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A Primer on Korea's Standards System: Standardization, Conformity Assessment, and Metrology

Dong Geun Choi

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Foreword

NIST, Standards Services of the Standards Coordination Office (SCO), provides standards-related expertise and services to strengthen the economy and improve the quality of life in the United States (US). Monitoring and providing standards-related activities of major U.S. trade partners is part of its mission. This NIST report provides U.S. industries and federal agencies with up-to-date information about the Republic of Korea's (Korea) standards system.

In 2011, the Republic of Korea, or Korea, ranked as the 12th largest economy in the world by gross domestic product with purchasing power parity (GDP PPP) of 1.55 trillion dollars, and the 9th largest trading economy with over 1.27 trillion dollar trading volume. In that year, Korea was one of the major trade partners of the U.S. U.S. goods and services trade with Korea totaled $125 billion. In that year, Korea was the 7th largest goods trading partner of the U.S. with $100 billion in total (two way) goods trade. U.S. exports of agricultural products to Korea totaled $7.0 billion, the 5th largest U.S. agriculture export market. This report may help U.S. exporters and importers capitalize on trade opportunities created through the newly enacted US-Korea trade agreement on March 15, 2012 by briefly explaining how the Korean standards system works.

Even though Korea's standards system is transitioning towards a public-private balanced system, it is currently more public-sector-led or legislation-based similar to most of the developing and newly developed nations. It is not same as developed economies in Europe and North America. The difference may have originated from its history and development of industrialization. Understanding the roles and scope of legislation and institutions is cardinal to understanding Korea's standards system as well as many other developing or newly industrialized countries. For instance, national standards development and certification of Korea is legislated by the *Industrial Standardization Act* of 1961 while those of the United States and most Western European countries are based on private sector development.

This report is intended to serve as a primer for outlining Korea's current national standards system by addressing the three main pillars of national standards infrastructure – standardization, conformity assessment, and metrology. It includes descriptions of major laws and institutions responsible for each pillar or specific sub-functions central to the contemporary national standards system of Korea, as well as some of Korea's policy agenda. The last section of this report contains the URLs of websites either frequently referenced in this report or useful for further information.

The author of this report, Dr. Dong Geun Choi is a NIST guest researcher originally from Korean Standards Association (KSA) who has attached with the Standards Services of NIST from March 2012 to Feb 2013.

Key Words

Korea, Standards System, Standardization, Conformity Assessment, Metrology, Legislation, Laws, Organizations, Korean Agency for Technology and Standards (KATS), Korean Standards Association (KSA), Korea Research Institute for Standards and Science (KRISS)

Table of Contents

Foreword ..... **ii**

Acronyms ..... **vi**

1. Introduction **1**

1.1 Purpose 1

1.2 Existing references about Korean Standards System 1

1.3 Report Structure 2

2. Overview of Major Institutions and Laws in Standards Systems **3**

2.1 Major Laws 3

(a) Framework Act on National Standards: Structure 4

2.2 Major Institutions 5

(a) KATS Organization Chart by Three Pillars of Standards 6

(b) KATS History, evolved from ATL in 1883 7

(c) MKE History, evolved from MOC in 1948 7

2.4 Korean Standards System: At a Glance by Numbers 8

3. Standardization Pillar **9**

3.1 Overview 9

3.2 KATS - KS Establishment 10

3.3 KSA – KS Dissemination and Sales 11

3.4 COSD – Designated SDOs for KS Development 13

3.5 Other Private Sector SDOs in Korea 13

3.6 International Standards Activities 14

4. Conformity Assessment Pillar **15**

4.1 Overview 15

4.2 KS Certification and KS Mark 16

4.3 KOLAS – Accreditation of laboratories 17

4.4 KAS – Accreditation of Product Certification Bodies 18
4.5 KAB – Accreditation of Management System Certification Bodies 19
4.6 Beyond KS, Product Certifications and KC Mark 20
(a) Electrical Appliances 21
(b) Consumer products 21
(c) KC Mark System since 2009 21

5. Metrology Pillar 22
5.1. Overview 22
5.2. KRISS, as the national metrology institute (NMI) 23
5.3 KATS, KRISS and KASTO 24

6. Current and Future Agenda: KNSP 2011-2015 25

Appendix A. Introduction to Korean Economy 27
A.1 Korean Economy and Industry 27
A.2 US-Korea Trade Facts 29

Appendix B. Useful Online Resources 30

Table of Figures

Figure 1 Organization Chart of KATS (source: www.kats.go.kr) 6

Figure 2 Number of KS from 1962 – 2011 (source: KSA) 10

Figure 3 Organizational Chart of KSA (source: www.ksa.or.kr).....12

Figure 4 KS Certification Procedures (source: www.kats.go.kr).....16

Figure 5 Organization chart of KOLAS (source: www.kolas.go.kr) 18

Figure 6 Organization chart of KAS (source: www.kats.go.kr).....19

Figure 7 Structure of KAB (source: www.kab.or.kr).....20

Figure 8 Towards a Single Korea Certification Mark: KC Mark (source: www.kats.go.kr) 21

Figure 9 Organization Chart of KRISS (source: www.kriss.re.kr) 24

Acronyms

A2LA	American Association for Laboratory Accreditation
AC	Alternating Current (movement of electric charge)
ANS	American National Standards (by ANSI)
ANSI	American National Standards Institute
APEC	Asia Pacific Economic Cooperation
APLAC	Asia Pacific Laboratory Accreditation Cooperation
APMP	Asia Pacific Metrology Program
ASTM	American Society for Testing and Materials
ATL	Analysis and Testing Laboratory
CACPK	Consumers Korea
CGPM	General Conference on Weights and Measures
CIA	Central Intelligence Agency (USA)
CIPM	International Committee for Weights and Measures
CODEX	Codex Alimentarius Commission
COSD	Cooperative Standards Developing Organizations (Korea)
CRM	Certified Reference Materials
DOC	Department of Commerce (USA)
DoS	Department of State (USA)
EMS	Environmental Management Systems (ex: ISO 14001)
FCC	Federal Communications Commission (USA)
FDA	Food and Drug Administration (USA, under HHS)
FDI	Foreign Direct Investment
FITI	FITI Testing & Research Institute
G20	G-20 Major Economies
GDP	Gross Domestic Product
HHS	Department of Health & Human Services (USA)
IAA	Industrial Advancement Administration
IAAC	InterAmerican Accreditation Cooperation
IAF	International Accreditation Forum
IAS	International Accreditation Service (USA)
IEC	International Electrotechnical Commission
ILAC	International Laboratory Accreditation Cooperation
IMEKO	International Measurement Confederation
IMF	International Monetary Fund
ISC	Industrial Standards Council

ISCP	International Standards Infrastructure Cooperation Program (Korea)
ISMS	information security management system (ex: ISO 27000)
ISO	International Organization for Standardization
ITU	International Telecommunication Union (UN)
JIS	Japanese Industrial Standards
KAB	Korea Accreditation Board
KAFRI	Korea Advanced Food Research Institute
KAS	Korea Accreditation System
KASTO	Korea Association of Standards and Testing Organizations
KATS	Korean Agency for Technology and Standards
KBS	Korean Bureau of Standards (past bureau of Korean Government)
KC	Korea Certification
KCA	Korea Consumers Agency
KCC	Korea Communications Commission (Korean government)
KCL	Korea Conformity Laboratories
KDI	Korea Development Institute
KESI	Korea Elevator Safety Institute
KFDA	Korea Food and Drug Administration (Korean government, under MW)
KLRI	Korea Legislation Research Institute
KNSP	Korea National Standards Plan (KNSP)
K-OHSMS	Korea - Occupational Health and Safety Management System (ex: K-OHSMS 18001)
KOLAS	Korea Laboratory Accreditation Scheme (Korea, KATS)
KOSTAT	Statistics Korea
KRISS	Korea Research Institute of Standards and Science
KS	Korean Industrial Standards
KSA	Korean Standards Association
KSSN	Korean Standards Services Network (Korea, KSA)
KTC	Korea Testing Certification
KTL	Korea Testing Laboratory
KTR	Korea Testing & Research Institute
MEST	Ministry of Education, Science & Technology (Korea)
MFE	Ministry of Finance and Economy (past Korean government)
MIC	Ministry of Information and Communications (past Korean government)
MIFAFF	Ministry for Food, Agriculture, Forestry and Fisheries (Korean government)
MKE	Ministry of Knowledge Economy (Korean government)
MLA	Multilateral Recognition Arrangement
MOC	Ministry of Commerce (past Korean government)
MOFAT	Ministry of Foreign Affairs and Trade (Korean government)

MOST	Ministry of Science and Technology (past Korean government)
MOTIE	Ministry of Trade, Industry, and Energy (past Korean government)
MRA	Mutual recognition agreement, Mutual Recognition Arrangement
MW	Ministry of Health and Welfare (Korea)
NCSRD	National Center for Standard Reference Data (KATS, KRISS)
NIST	National Institute of Standards and Technology (USA, DOC)
NISTIR	NIST Interagency Report (USA, NIST)
NITQ	National Institute of Technology and Quality (past Korean government)
NMI	National Metrology Institutes (BIPM)
NP	New Proposal, New Work Item Proposal (ISO, IEC)
NVLAP	National Voluntary Laboratory Accreditation Program (USA, NIST)
OECD	Organisation for Economic Co-operation and Development
OIML	International Organization of Legal Metrology
PAC	Pacific Accreditation Cooperation
PASC	Pacific Area Standards Congress
PPP	Purchasing Power Parity (GDP)
QMS	Quality Management System
RMISYS	National Reference Materials Information Systems
RMP	Reference Materials Producers
SC	Sub-Committees (ISO, IEC)
SDO	Standards Developing Organizations
SMBA	Small and Medium Business Administration (Korea)
TC	Technical Committees (ISO, IEC)
USDA	Department of Agriculture (USA)
UNDP	United Nations Development Programme
UNSD	United Nations Statistics Division
USCB	United States Census Bureau (USA, DOC)
USTR	United States Trade Representative
WIPO	World Intellectual Property Organization
WTO	World Trade Organization
WTO SPS	WTO Sanitary and Phytosanitary Measures
WTO TBT	WTO Technical Barriers to Trade

1. Introduction

1.1 Purpose

Korea is considered to have a relatively public-sector-led and legislation-based standards system, as many of newly developed countries and developing countries do, while many developed countries including the U.S. have more private-sector-led or less legislated systems. Such differences may arise from cultural, socio-economic, and industrial development of the economy. For instance, in bilateral or multilateral cooperation meetings, a country with a private-sector-led standards system may often find difficulty in understanding the nature of a relatively more public-sector-led standards system of other countries, and vice versa.

Examining industrialization periods shows there are differences between Korea and other advanced nations. Korea's industrialization period began much later (1970-1989) and was of shorter duration (19 years) than those of major advanced countries – Netherlands (1840-1938, 98 years), Germany (1881-1949, 68 years), and the U.S. (1880-1934, 54 years)[1]. Korea's industrialization had been led by its government and related statutes were legislated and public organizations were established accordingly. Because major activities of the national standards system are articulated by law and operated by government agencies or non-governmental public organizations, an understanding of these institutions is more of a pre-requisite to learning Korea standards system than many other developed nations.

This report is intended to serve as a primer for outlining existing instruments of Korea standards system, focusing on relevant key laws and organizations. This report highlights objectives and contents of key legislations, and responsibilities and activities of major organizations in the area of standardization, conformity assessment, and metrology. Also, key policy issues and agendas are briefly highlighted. It should be noted that due to the nature of this report, much of its content is based on or excerpted from original statutes, annual reports and official websites of relevant institutions and systems.

1.2 Existing references about Korean Standards System

There are limited references about the Korean standards system available in English. Except for websites of relevant organizations, only two publications are available – one by National Institute of Standards and Technology (NIST) in 2003 and the other jointly by Korean Agency for Technology and Standards (KATS) & Korean Standards Association (KSA) in 2011.

NISTIR 6960[2] "*Standardization and Conformity Assessment in the Republic of Korea"* (Choe, 2003) – The NIST report is probably the only English publication publicly available about the Korea standards system. The NIST publication was authored by Dr. Gum Ho Choe, a NIST Associate originally from KATS who was working with the Standards Services Division of NIST at the time of the publication. The publication

[1] Yoo, J. (1997). The Impact of the Size of the Global Market on the Speed of Industrialization (in Korean) KDI Development Review, 19(2), 73-157. In the study, industrialization refers to when the population for agricultural industry of a country drops from 50% to 20%.

[2] Full text is available at http://gsi.nist.gov/global/index.cfm/L1-3/L2-8/L3-44/A-371

includes useful information covering Korea's national standards strategy, national standards development and certification, and conformity assessment systems.

KATS & KSA ISCP.PUBLICATION.02[3] – *"Introduction to National Standards System of Korea"* – The report was published jointly by KATS and Korean Standards Association (KSA) in 2011 as a part of International Standards Infrastructure Cooperation Program (ISCP). The publication includes seven major statutes for the Korean standards system both in Korean and English. It was not publically available as it was developed for internal reference purposes only. The joint KATS and KSA publication was a useful reference when preparing legislation related sections of this report describing the laws of Korea's standards system.

Websites provide other useful references. Two notable websites are the official English website of KATS[4] and the Standards Portal of American National Standards Institute (ANSI) with its section for Republic of Korea[5], the contents of which were mostly contributed by KATS in cooperation with ANSI.

English publications about Korean standards system are scarce, and existing publications are dated or provide only partial information rather than presenting a complete picture. In particular, none of the existing publications or websites describe the different roles of laws and institutions in a more comprehensive and comparative purpose. This report may provide a current and wider-ranging picture of Korean standards system. In particular, the scope and responsibility of major statutes and organizations are compared.

1.3 Report Structure

Section 2 of this report includes some figures and statistics of Korea, including its economic development and industrialization structure, science and technology. **Section 3** presents an overview of the Korea standards system with a list of major organizations and statutes noting counterparts or equivalent organizations in the U.S. or international context. **Section 4**, **Section 5**, and **Section 6** highlight relevant legislation and organizations respectively for standardization, conformity assessment, and metrology. **Section 7** summarizes current and future standards policy trends by summarizing Korean National Standards Strategy 2011-2015, which is followed by Appendix A. Introduction to Korean Economy and Appendix B. Useful Online References Resources.

"The state shall establish a system of national standards"

- Constitution of the Republic of Korea: Chapter IX. Economy – Article 127 (3)

[3] Hong, J.-I. (Ed.). (2011). Introduction to National Standards System of Korea (Vol. ISCP.PUBLICATION.02). Seoul, Korea: KATS & KSA.

[4] http://www.kats.go.kr/en_kats/main.asp

[5] http://www.standardsportal.org/usa_kr/e/key_information/key_information.aspx

2. Overview of Major Institutions and Laws in Standards Systems

2.1 Major Laws

In order to understand the national standards system of Korea, one may first start by recognizing the fundamental difference between Korea and the other countries, in particular the U.S. Korea has a more legislation-based national standards system, while the U.S. has a private sector led system. There is no overarching "standardization law" in the United States[6] even though there are several important federal laws and policies of the US including the National Technology Transfer and Advancement Act. The list of relevant laws can be found at www.Standards.gov, a website managed by NIST[7].

Korea however has several laws framing its national standards system, and they are key instruments to understanding how the Korean standards system works. **Table 1** presents six major statutes of Korea's national standards system. KATS is responsible for all the six laws, meaning that KATS is the most important government body in Korea's national standards scheme. The two overarching laws in Korea are *Industrial Standardization Act* of 1961 and *Framework Act on National Standards* of 1999. This report covers laws and institutions for the generic system under the Ministry of Knowledge Economy (MKE). There are many other laws specifying sector-specific regulations and compliances, such as the Framework Act on Broadcastings Communication Development, but such sector-specific laws are not within the scope of this report.

Table 1 Major laws in the Korean standards system (KATS is responsible agency for the laws) [8]

Law	Year	Scope[9]			Short description
		ST	CA	ME	
Framework Act on National Standards	1999	○	○	○	management and coordination of national standards system
Industrial Standardization Act	1961	○	○		national standards (KS) development and conformity assessment (product quality)
Measures Act	1961			○	legal metrology
Quality Control and Safety Management of Industry Product Act	1967 (2000)		○		conformity assessment (product safety and management systems)
Electrical Appliances Safety Control Act	1974		○		conformity assessment (electrical product safety)
Framework Act on Product Safety	2010		○		management and operation of national product safety system

[6] Saunders, M. (2012, Jun 14, 2012). Standards: Federal Participation and Use. Paper presented at the Fundamentals of Standards and Conformity Assessment Washington, DC.

[7] In particular, see http://standards.gov/upload/Federal_Engagement_in_Standards_Activities_October12_final.pdf

[8] The English titles of the laws are those of Korea Legislation Research Institute (KLRI)

[9] In **Table 1** and **Figure 1**, ST represents standardization sector; CA represents conformity assessment sector including accreditation, certification, testing, inspection; and ME represents metrology sector.

(a) Framework Act on National Standards: Structure

☞ **Chapter I. General Provisions**
→ Article 1 (Purpose)
→ Article 2 (Scope of Application)
"This Act shall govern economic and social activities in all areas, to which national standards based on science and technology shall be applicable mutatis mutandis."
→ Article 3 (Definitions)
☞ **Chapter II. Establishment of National Standards System**
→ Article 4 (Preparation of Various Policies)
→ Article 5 (Committee for Deliberation on National Standards)
→ Article 6 (Full Advancement of Resolutions of Deliberative Committee)
→ Article 7 (Establishment of Basic Plans for National Standards)
→ Article 8 (Establishment of Plans for Implementation of National Standards)
☞ **Chapter III. Advancement of National Standards System**
→ Article 9 (Classification of Units of Measurement)
→ Article 10 (Base Units)
→ Article 11 (Derived Units)
→ Article 12 (Measurement Units Outside International System of Units)
→ Article 13 (Representative Institute of National Measurement Standards)
→ Article 14 (Establishment of National Calibration System)
→ Article 15 (Certification and Diffusion of Standard Substances)
→ Article 16 (Establishment and Diffusion of Reference Standards)
→ Article 17 (Legal Weight and Measure)
→ Article 18 (Establishment and Diffusion of Industrial Standards)
→ Article 19 (Advancement of Projects for Establishment of National Measurement Standards)
☞ **Chapter IV. Operation and Management of National Standards System**
→ Article 20 (Overall Control of National Standards System)
→ Article 21 (Establishment of Conformity Assessment System)
→ Article 22 (Product Certification)
→ Article 22-2 (Introduction of Examination System for Certification of Standards)
→ Article 22-3 (Certification of New Type of Products)
→ Article 22-4 (Introduction of Integrated National Certification Marks)
→ Article 23 (Accreditation of Testing and Inspection Institutes)
→ Article 24 (Certification of Quality Management Systems and Environmental Management
→ Article 25 (Reciprocal Accreditation of Conformity Assessment)
→ Article 26 (Enhancement of Cooperation in International Standards)
→ Article 27 (Support with Contributions)
→ Article 28 (Establishment of Foundation to Upgrade Industrial Structure)
→ Article 29 (Fostering Professional Human Resources for Technology of Standards)
→ Article 30 (Personnel Management of Public Officials in Charge of National Standards)
→ Article 30-2 (Establishment of Korea Testing & Research Institute)
→ Article 30-3 (Establishment of Korea Testing Certification)
→ Article 30-4 (Establishment of Korea Conformity Laboratories)
☞ **Chapter V. Supplementary Provisions**

2.2 Major Institutions

Table 2 presents seven major institutions of Korea's national standards system. KATS is a government agency under the Ministry of Knowledge Economy (MKE), and is the single most important institution shaping the Korean system. KATS is responsible for the full spectrum of national standards activities; while implementation or operations may be done by other non-governmental organizations empowered by KATS. KSA is a public institution[10] registered in KATS, and its main responsibilities include KS (Korean Industrial Standards) certification, KS dissemination and promotion as well as being the national quality management promotion center. KATS operates two accreditation systems – Korea Laboratory Accreditation Scheme (KOLAS) and Korea Accreditation System (KAS). KOLAS is responsible for accreditation of laboratories for calibration, testing, inspection, and reference materials while KAS is responsible for product certification bodies. Korea Accreditation Board (KAB) is a non-profit organization and responsible for accreditation of management system certification bodies.

KATS is also responsible for legal metrology and it empowered the Korea Association of Standards and Testing Organizations (KASTO) to disseminate and promote legal metrology. Korea Research Institute of Standards and Science (KRISS) is a public institute registered in Ministry of Education, Science and Technology (MEST), and it mainly serves as the national metrology institute (NMI). KRISS also manages National Center for Standard Reference Data (NCSRD).

Table 2 Major institutions in Korean standards system[11]

Sub-Fields	In Korea (status)		In USA (status)		The institutions are members in:
national standards development and approval	**KATS**	*Gov.*	**ANSI[12] +SDO**	*Almost Exclusively Private*	ISO, IEC PASC
national standards publication, dissemination (sales)	**KSA**	*Public*	**ANSI[13] +SDO**	*Private*	ISO, IEC, members
SDO accreditation (registration in Korea)	**KSA**	*Public*	**ANSI**	*Private*	–
*** Communications Sector**	**KCC**	*Gov.*	**DoS (FCC)**	*Gov.*	ITU
*** Food Sector**	**KFDA, MW, MIFAFF**	*Gov.*	**USDA, HHS, FDA**	*Gov.*	CODEX
*** Technical Barriers to Trade**	**MOFAT, KATS**	*Gov.*	**USTR, DOC**	*Gov.*	WTO/TBT

[10] Public institutions in Korea, in this report, refer to one of the 286 institutions officially listed by Korean Ministry of Strategy and Finance (MOSF) as of 2012 drawing on the *Act on Management of Public Institutions*. Other non-listed organizations may be instead described as non-profit or private organizations.

[11] For names and acronyms of the organizations, please see the 'Acronym section' of this report.

[12] ANSI does not develop standards, but accredits American National Standards (ANS) which are developed by its accredited Standards Developing Organizations (SDOs). Its accreditation procedures are available at www.ansi.org. ANSI is the US representative to ISO, IEC and PASC; but ANSI accredited SDOs are not.

[13] ANSI provides a standards database and sells standards at www.nssn.org and webstore.ansi.org from over 180 standards publishers. There are other private sector organizations that also maintain standards databases mostly in support of their standards sales operations including IHS Global, TechStreet (Thomson Reuters).

(a) KATS Organization Chart by Three Pillars of Standards

KATS is a government agency under MKE, and it has 250 staff. KATS is led by the Administrator, who is assistant minister level, and four Director Generals of Bureaus, and 19 Division Directors. **Figure 1** displays the major responsibilities of the 19 divisions under four bureaus by the three pillars of standards: standardization, conformity assessment, and metrology. The responsibility of Bureau of Technology & Standards policy and its five divisions are cross-pillars. The responsibility of Bureau of Product Safety Policy and its four Divisions are in conformity assessment, in particular product safety; while the responsibility of the Bureau of Conformity Policy and its four Divisions is in more general conformity assessment and metrology. The responsibility of Bureau of Knowledge Industry Standards is in national standards administration and participation in international standardization activities.

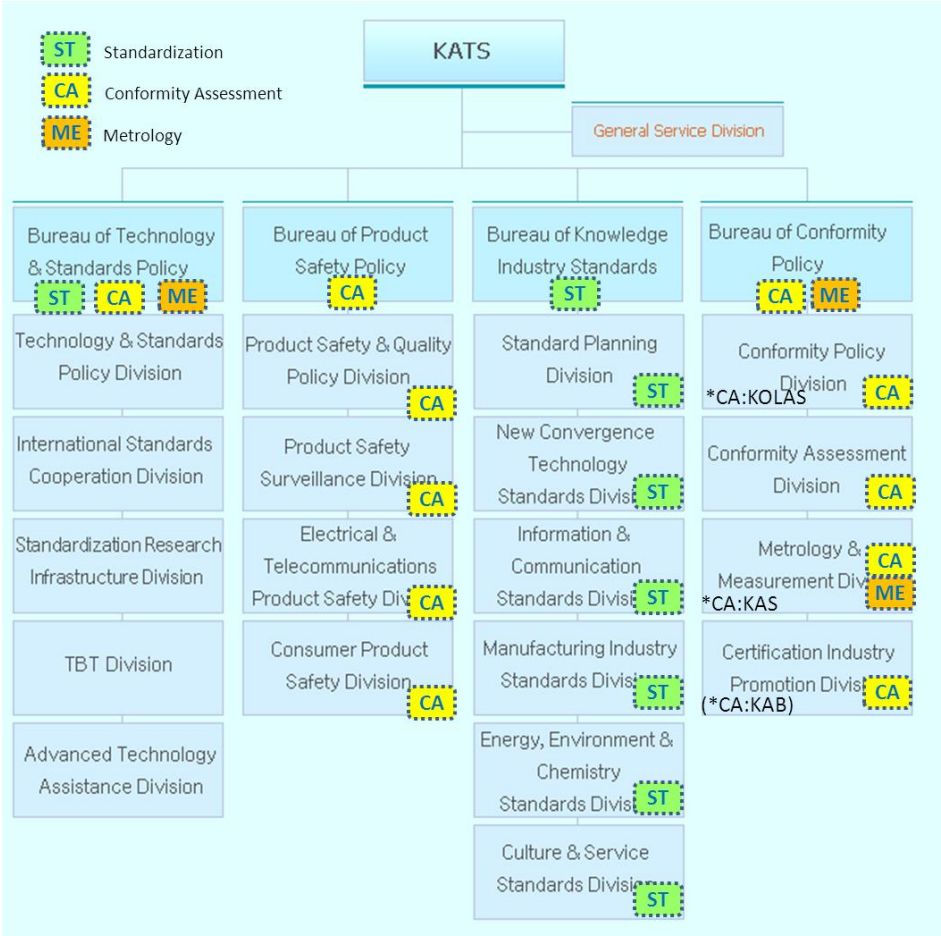

Figure 1 Organization Chart of KATS (source[14]: www.kats.go.kr)

[14] The tags of three pillars (ST, CA, ME) are added by the author

(b) KATS History, evolved from ATL in 1883[15]

KATS is the national standards authority of Korea on behalf of MKE. MKE delegates and entrusts the Administrator of KATS to serve for national standards through the article 32 (Delegation and Entrustment of Authority) of *Enforcement Decree of the Industrial Standardization Act*. The national standards authority of Korea has evolved since the *Act* was established in 1961:

1961 Oct~ : Korean Bureau of Standards (KBS), MOC (Joined ISO and IEC in June 1963)
1973 Jan~ : Korean Bureau of Standards (KBS), IAA
1996 Feb~: Korean National Institute of Technology and Quality (KNITQS), SMBA
1999 Jun~: Agency for Technology and Standards (ATS), MOCIE
2008 Feb~: Korean Agency for Technology and Standards (KATS), MKE

KATS was originally established in 1883, as the Analysis and Testing Laboratory (ATL) under the auspices of the Mint Office. In 1946, it was renamed as Central Industrial Research Institute under the Ministry of Trade and Industry (MOTI). In 1973, it was merged as a National Industrial Standards Testing Institute under the Industrial Advancement Administration (IAA) together with Bureau of Standards, MOC. In 1996, it was merged with the name of National Institute of Technology and Quality (NITQ) under the Small and Medium Business Administration (SMBA). In 1999, it became Agency for Technology and Standards (ATS) under the Ministry of Commerce, Industry and Energy (MOCIE). In 2008, its formal English name changed to Korean Agency for Technology and Standards under the Ministry of Knowledge Economy (MKE).

(c) MKE History, evolved from MOC in 1948[16]

The Korean Ministry of Knowledge Economy (MKE) serves to establish national policy for commerce, industry, energy, FDI, R&D, and some information and communication technology. MKE was originally established in 1948 as the Ministry of Commerce (MOC) in the First Republic. In 1962, MOC established an external Bureau for Standards (KBS). MOC was merged with the Ministry of Trade and Industry, and the Ministry of Energy and Resources, as the Ministry of Trade, Industry, and Energy (MOTIE) in 1993. MOTIE was reorganized once again, as the Ministry of Commerce, Industry, and Energy (MOCIE) in 1998, after the government reforms of 1998, transferring the responsibility for international trade issues to the Ministry of Foreign Affairs and Trade. MOCIE was reorganized as MKE in in 2008, merging some elements of the Ministry of Information and Communications (MIC), the Ministry of Science and Technology (MOST), and the Ministry of Finance and Economy (MFE) in order to enhanced government instrument capable of meeting new challenges of the 21st century. By the *Industrial Standardization Act* of 1961, the MKE has the authority of Korean Industrial Standards (KS), its establishment and conformity assessment.

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[15] History of KATS can be found at http://www.kats.go.kr/en_kats/about/KAEU01_2.asp?sub_menu=2

[16] History of MKE can be found at http://www.mke.go.kr/language/eng/about/history.jsp. The Presidential election of Korea is scheduled in Dec 2012, and some experts carefully anticipate that another governmental restructuring is expected with new President. After the election, there is a possibility that MKE may have a new name in 2013.

2.4 Korean Standards System: At a Glance by Numbers

Major figures of Korean national standards infrastructure are summarized in **Table 3**.

Table 3 Korean National Standards Infrastructure at a Glance by Key Figures

Items	Status or Numbers	Rank	Source (year)[17]
KS number	23,923	–	KATS (2011)
- aligned KS	15,365 (with ISO, IEC)	–	KATS (2011)
KS technology councils	52 councils (543 experts)	–	KATS (2010)
- expert committees	370 committees (4,493 experts)	–	KATS (2010)
KS certification	1,284 standards (items)	–	KSA (2011)
- total certificates	10,284 (6,245 factories for 801 items)	–	KSA (2011)
- overseas certificates	240 factories (for 117 items)	–	KSA (2011)
KOLAS accredited	630 laboratories (organizations)	–	KOLAS (Aug 2012)
KAS accredited	13 laboratories (organizations)	–	KATS (2010)
KAB accredited	35 organizations (companies)	–	KAB (Aug 2012)
Standard Reference data	44 Database (21 Data Centers)	–	NCSRD (2011)
Reference materials	658	–	KRISS (2011)
Other Private Standards	1,882 standards by 106 SDOs	–	KSA (2011)
ISO	Member Bodies (111)	–	ISO (Sep 2011)
- TC P membership	709 (out of 737 TCs)	–	ISO (Sep 2011)
- convenors	65 (out of 2,414 convenors)	12th	ISO (Sep 2011)
- secretariats	16 (out of 725 secretariats)	10th	ISO (Sep 2011)
IEC	Full members (60)	–	IEC (Aug 2012)
- TC P-membership	142 (out of 174 TCs)	10th	IEC (Aug 2012)
- chairs	1 (out of 291 chairs)	20th	IEC (Aug 2012)
- secretariats	4 (out of 187 chairs)	10th	IEC (Aug 2012)
- NP proposal	19 (out of 144 NP proposals)	3rd	IEC (Aug 2012)
ISO 9001 certificates	24,778 (increase in 2010: 1,378)	10th	ISO Survey (2010)[18]
ISO 14001 certificates	9,681 (2010: 1,838)	10th	ISO Survey (2010)
TS 16949 certificates	4,014 (2010: 157)	2nd	ISO Survey (2010)
ISO 13485 certificates	500 (2010: 157)	5th	ISO Survey (2010)

[17] The figures of the table are mostly attained from official websites of mentioned institutions unless indicated otherwise. Most of websites provide the data in Korean only.

[18] ISO Survey of Certifications, for 2010, published in Dec. 2011 (http://www.iso.org/iso/iso-survey2010.pdf)

3. Standardization Pillar

3.1 Overview

KS, National standards of Korea, are managed by KATS, whose responsibility was delegated and entrusted by MKE drawing on *Industrial Standardization Act* and its *Enforcement Decree* as noted below. KSA is responsible for publishing and disseminating KS by the same law.

☞ **Industrial Standardization Act:**

→ **Chapter II. Korean Industrial Standards – Article 5 (Establishment, etc. of Industrial Standards)**
"The Minister of Knowledge Economy may establish, amend, or abolish industrial standards…"

→ **Chapter V. Korean Standards Association – Article 34 (Functions of Association)**
"The Association shall conduct the following activities: …. 1. Publication and dissemination of Korean Industrial Standards and publications, and promotion for implementing…"

☞ **Enforcement Decree of the Industrial Standardization Act:**
→ **Article 32 (Delegation and Entrustment of Authority)**
"Ministry of Knowledge Economy shall delegate …..the authority to the Administrator of Korean Agency for Technology and Standards…"

Table 4 displays major institutions by fields of standards, in comparison to those of United States and related international organizations.

Table 4 Major institutions in Korean standardization system

Sub-Fields	In Korea (status)		In USA (status)		The institutions are members in:
national standards development and approval	**KATS**	*Gov.*	**ANSI[19] +SDOs**	*Private*	ISO, IEC PASC
national standards publication, dissemination (sales)	**KSA**	*Public*	**ANSI[20,21] +SDOs**	*Private*	ISO, IEC, members
private SDO registration[22] (accreditation in the USA)	**KSA**	*Public*	**ANSI**	*Private*	–

[19] ANSI does not develop standards, but accredits American National Standards (ANS) which are developed by its accredited Standards Developing Organizations (SDOs). Its accreditation procedures for standards and SDOs are available at www.ansi.org.

[20] ANSI provides a standards database and sells standards (www.nssn.org and webstore.ansi.org) from over 180 standards publishers. Individual standards developing organization may also sell their own standards.

[21] It is also important to note that the context of national standards. In the case of Korea and many other countries, the phrase "National Standard" has a very specific connotation, which is not the case in the USA.

[22] For more information, see Section 3.5

3.2 KATS - KS Establishment

Based on the *Industrial Standardization Act*, KATS organizes and manages a high-level 'Industrial Standards Council (ISC)', 52 technology councils composed of 543 experts at the next level, and 370 expert committees composed of 4,493 experts at the lowest level. The Industrial Standards Council may approve KS based on the recommendations from technology councils and expert committees. Expert committees often function as mirror committees and counterparts to the technical committees (TC) or sub-committees (SC) of ISO and IEC.

Figure 2 shows total number of KS from 1962 to 2011. The first 300 KS standards were published in 1962, and by the end of 2011 the number has grown to 23,923 KS standards.

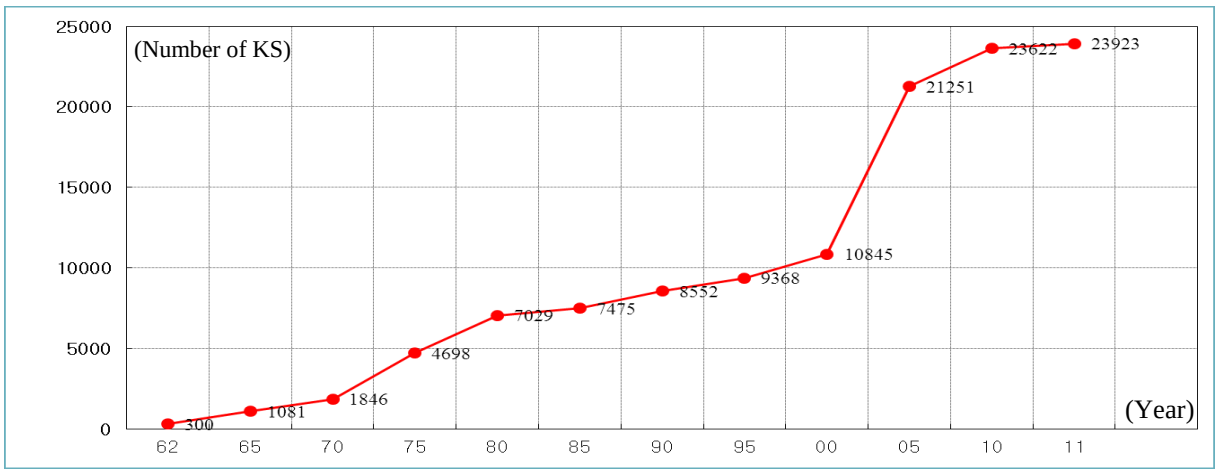


Figure 2 Number of KS from 1962 – 2011 (source: KSA)

KS may be grouped into three types of standards as follows. Product standards specify improvement, measurement and quality of product. Procedure standards stipulate testing, analysis, inspection, measurement method and process standard, etc. Horizontal standards specify terminology, technical characteristics, unit and numerical progression, etc. The 23,923 KS are composed of 7,576 product standards, 8,540 procedure standards, and 7,807 horizontal standards.

KS is also classified into 21 sectors to help users. **Table 5** presents the 21 KS sector codes including (A) for basic, (B) for mechanical engineering, (Q) for quality management, (S) for services, to (X) for Information sectors. For instance, in service sector (S), the number for "Call Center Services" standard is KS S 1006-1: 2006.

Table 5 Number of KS by the Classification Code (as of Dec 2011, source: www.ksa.or.kr)

Sector	No. of Standards	Sector	No. of Standards
1. Basic Standards (A)	744	12. Ceramics (L)	475
2. Mechanical Eng. (B)	4,149	13. Chemistry (M)	3,465
3. Electrical & Electronic Eng. (C)	3,832	14. Medical (P)	760
4. Metals (D)	1,633	15. Quality management (Q)	123
5. Mine (E)	440	16. Transport machine (R)	1,067
6. Construction (F)	858	17. Service (S)	113
7. Necessities (G)	383	18. Logistics (T)	319
8. Foodstuffs (H)	526	19. Shipbuilding (V)	834
9. Environment (I)	672	20. Aerospace (W)	522
10. Organism(J)	78	21. Information (X)	2,039
11. Fiber (K)	891	**Total:**	**23,923**

3.3 KSA – KS Dissemination and Sales

☞ **Industrial Standardization Act:**
→ **Chapter V. Korean Standards Association – Article 34 (Functions of Association)**

*"**The Association shall conduct the following activities:***
1. *Publication and dissemination of Korean Industrial Standards and publications, and promotion for implementing Korean Industrial Standards;*
2. *Collection and dissemination of international and foreign standards and various other standards;*
3. *Investigation, research, development, promotion, diagnosis, guidance, and training on industrial standardization and quality management;*
4. *Accreditation and evaluation promoting industrial standardization and quality management;*
5. *Support for collective standardization activities;*
6. *Support for international standardization activities;*
7. *Other services entrusted by the Minister of Knowledge Economy or determined by the articles of incorporation."*

KSA provides KS standards at a low price online (KSSN network) and offline (printed copy) for producers and consumers. To enable industries and consumers to encourage introduction and understanding of KS and KS mark certification system, KSA publishes and distributes various kinds of information and makes efforts to broadcast the importance of its standardization program and the system in TV, newspaper and radio. In the *Industrial Standardization Act* revised to promote utilization of KS in Feb. 5, 1999, it was prescribed that companies financed by national and local self-governing bodies, governmental investment institutes, public agencies, and Korea Development Bank shall observe the KS standards relating to procurement of materials and services, production management and facilities construction.

KSA holds anniversary events on "World Standards Day" in coordination with KATS. It awards prizes or medals to good companies which contribute to the introduction and application of standardization as well as to people of merit in standardization to enhance the recognition of standardization.

Korean Standards Service Network (KSSN, www.kssn.net) is a standard information portal service which was developed as a part of the Technology Infra Foundation Program formed by Ministry of Commerce, Industry and Energy. It contains huge amounts of data-based standards information including written standards, measurement standards and reference standards as well as conformity assessment, trends in standardization and international and private standardization activities.

KSSN Web-Store service provides not only Korean Industrial Standards (KS), but ISO, IEC, JIS, ASTM standards under the information agreement with international and foreign standardization institutes online. KATS also provides a standards information portal for informational purposes. (www.standard.go.kr)

KSA has 4,500 member companies, and its 2011 budget was around 80.6 million U.S. dollars. KSA has over 300 full-time staff and its offices are located in Seoul, in 13 local cities as well as in Beijing, China. One of the KSA's missions is to develop human resources in standards and quality. KSA trains approximately 25,000 experts with around 400 courses every year. The organizational chart of KSA is displayed in **Figure 3**.

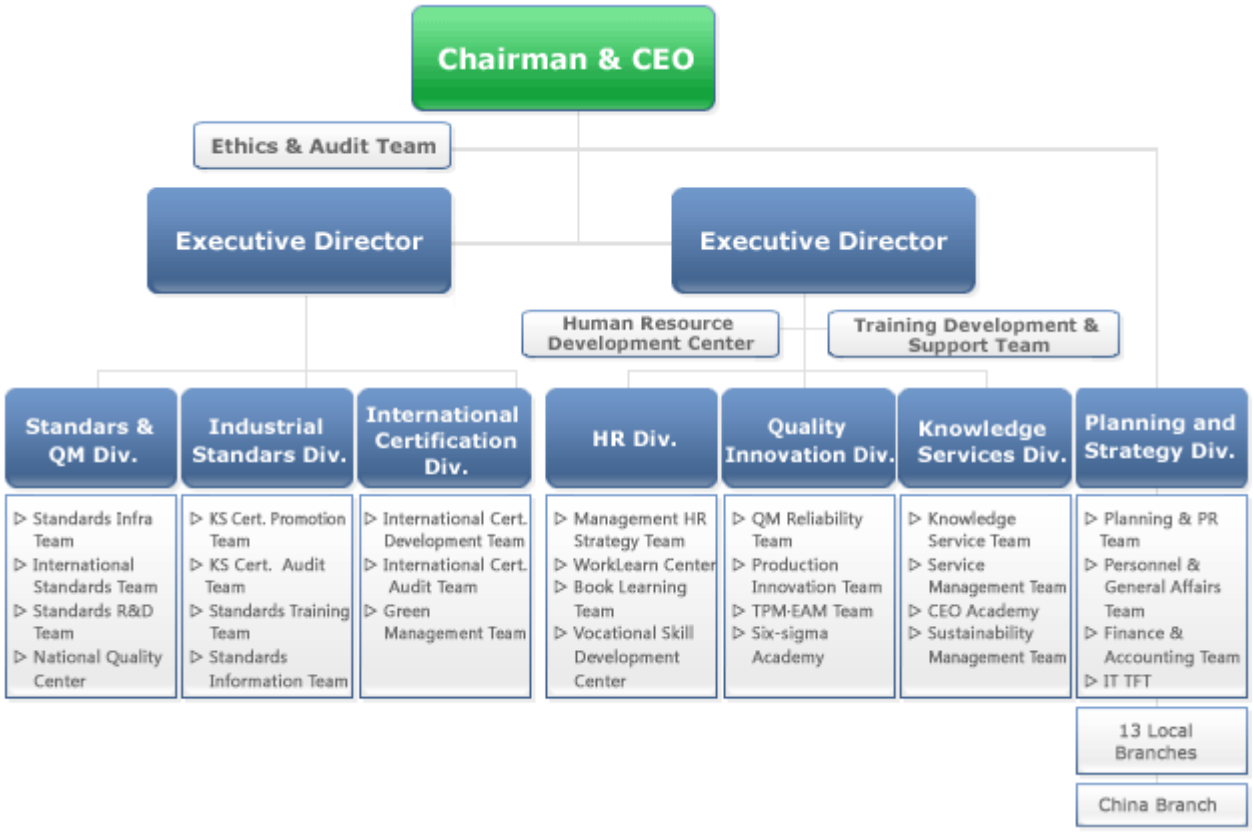


Figure 3 Organizational Chart of KSA (source: www.ksa.or.kr)

3.4 COSD – Designated SDOs for KS Development

☞ **Industrial Standardization Act:**
→ Chapter II. Korean Industrial Standards – Article 5 (Establishment, etc. of Industrial Standards)

"(3) Where necessary for an efficient promotion of the establishment and amendment of industrial standards, the Minister of Knowledge Economy may designate any juristic person or organization conducting affairs related to industrial standardization as a cooperative organization for the development of industrial standardization and utilize it."

KATS has introduced a Cooperative Standards Developing Organizations (COSD) scheme in order to efficiently develop national KS by improving the standardization capacity of the private sector. In its long term plan, KATS plans to transfer its responsibility in standards development and management from KATS to private professional organizations or trade associations.[23]

As of June 2011, 44 organizations have been designated as Cooperative Standards Developing Organizations (COSD) – 14 organizations were first designated in 2008, 23 organizations in 2009, and 12 organizations in 2010. The 49 organizations were reduced to 44 because of mergers of five organizations.

3.5 Other Private Sector SDOs in Korea

☞ **Industrial Standardization Act:**
→ Chapter IV. Promotion of Industrial Standardization – Article 27 (Establishment, etc. of Collective Standards)

"(1) Any organization determined by Ordinance of the Ministry of Knowledge Economy, from among those related to industrial standardization, may establish standards for symbols, terms, functions, procedures, methods, technology, etc. (hereinafter referred to as "collective standards") applicable to specific professional field in order to secure the public safety, protect consumers and strive for convenience of members.."

In the statute above, 'collective standards' refers to domestic private sector SDOs. KSA was designated as secretariat office to register 'collective standards' in 2004. The number of standards registered by KSA has increased from 1,188 standards in 2004 to 1,878 active standards in Aug 2012. SDOs should prove that the standards are developed in fair, open, and consensus-based process in order to register their standards in the KSA database. These SDOs include small to medium and large size of organizations such as Korea Fire-Fighting Escapement Industry Cooperative (KFEIC, 2 standards registered), Korea Agricultural Machinery Industry Cooperative (KAMIC, 111 standards), Korea Electric Association (KEA, 345 codes), Korea Education and Research Information Service (KERIS, 29 standards).

[23] Technology Standards White Paper 2011 (KATS)

3.6 International Standards Activities

☞ **Framework Act on National Standards:**
→ Chapter IV. Operation and Management of National Standards System – Article 26 (Enhancement of Cooperation in International Standards)

"The Government shall endeavor to maintain or strengthen cooperative relationships between domestic standards-related agencies and international standards organizations or foreign standards agencies and promote exchanges of science and technology."

☞ **Industrial Standardization Act:**
→ Chapter IV. Promotion of Industrial Standardization – Article 29 (Promotion of Cooperation in International Standardization)

"…(2) In order to promote cooperation in international standardization, the Minister of Knowledge Economy shall conduct the following activities:
1. Promotion of investigation, research, dissemination and use of international standards;
2. Investigation and research for cooperation in international standardization;
3. Collection, analysis and dissemination of information on cooperation in exchange of human resources and standardization;
4. Other projects deemed necessary for promoting cooperation in international standardization by the Minister of Knowledge Economy"

The two major Korean statues specify the responsibility of government in participating and monitoring international standards activities. Korea joined the ISO and IEC in 1963 led by the Korean Ministry of Commerce, and joined the ITU in 1952, led by the Ministry of Foreign Affairs.

4. Conformity Assessment Pillar

4.1 Overview

The two following statutes specify that the government shall establish and promote a conformity assessment system – accreditation, certification, testing, inspection, and related management.

☞ **Framework Act on National Standards:**
→**Article 21 (Establishment of Conformity Assessment System)**
(1) The Government shall endeavor to promote projects for accreditation and certification of the conformity assessment system and to make the conformity assessment procedure conform to international guidelines and international standards (hereinafter collectively referred to as "international norms").
→Article 22 (Product Certification, etc.)
→Article 22-4 (Introduction of Integrated National Certification Marks) *KC Mark
→Article 23 (Accreditation of Testing and Inspection Institutes)
→Article 24 (Certification of Quality Management Systems and Environmental Management Systems)

☞ **Industrial Standardization Act:**
→ Article 13 (Designation of Certification Institutions)
→ Article 15 (Certification of Products), Article 16 (Certification of Services)
→ Article 17 (Certification Inspection)

Table 6 presents one KS certification body, KSA, and three accreditation bodies for laboratory, product, and management systems in Korea. KATS administers KOLAS and KAS; the 'conformity policy division' of KATS is responsible for KOLAS and its 'metrology and measurement division' is for KAS (see **Figure 1**). KAB is a private organization entrusted by KATS, and its activities are coordinated with the 'certification industry promotion division' of KATS.

Table 6 Major institutions in Korean Conformity Assessment System

Sub-Fields	In Korea (status)		In USA (status)		The Institutions are members in:
Certification Bodies for National standards (KS)	**KSA**	*Public*	–	–	–
Accreditation for laboratory	**KOLAS (KATS)**	*Gov.*	**9 Org.**[24] **(ex. NVLAP)**	*Public & Private*	ILAC, APLAC, IAAC
Accreditation for product certification	**KAS (KATS)**	*Gov.*	**3 Org**[25] **(A2LA, ANSI, IAS)**	*Public & Private*	IAF, PAC, IAAC
Accreditation for management system	**KAB**	*Private*	**ANAB**	*Private*	IAF, PAC IAAC

[24] This table includes nine U.S. domiciled accreditation bodies that are signatories to the ILAC MRA.

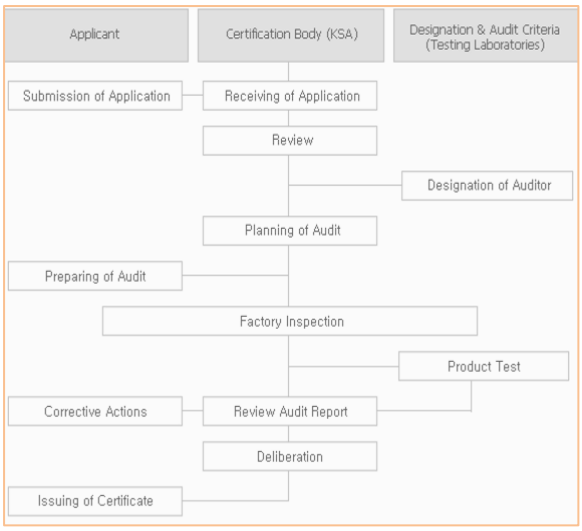
[25] This table includes U.S. domiciled accreditation bodies that are signatories (full member) to the IAF MLA.

4.2 KS Certification and KS Mark

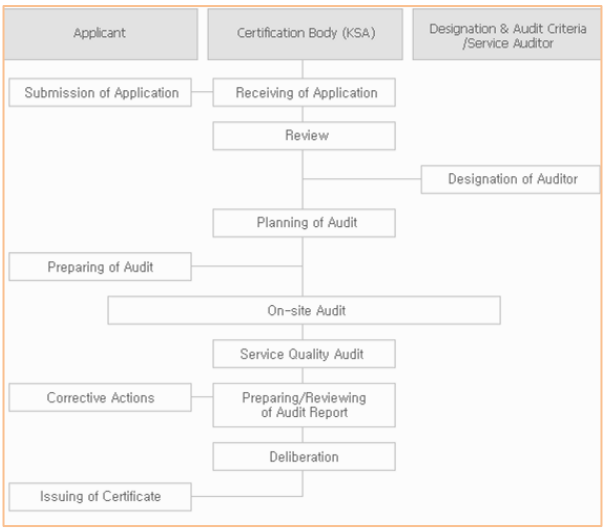
KS certification scheme provides government agencies, local governments, government investment corporations and public organizations with the benefit that they can preferentially purchase products and services by KS-certified companies in accordance with the Article 25 of *Industrial Standardization Act*.

Launched in 1962, the KS certification system has operated for as long as Korea's industrialization process. Just as Korea's industrial structure developed into a highly sophisticated, knowledge-intensive industry in the 21st century, KS certifications also prepared for the future. First, KSA expanded the KS certification in future promising industries as new growth engines. Certification in green industries such as LED lighting has started recently, and has been extended to IT, shipbuilding, and aerospace industries. KS certification is looking for ways to play its role anew vis-a-vis safety, environment-friendliness, social responsibilities, enhancement of energy efficiency, and consideration of the aged and the disabled, which are emerging as social issues.

The use and certification of KS has been extended to some of our trade partners, and a total of 278 items from seven countries received KS certification as of the end of 2008; standards and audit criteria are increasingly aligned with international standards. Such transformation of KS certification will further promote citizens' benefits and lead to the continuous development of Korea's industries.



(a) Product Certification



(b) Service Certification

Figure 4 KS Certification Procedures (source: www.kats.go.kr)

Product Certification – KS certification scheme for products is the system of certifying that a certain product regulated in relevant standards has passed product testing, factory inspection and auditing according to the criteria of relevant KS based on the Article 15 of Industrial Standardization Act, allowing it to display

the KS mark on their product, packaging, container, statement of delivery warranty and/or promotional materials. (**Figure 4-(a)**)

Service Certification – KS certification scheme for service is designed to ensure that the service provider who passes the onsite and service quality audit in accordance with the audit criteria of the relevant KS under the Article 16 of Industrial Standardization Act is allowed to indicate the KS mark on the contract, statement of delivery, warranty and/or promotional materials. (**Figure 4– (b)**)

Audit Criteria for Certification – There are regulations for implementing certification audits on products and services by relevant standards. Audit criteria for certification include manufacturing equipment, inspection facility and procedure, quality management, as well as technical conditions for quality assurance.

This section is based on, and more information can be found at the following links:

▷ http://www.kats.go.kr/en_kats/standard/KAEU03_2.asp?sub_menu=2
▷ http://www.ksa.or.kr/eng/eng02_04.jsp; http://www.kssn.net/English/
▷ http://www.standard.go.kr/CODE02/USER/0D/01/CtnInf01.asp (Korean)

4.3 KOLAS – Accreditation of laboratories

The Korea Laboratory Accreditation Scheme (KOLAS) is the governmental accreditation body established on December 8, 1992 and administered by the Korean Agency of Technology and Standards (KATS). The KOLAS Secretariat, which is responsible for the day-to-day running of KOLAS is currently operated by the 'Conformity Assessment Division' of KATS for accreditation of testing, calibration laboratories and inspection bodies. The division resides within the Bureau of Conformity Policy of KATS and the Administrator of KATS represents KOLAS externally. The organization structure of KOLAs is displayed in **Figure 5**.

KOLAS has been actively participating in the international activities relating to testing and calibration in cooperation with the Asia-Pacific Laboratory Cooperation (APLAC) and the International Laboratory Accreditation Cooperation (ILAC). KOLAS signed Asia-Pacific Laboratory Cooperation Mutual Recognition Arrangement (APLAC MRA) in Sydney on October 23, 1998 for testing and May 22, 2001 for calibration. Since then, members of the APLAC MRA have expanded from 17 to 27 economies. KOLAS is also a signatory to the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement (ILAC MRA) which was signed in Washington DC on November 2, 2000. It now involves 73 member bodies. The ILAC arrangement will provide technical underpinning to international trade by promoting cross-border stakeholder's confidence and acceptance of accredited testing and calibration results.

To improve work efficiency of the KOLAS secretariat, KOLAS is operating e-KOLAS, a service established to shorten the period required for application and assessment procedures, provide faster services and promote the qualitative enhancement of all KOLAS business affairs from application to announcement of the accreditation.

Four KOLAS publications are available in English at its website. These include the following: 1) **KOLAS-R-001** *Regulations for Accreditation of Calibration Laboratories; 2)* **KOLAS-R-002** *Regulations for Accreditation of Testing Laboratories and Inspection Bodies; 3)* **KOLAS-R-003** *Regulations for Proficiency Testing Scheme; 4)* **KOLAS-R-004** *Regulations for Accreditation and Assessment of CABs.* More information can be found at http://www.kolas.go.kr/english/

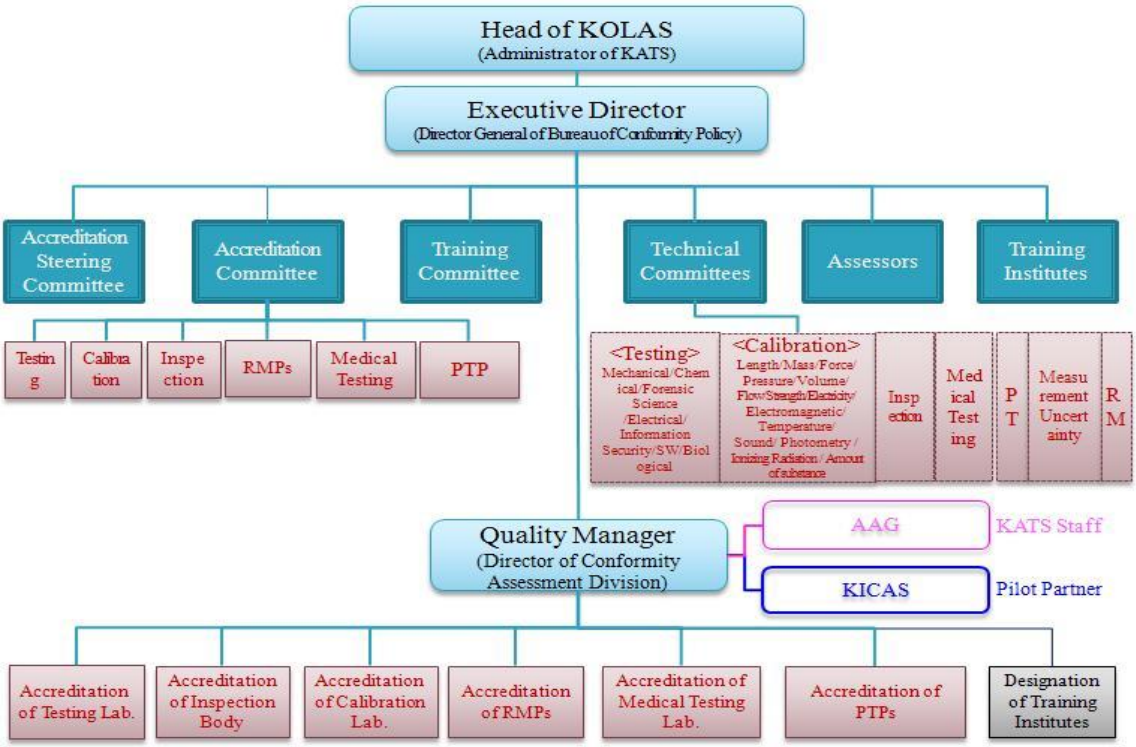


Figure 5 Organization chart of KOLAS (source: www.kolas.go.kr)

4.4 KAS – Accreditation of Product Certification Bodies

Korea Accreditation System (KAS) is a national accreditation body established in 2001 within the framework of KATS, and the Administrator of KATS serves as the Head of KAS. KAS provides accreditation for product certification bodies in the fields of electric apparatus, gas appliances, renewable energy equipment, metals, ceramics, chemicals and plastics which are not subject to the current mandate. KAS joined PAC MLA in July 2007 and IAF MLA in October 2007 for products. KAS consists of the Head of KAS, Accreditation Review Committee, Accreditation Planning Committee, Training Committee, Technical Committees and the Secretariat as shown in **Figure 6.**

The main mission of KAS is to improve the accreditation system in order to ensure qualitative growth and competitiveness of the accreditation service; to guarantee the compliance of international standards and

enhance accreditation service; to properly respond to the demands by stakeholders in the accreditation service and improve the reliability and value of accreditation service; and to implement effective and reliable accreditation service and train personnel. More information can be found at http://www.kats.go.kr/kas/english/index.asp

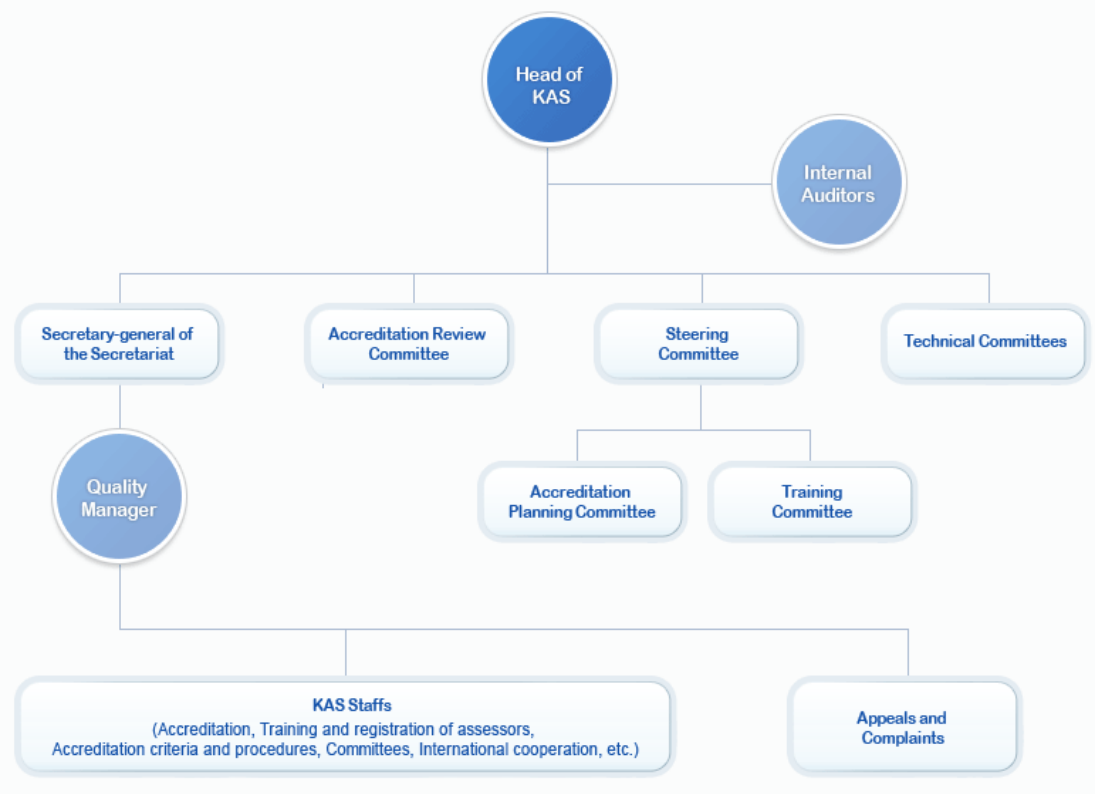


Figure 6 Organization chart of KAS **(**source: www.kats.go.kr)

4.5 KAB – Accreditation of Management System Certification Bodies

Korea Accreditation Board (KAB) was established on September 28, 1995 in accordance with the government's policy of non-governmental operation for Quality and Environmental Management System certification. KAB is a sole national accreditation body recognized by the Ministry of Knowledge Economy MKE, and operates the accreditation programs of management systems certification bodies and of personnel certification bodies. A company or person intended to be certified shall conform to certification criteria or standards required by the certification scheme concerned, while conformity assessment bodies, management system certification bodies and personnel certification bodies shall be operated in an objective, independent and impartial manner.

KAB became signatories of the IAF MLA in 1999 for quality management systems (QMS) and in 2003 for environmental management systems (EMS) after successful evaluation by a peer evaluation team, which made ISO 9001 and ISO 14001 certificates accredited by KAB recognized in the countries who are

members of the IAF MLA. In addition, to meet market needs of industry specific quality as well as other management systems, KAB operates accreditation programs for TL 9000, K-OHSMS, ISMS, and ISO 22000 etc. with the support of Ministry of Knowledge Economy (previously the Ministry of Commerce, Industry and Energy (MOCIE)).

KAB provides accreditation activities and surveillance of certification bodies for management systems and people, and carries out MLA activities for international recognition as well as other services for certification development such as research & development, dissemination and publication. KAB's source of revenue is service charges from its own business. For the organization structure of KAB, please see **Figure 7**. The accreditation criteria for ISO 9001 certification bodies, ISO 14001 certification bodies, management system certification bodies, and administrative templates are available online in its website. More information can be found at https://www.kab.or.kr/English/kab/kab_service.html

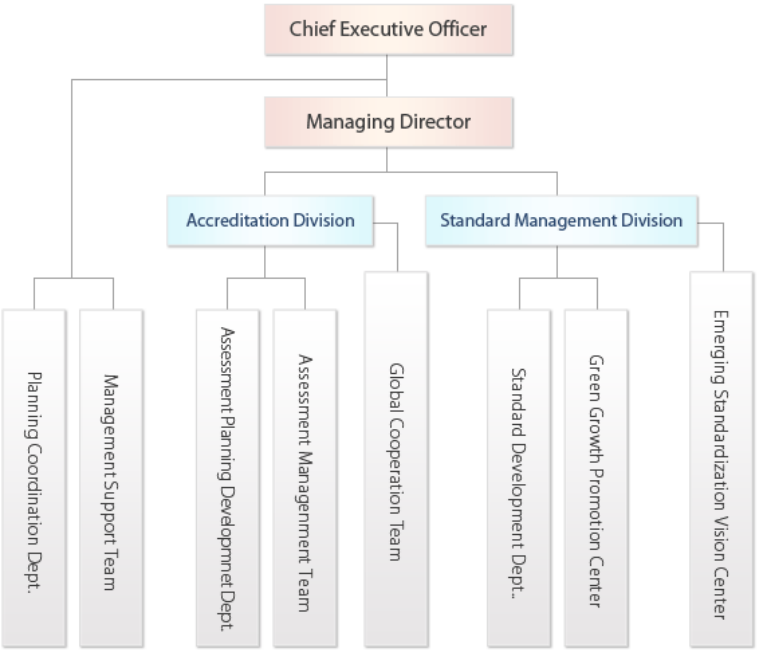


Figure 7 Structure of KAB (source: www.kab.or.kr)

4.6 Beyond KS, Product Certifications and KC Mark

Other than KS certification, there are three important conformity schemes in Korea. Two of them are electrical appliances and consumer products based on two different laws. Also, an integrated marking system, KC mark, is based on the Framework Act on National Standards.

(a) Electrical Appliances [26]

To protect consumers from hazards and accidents such as a fire, electric shock or injury, the ***Electrical Appliances Safety Control Act*** was enacted in 1974. The listed electrical appliances in the Act rated between AC 50V to 1000V are controlled by the Act.

(b) Consumer products [27]

A safety certification scheme for consumer products is designed to prevent consumers from safety accidents or physical injury caused by consumer products such as metal blades for portable brush cutters and children's goods such as toys (***Quality Management & Safety Control of Industrial Products Act***). This scheme is mandatory safety certification that domestic and foreign manufacturers from safety certification bodies prior to the delivery of products. The statute regulates that consumer products product test and factory inspection shall be conducted to ensure the safety of consumer products.

(c) KC Mark System since 2009[28]

Diverse or overlapping certification marks may have caused confusion among consumers, and have also proven costly and time consuming for businesses. To resolve such issues, KATS revised the ***Framework Act on National Standards*** and ***its Enforcement Decree*** and introduced its national integrated certification mark on July 1, 2009. KS Mark system is designed to protect public health and safety, and companies are required to obtain prior certification from authorized bodies before they can put certain products on the market. Items subject to legally compulsory certification are specified in related laws and ordinances pertaining to safety, health, environment and quality.

In this context, KC Mark was introduced as one single Korea Certification mark to integrate and unify all 13 existing legally compulsory certification marks (see **Figure 8**). KC Mark may reduce the number of standard certification audit systems from 20 to 9 based on international standards (ISO/IEC Guide 67). The MKE introduced the KC mark system on July 1, 2009, and the systems have been implemented on January 1, 2011, with the participation of other responsible ministries.

Figure 8 Towards a Single Korea Certification Mark: KC Mark (source: www.kats.go.kr)

[26] More information is available at http://www.kats.go.kr/en_kats/psc/KAEU07_1.asp

[27] More information is available at http://www.kats.go.kr/en_kats/psc/KAEU07_2.asp?sub_menu=2

[28] More information is available at http://www.kats.go.kr/en_kats/news/KAEU04_6.asp?sub_menu=6

5. Metrology Pillar

5.1. Overview

Measures Act covers mainly legal metrology activities including the role of KATS and KASTO while *Framework Act on National Standard*s articulates overall activities of measurement standards, standards reference materials and data including the role of KATS and KRISS as noted below.

☞ **Measures Act:**
→ **Chapter I. General Provisions**
Article 1 (Purpose), Article 2 (Definitions), Article 4 (Measuring Units)
→ **Chapter II. Measuring Instrument Business, Tests, Etc.**
SECTION 1 Registration, etc. of Business of Manufacturing Measuring Instruments
SECTION 2 Observance of Legal Measurements
SECTION 3 Type Approval for Measuring Instruments
SECTION 4 Tests, etc. of Measuring Instruments
→ **Chapter III. Self-Declaration of Conformity for actual Quantity-indicated Goods**
→ **Chapter IV. Mayor/Governor's Post-Management**
→ **Chapter V. Supplementary Provisions**
Article 40 (Korea Association of Standards and Testing Organizations)

☞ **Framework Act on National Standards:**
→ Chapter III. Advancement of National Standards System
Article 9 (Classification of Units of Measurement)
Article 10 (Base Units)
Article 11 (Derived Units)
Article 12 (Measurement Units Outside International System of Units)
Article 13 (National Metrology Institute)
Article 14 (Establishment of National Calibration System)
Article 15 (Certification and Diffusion of Standard Substances)
Article 16 (Establishment and Diffusion of Reference Standards)
Article 17 (Legal Metrology)
Article 18 (Establishment and Diffusion of Industrial Standards)
Article 19 (Advancement of Projects for Establishment of National Measurement Standards)

Table 7 shows that KRISS is the national metrology institute and the Korean representative for the National Metrology Institutes (BIPM) and Asia Pacific Metrology Program (APMP). Korea joined BIPM in 1959. KATS has legal authority to develop standards reference data and materials, and KATS empowers KRISS and other organizations to serve and operate standards reference data and material centers. KATS is also responsible for legal metrology, and represents Korea in International Organization of Legal Metrology (OIML). Korea joined OIML in 1978. KASTO, a non-profit private organization, promotes and disseminates legal metrology in cooperation with KATS. The metrology and measurement division of KATS is responsible for the metrology activities.

Table 7 Major institutions in Korean metrology system

Sub-Fields	In Korea (status)		In USA (status)		The institutions are members in:
National metrology institute (NMI)	**KRISS**	*Public*	**NIST**	*Gov.*	BIPM, APMP
Standard Reference Data	**KRISS (KATS)**	*Public (Gov.)*	**NIST**	*Gov.*	–
Standard Reference Materials	**KRISS +9 org.**[29]	*Public +RMPs*	**NIST**	*Gov. +many*	ISO/REMCO
Legal metrology	**KATS**	*Gov.*	**NIST**	*Gov.*	OIML, APLMF
Legal metrology promotion	**KASTO**	*Private*	–	–	–

5.2. KRISS, as the national metrology institute (NMI)

In the Korean standards system, the *Framework Act on National Standards* officially designated KRISS, a national metrology institute (NMI), in February 1999. As the NMI representing the Republic of Korea, pursuant to Article 13 of the *Framework Act on National Standards*, KRISS has established national measurement standards in over 170 areas as of 2009. KRISS provides internationally recognized national measurement standards to its customers in various industries as a means to help improve the quality and competitiveness of Korean industrial products and exports in global markets. KRISS also engages in developing new measurement technologies and standards required for cutting-edge technological innovations such as in nanotechnology, biotechnology, and information and communications technologies, and in playing a leading role in the development of forward-looking innovations.

KRISS has been is an active member of international metrology organizations such as the APMP and General Conference of Weights and Measures (CGPM). KRISS has sought to ensure the equivalence of Korea's national measurement standards with those of the international community and to reinforce its leadership in these international bodies in order to enhance the global recognition of Korea's metrology capabilities.

Major functions of KRISS include establishment, maintenance, and improvement of national measurement standards for length, time, and weight; development of new metrology and assessment technologies necessary for advanced industries; calibration and testing of industrial measuring instruments; and dissemination of certified reference materials (CRM).

KRISS has about 388 full time employees with 221 holding Ph.D. degrees – 234 research scientists, 61 engineers, 54 technicians, and 39 admin staff. KRISS collaborates with three international organizations: International Committee for Weights and Measures (CIPM), APMP and International Measurement Confederation (IMEKO). The operating units of KRISS are organized into four divisions for R&D, and four

[29] KRISS leads activities for standards reference materials, and serves as a purveyor of certified reference materials in Korea (more information can be found at http://rmisys.kriss.re.kr/english/main.html). There are 9 KOLAS accredited reference materials producers (RMPs) in Korea by KOLAS, and their list can be found at http://www.kolas.go.kr/english/Directory/DirectoryList.aspx?Accredit=04

divisions for Service & Management. Each division is made up of specialist centers dedicated to improving measurement capabilities and services. The budget for fiscal year 2011 amounts to U.S. $ 108 million. As **Figure 9** shows, KRISS has two offices directly under the president, and eight centers which are composed of 28 scientific centers under five (green) divisions and 12 policy and administrative teams under three (gray) divisions.

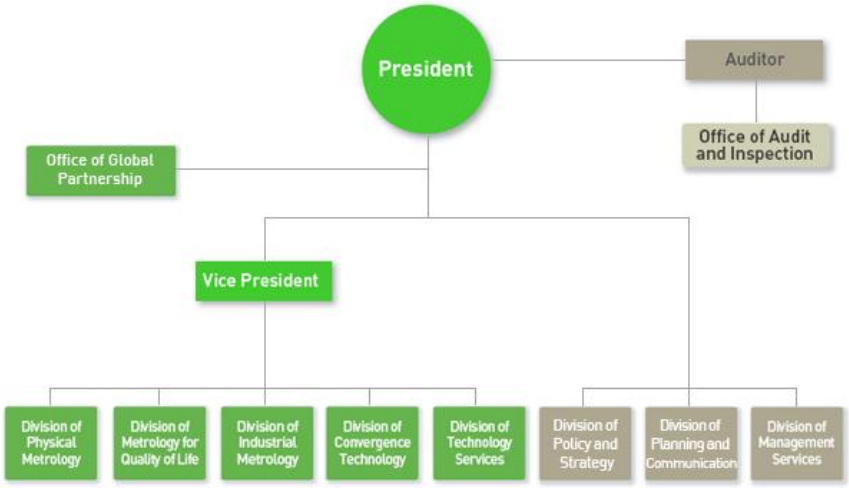


Figure 9 Organization Chart of KRISS (source: www.kriss.re.kr)

5.3 KATS, KRISS and KASTO

Even though KRISS is a research institute mainly funded and registered under the Ministry of Education, Science & Technology (MEST), KRISS has been working closely with KATS within a national metrology system. It is because KATS is responsible for the *Framework Act on National Standards* which covers both scientific and legal metrology. This situation requires good coordination and cooperation relationship between the public research institute KRISS, which has good scientific capacity, and the government agency KATS, which has legal authority.

It is clear that KRISS is responsible for scientific metrology while KATS is for legal metrology in general. The responsibilities may appear a bit mixed in the area of standards reference data and standards reference materials. KATS plays a greater policy role, while KRISS operates National Center for Standard Reference Data (NCSRD)[30] and national Reference Materials Information Systems (RMYSYS)[31].

KASTO was established as a non-profit organization in 1990 and later on recognized in *Measures Act*. KASTO serves to promote and disseminate metrology. KASTO is also one of the designated training institutions for KOLAS.

[30] More information can be found at http://www.srd.re.kr, http://db.srd.re.kr/ (in Korean)

[31] More information can be found at http://rmisys.kriss.re.kr/english/

6. Current and Future Agenda: KNSP 2011-2015

This section highlights current and future issues and goals of Korean standards system by summarizing the Korea National Standards Plan (KNSP). Article 7 of the *Framework Act on National Standards* requires the Korean government to revise a Korea National Standards Plan (KNSP) every five years, which is approved by the National Standards Council[32]. On 29 November 2010 the Council approved the 3rd KNSP for the year of 2011-2015 which was completed in over a year of consultations with government agencies and some fifty experts.

The KNSP 2011-15 aims to transform Korea into a 'world-class nation with strong standards'. The KNSP 2011-15 expands its policy spectrum from two earlier versions of KNSPs, which were more focused on standards activities for industrial development such as product interoperability and productivity maximization, to a broader concept including convenience of citizens' life and public-private partnership for national standards system. The 3rd KNSP includes four main strategies composed by 12 sub-strategies and 151 action items as shown **Table 8**.

(Strategy I) The KNSP continues to highlight the importance of national standards development to support major national current and future prioritized industry and relevant international standards activities. Such national standardization efforts should be the basis for Korea's proactive participation in international standards setting. The plan underlines the need to enhance the integrated approach between R&D and standard-setting efforts[33].

Table 8 KNSP 2011-2015: Four Major Objectives

Strategies	Sub-Strategies
I. Support Growth Engine Industry: 36 action items	1. Develop national standards development for emerging major industries 2. Proactive participation in international standards for infra-technologies 3. Enhance integration of R&D and standardization activities
II. Build Business-friendly Infrastructure: 35 action items	4. Reform certification system to be more business-friendly 5. Support standards development for the user 6. Advance global competitiveness in measurement
III. Form Convenient and Safe Society: 50 action items	7. Standardization for convenient life and services 8. Standardization for societal safety and security 9. Standardization for Public Administration
IV. Public-Private Partnership System: 30 action items	10. Advance national standards system 11. Promote more participation of private sector 12. Strengthen Inter-governmental agency cooperation

(Strategy II) The KNSP directs the Korean government to build more business friendly standards

[32] The National Standards Council is composed of a few private sector experts and Deputy Ministers of different ministries, and chaired by the Minister of Ministry of Knowledge Economy (MKE).

[33] KATS recently introduced a standards-PM or standards-coordinator for prioritized national R&D program for such area as Smart Grid, and there will be high chances of cooperation with the U.S. in common areas of standards development interest.

related environments in Korea. It includes reform of the national standards certification system including that of KS certification. Also, it emphasizes the importance of measurement competences for further industrial development.

As a follow-up of this strategy, in July 2012 KATS reported to the President of Republic of Korea about its 'Advancement Plan for National Standards Certification System', which includes 1) coordination of reportedly duplicating or unreasonable certification related regulations, 2) alignment of KS and government agencies' regulations with international standards, 3) building a globally relevant standards-certification system, 4) developing a standards-certification infrastructure for knowledge economy[34].

(Strategy III) The concept of convenience and a safe society in the KNSP includes developing an online portal where any citizen can propose a new standardization project to resolve daily-life inconveniences. KATS and KSA will also operate 'Convenient Daily-life Standardization Forums' in order to incorporate the voices of consumers and related organizations in a national standardization plan. These projects might include standardization of cellular phones keypads, inter-hospital data sharing, Korean rice wine, tour services, wedding procedure services as well as civil services.

(Strategy IV) The KNSP clearly presents its future direction from a current public-sector (government)-led system towards a public-private balanced system for national standards. If the direction is right, the challenges include finding workable mechanisms to transform into a public-private cooperative system without damaging current well-working processes within the established government-led national standards system. The public-private balanced system may require more capacity of private sector than they currently have – more experienced and capable standards development organizations, and for testing laboratories in testing and inspection than now[35]. Human resources development is also cardinal in making this strategy a success, which suggests strengthening education and training programs at formal, post-formal, and sector-specific levels[36]. Finally, inter-governmental agency cooperation could be one of the key future agenda items. The inter-agency cooperation[37] may include harmonization between KS and agency regulations, a common approach to standardization efforts in government funded R&D program, and collaboration in convergence sectors.

[34] KATS released a relevant press release on 16 July 2012.

[35] Even though Korea may not simply follow the uniquely developed U.S. standards system, the U.S. private-sector-led and public-private cooperative system is a good reference for Korea to study.

[36] Human resource development is another good area of cooperation between Korea and the U.S. at both formal level education which Korea has been quite active and post-formal level training programs which the U.S. has diverse programs.

[37] NTTAA implementation experiences of the U.S. will be useful references for Korea in the harmonization efforts of regulations with KS or international standards.

Appendix A. Introduction to Korean Economy

A.1 Korean Economy and Industry

After the Korean War in 1953, Korean economy grew significantly and the country was transformed into one of the major newly industrialized countries in the world. Korea showed fast industrial and economic growth particularly between 1960s - 1990s. The nominal Gross Domestic Product (GDP) of Korea had grown from around $3.9 billion in 1960 (in current U.S. dollars) to over $1,116 billion in 2011. The Korean GDP (PPP) ranked 12th in 2011, and total value of international merchandise trade values were $1,271 billion dollars, ranking 9th in the world.

Korea has adopted an export driven economic development policy, and its current exports are mainly composed of products in heavy, chemical, electronic industries and information and communication industries. Such exports have been largely supported by its infrastructure for standardization, conformity assessment, and metrology. As SaKong and Koh (2010) explained, the transformation of the Korean economy can be summarized through industrialization and globalization. The share of its primary sector fell precipitously from 42 percent in the 1950s to 3 percent in the 2000s. Light industries used to dominate Korean manufacturing value-added by the 1970s, but heavy and chemical industries, and later electrical and electronic industries have surpassed light industries after the 1980s and the 1990s.

CIA's World Fact Book[38] suggests that an initial system of close government and business ties, including directed credit and import restrictions, made Korea's success possible. The government promoted the import of raw materials and technology at the expense of consumer goods, and encouraged savings and investment over consumption. But the Asian financial crisis of 1997-98 exposed longstanding weaknesses in South Korea's development model including high debt/equity ratios and massive short-term foreign borrowing. GDP plunged by 6.9% in 1998, and then recovered by 9% in 1999-2000. Korea adopted numerous economic reforms following the crisis, including greater openness to foreign investment and imports. In 2004, Korea joined the trillion dollar club of world economies, and currently is among the world's 20 largest economies. In the third quarter of 2009, the economy began to recover, in large part due to export growth, low interest rates, and an expansionary fiscal policy, and growth was 3.6% in 2011.

Around two thirds of Korea's export volume was toward the U.S. and Japan in the 1960s and 1970s. At that time, because of historic and economic reasons, its national standards system and standards development activities had been largely influenced by the U.S. and Japan. During the period, many standards and test methods used in Korea were likely transferred or influenced by those of the two countries. After the 1990s, the export and trade partners are diversified to include the current top trade partner, China, and other economies.

[38] Online version of CIA World Factbook is available at https://www.cia.gov/library/publications/the-world-factbook/

Table A-1 shows an outline of Korean economy with key figures and rankings in scientific and technological investment and outcomes, and the size of economy and trade in the global context.

Table A-1 Korean Economy at a Glance by Key Figures

Items	Status or Figures	Rank	Source (year)
Memberships	WTO, OECD, G20, APEC	-	-
Population	50,004,441	25th	www.kostat.go.kr/eng/
- Seoul (capital)	10,528,774	-	www.kostat.go.kr/eng/
- Seoul Metropolitan	22,547,000	3rd	www.Demographia.com
Area	38,691 sq mi	109th	unstats.un.org
Population Density	487 person/km2	6th	-
R&D expenditure	$ 44.8 Billion (3.0% GDP)	5th	Royalsociety.org (2010)
Patent (application)	172,342	4th	www.wipo.int/ipstats/en/
Human Development	0.897	15th	hdr.undp.org/en/statistics/
GDP (PPP)	$ 1,554 Trillion	12th	www.imf.org/external/data.htm
- per capita	$ 31,714	26th	www.imf.org/external/data.htm
GDP (nominal)	$ 1,116 Trillion	15th	www.imf.org/external/data.htm
- per capita	$ 22,778	34th	www.imf.org/external/data.htm
Trade	$ 1,271 Billion	9th	stat.wto.org
Trade/GDP(nominal)	113.8%	-	-
Export	$ 649 Billion	8th	stat.wto.org
- merchandise	$ 555 Billion	7th	stat.wto.org
- services	$ 94 Billion	15th	stat.wto.org
Import	$ 622 Billion	9th	stat.wto.org
- merchandise	$ 524 Billion	9th	stat.wto.org
- services	$ 98 Billion	13th	stat.wto.org

A.2 US-Korea Trade Facts

This sub-section summarizes the US-Korea trade facts provided by the official website of the U.S. Trade Representative (USTR)[39]. In 2011, the US-South Korea Free Trade Agreement was ratified by both governments and went into effect in March 2012. The South Korean economy's long term challenges include a rapidly aging population, inflexible labor market, and heavy reliance on exports - which comprise half of its GDP. U.S. goods and services trade with Korea totaled $125 billion in 2011. U.S. exports totaled $60 billion; Imports totaled $65 billion.

Goods Trade – In 2011, Korea was the 7th largest goods trading partner of the U.S. with $100 billion in total (two way) goods trade. Korea was the United States' 7th largest goods export market with U.S. goods exports to Korea totaling $43.5 billion, up 12.0% ($4.7 billion) from 2010, and up 56% from 2000. U.S. exports to Korea account for 2.9% of overall U.S. exports in 2011. The top export categories by commodity classification of 2 digit Harmonized System (HS) Code were machinery ($6.1 billion), electrical machinery ($6.1 billion), optic and medical instruments ($2.9 billion), aircraft ($2.6 billion), and mineral fuel (oil) ($2.6 billion).

U.S. goods imports from Korea totaled $56.6 billion in 2011, a 15.9% increase ($7.8 billion) from 2010, and up 41% from 2000. U.S. imports from Korea accounted for 2.6% of overall U.S. imports in 2011. The five largest import categories were: electrical machinery ($16.1 billion), vehicles (cars) ($12.0 billion), machinery ($10.3 billion), mineral fuel and oil ($2.6 billion), and iron and steel products ($2.1 billion).

Agricultural Products Trade – U.S. exports of agricultural products to Korea totaled $7.0 billion in 2011, which is the 5th largest U.S. agricultural export market. Leading categories include: coarse grains ($1.8 billion), red meats (fresh/chilled/frozen) ($1.2 billion), hides and skins ($470 million), wheat ($466 million), and cotton ($394 million).

US imports of agricultural products from Korea totaled $333 million in 2011. Leading categories include processed fruit and vegetables ($37 million) and snack foods including chocolate ($32 million).

Private Commercial Services Trade – U.S. exports of private commercial services (i.e., excluding military and government) to Korea were $16.8 billion in 2011 (preliminary data), 11% ($1.7 billion) more than 2010 and 143% greater than 2000 levels. Other private services (education and business, professional and technical services and education services), royalties and license fees, and the travel categories accounted for most of U.S. services exports to Korea.

US imports of private commercial services, excluding military and government, were $8.4 billion in 2011 (preliminary data), up 8% ($633 million) from 2010, and up 83% from 2000. Other transportation (freight services), passenger fares, and travel categories accounted for most of the U.S. services imports from Korea.

[39] The USTR website was accessed 13 September 2012, at http://www.ustr.gov/countries-regions/japan-korea-apec/korea.

Appendix B. Useful Online Resources

1) ANSI Standards portal – Republic of Korea section
    a. http://www.standardsportal.org/usa_kr/e/key_information/key_information.aspx

2) CACPK - Consumers Korea **safety, market surveillance*
    a. http://www.cacpk.org/eng.html

3) FITI - FITI Testing & Research Institute
    a. http://www.fiti.re.kr/ft_eng/ft_about/about01.asp

4) KAB - Korea Accreditation Board **accreditation of management systems certification bodies*
    a. https://www.kab.or.kr/English/kab/kab_greeting.html

5) KAFRI - Korea Advanced Food Research Institute ** KS (food category)*
    a. http://www.kafri.re.kr/n_english/english.asp

6) KATS - Korean Agency for Technology and Standards
    a. KATS history:
    http://www.kats.go.kr/en_kats/about/KAEU01_2.asp?sub_menu=2
    b. KATS organization:
    http://www.kats.go.kr/en_kats/about/KAEU01_3.asp?sub_menu=3
    c. KATS Annual reports 2006-2008:
    http://www.kats.go.kr/en_kats/news/KAEU04_4_1.asp?sub_menu=4
    d. Korean Standards System :
    http://www.kats.go.kr/en_kats/policy/KAEU02_1.asp
    e. KS – Korean Industrial Standards
    http://www.kats.go.kr/en_kats/standard/KAEU03_1.asp?sub_menu=1
    f. KS Certification:
    http://www.kats.go.kr/en_kats/standard/KAEU03_2.asp?sub_menu=2
    g. KC Mark System:
    http://www.kats.go.kr/en_kats/news/KAEU04_6.asp?sub_menu=6
    h. KC Certification System:
    http://www.kats.go.kr/en_kats/standard/KAEU03_2.asp?sub_menu=2

7) KATS > KAS: Korea Accreditation System (operated by KATS)
**accreditation of products certification bodies*
    a. http://www.kolas.go.kr/english/

8) KATS > KOLAS: Korea Accreditation System (operated by KATS)
**accreditation of products certification bodies*
    a. http://www.kolas.go.kr/english/

9) KATS > Korea Enquiry point for TBT (operated by KATS)
    a. http://www.knowtbt.kr:8888/eng/index.aspx

10) KATS > Standards Information Portal: KS Info (operated by KATS)

a. http://www.standard.go.kr/
b. http://www.standard.go.kr/CODE02/USER/0B/12/GovStdFieldSearch.asp (technical regulations search)
c. http://www.standard.go.kr/e-book/ks_history_50th.html?OlapCode=STAU0109 (Fifty Years of Korean Industrial Standardization History 1961-2011 (e-book, Korean)

11) KCL - Korea Conformity Laboratories

a. http://www.kcl.re.kr/

12) KCA - Korea Consumers Agency

a. http://www.kca.go.kr/jsp/eng/main.jsp

13) KESI - Korea Elevator Safety Institute

a. http://www.kesi.or.kr/10_english/01_welcome/01_welcome.asp

14) KFDA - Korea Food and Drug Administration * *CODEX, WTO/SPS*

a. http://www.kfda.go.kr/eng

15) KLRI - Korea Legislation Research Institute * *full text statues translated in English*

a. http://www.klri.re.kr/eng/category/main.do
b. http://elaw.klri.re.kr/eng_service/lawNameList.do (Korean laws translated into English)
c. Full text of Korean statues are freely available at www.law.go.kr

16) KRISS - Korea Research Institute of Standards and Science **NMI, scientific measurement*

a. http://english.kriss.re.kr/
b. KRISS Organization: http://www.kriss.re.kr/eng/about/02_4.html
c. KRISS Statistics: http://www.kriss.re.kr/eng/about/02_6.html
d. KRISS Brochure and Video: http://www.kriss.re.kr/eng/communy/03_1.html
e. CIPM MRA, Fact sheet: http://www.kriss.re.kr/eng/communy/03_3.html
f. KRISS Handbook & Points of contact: http://www.kriss.re.kr/eng/communy/03_4.html

17) KRISS > NCSRD - National Center for Standard Reference Data (operated by KRISS) **standard reference data center*

a. http://www.srd.re.kr/ (in Korean)
b. http://db.srd.re.kr/ (in Korean)
c. http://sizekorea.kats.go.kr (in Korean)

18) KRISS > National Reference Materials Information Systems (RMISYS)

a. http://rmisys.kriss.re.kr/english/

19) KSA - Korean Standards Association * *KS certification, KS promotion, quality management*

a. KSA history:
http://www.ksa.or.kr/eng/eng01_02.jsp
b. KSA organization:
http://www.ksa.or.kr/eng/eng01_03.jsp
c. KSA business and services
http://www.ksa.or.kr/eng/eng02_01.jsp
d. KSA training and education:
http://www.ksa.or.kr/eng/eng02_03.jsp
e. Certifications for KS, ISO, CDM, JIS
http://www.ksa.or.kr/eng/eng02_04.jsp
f. KSA promotions: National Quality Award, Quality Circles, Standards Day
http://www.ksa.or.kr/eng/eng02_05.jsp

20) KSA > KSSN – Korean Standards Services Network *KS sales (operated by KSA)

a. http://www.kssn.net/English/
b. KS classification:
http://www.kssn.net/English/Intro/C_Intro_list5.asp
c. KS distribution:
http://www.kssn.net/English/Intro/C_Intro_list6.asp
d. KS webs-store (standards searching and purchase):
http://www.kssn.net/English/WebStore/C_WebStore_list.asp
e. KS certification procedure:
http://www.kssn.net/English/Intro/C_Intro_list8.asp

21) KTC - Korea Testing Certification

a. http://www.ktc.re.kr/

22) KTL - Korea Testing Laboratory

a. http://www.ktl.re.kr/eng/

23) KTR - Korea Testing & Research Institute

a. http://www.ktr.or.kr/

24) MIFAFF - Ministry for Food, Agriculture, Forestry and Fisheries * *CODEX, WTO/SPS, KS (food category)*

a. http://english.mifaff.go.kr/main.jsp

25) MW - Ministry of Health and Welfare (MW) * *CODEX, WTO/SPS*

a. http://english.mw.go.kr/front_eng/index.jsp