perspective related to specific Study Terms of Reference.

The international assessment consisted of visits to a group of targeted countries, as well as a questionnaire-based survey of other selected countries. Australia, the United Kingdom, Brazil and Malaysia were visited, and Columbia, the USA, Germany, Sweden, the Netherlands, Singapore, Iceland and New Zealand were targeted through a questionnaire. The international visits proved to be very successful with the study team being able to conduct visits to most of the primary institutions within the targeted countries. A large number of institutions in these

countries not visited participated by completing the questionnaire, thereby providing valuable additional insight to their environment and operations.

A complete report of the International situation is contained in Reference Document C: “SQAM Review - International Report”

The domestic assessment included the analysis of the formal submissions received from primary SQAM institutions and other role-players in the SQAM environment, as well as follow up discussion sessions with the relevant organisations.

A complete report of the South Africa situation is contained in Reference Document D: “SQAM Review – South African Situation Report”

### **2.2.3 Best practice model, feature comparison and gap analysis**

The best practice model developed for this review represents the “best practices” that can be considered for adoption within the South African context. It is acknowledged that there are many needs which are unique to South Africa, as a developing nation, and that many practices found in more developed countries are not suitable for South Africa. Best practices are derived from the analysis of international and domestic practices, with the needs of South Africa as the common denominator for which practice should be considered in the South African context, and those which are inappropriate.

A comparison of the current South African situation with the derived best practice model indicated specific areas of strength, as well as areas for improvement.

### **2.2.4 Recommendations and recommendations roadmap**

Recommendations are formulated with a view to the closing of existing gaps within the South African SQAM infrastructure, and the exploitation of opportunities. The viability of implementation of such recommendations is considered, as well as the risks associated with implementation. The requirements for the successful implementation of recommendations are therefore also broadly identified.

It is recognised that many recommendations will have to be implemented over a period of time. The conclusion to the review provides a high level “roadmap” that outlines how the South African SQAM infrastructure is expected to evolve over time. The ongoing relevance and reaction to emerging influences are specific themes for the long term.

### **2.3 Structure of this report**

The structure of this report, and the rationale behind the specific approach followed are as follows:

Part A focuses on the background to the review, the rationale behind the initiative, the broad objectives, and the approach followed towards the attainment of the objectives

Part B deals with the environment in which the South African SQAM infrastructure operates. It describes the broad international, regional and domestic economic environment, and proceeds to summarise the South African SQAM infrastructure and its regional counterparts. The needs of South Africa, and the implication of the needs for the SQAM infrastructure are summarised. The ability of the South African SQAM infrastructure to meet the needs of the country, and its stakeholders, is considered throughout this review, and becomes a common thread throughout this report.

The essence of this report is contained in Part C where the ability of the South African SQAM infrastructure to meet the needs of the country, in a regional and international context, is assessed, conclusions drawn and recommendations formulated. Firstly, a number of system-wide issues, specific to the Study Terms of Reference, are dealt with. The next sections then focus on the primary functions and role-players that constitute the SQAM infrastructure. General themes such as governance, positioning, functions, funding and performance are covered as well as specific Study Terms of Reference items. The roles of counterpart organisations internationally are described and compared to that of organisations in South Africa. Strengths and weaknesses are identified and appropriate recommendations are formulated.

The relevant sections cover the following:

- The role of the South African Government, and specifically the role of the Department of Trade and Industry (DTI). Reference is also made to other relevant Government Departments, such as the Department of Arts, Culture, Science and Technology (DACST).
- Standards development, with specific reference to the Standards Division of the South African Bureau of Standards (the SABS).
- Physical metrology, with specific reference to the National Metrology Laboratory (NML) of the CSIR.

- Accreditation, with specific reference to the South African National Accreditation System, (SANAS).
- Trade metrology, with specific reference to the Trade Metrology Department of the SABS
- Quality and business excellence promotion, with specific reference to the role of prominent organisations, such as the South African Quality Institute (SAQI) and the South African Excellence Foundation (SAEF). Reference is also made to other players in the field, such as the South African Auditor Certification Testing Authority (SAACTA), etc.

There is no section that deals exclusively with the conformance assessment functions of testing and certification, which are largely vested in the private sector. This review focussed primarily on the official institutions of the South African SQAM infrastructure, which are primarily public sector organisations. Where specific Terms of Reference items required an assessment of aspects of the commercial certification and testing infrastructure, for example the Terms of Reference item to assess the feasibility of the commercialisation/privatisation of the testing and certification services of the SABS, appropriate investigation and analysis was conducted.

The final section, Part D, concludes on the road ahead for the South African SQAM infrastructure. It provides a “roadmap” for implementation and deals with issues such as sustainability, resourcing, risk and investment.