

Strategy document for information technology standards in Singapore

Choo Chun Wei

Deputy Director, Planning Department, National Computer Board, Singapore

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Preface by the Editor-in-Chief

This strategy document offers useful, interesting, and unique insights into the way one national standards organization plans for information technology standardization. Not every nation participates in all the International Standards Organization's technical committees but all such technical committees do have an effect upon economic decisions made by both the large and small nations. In this document we see an example from which many nations can learn.

We see also an attempt to do strategic planning in the area of information technology standardization. Whether strategic planning is possible for standards causes discussions at the highest levels internationally.¹ This document clearly represents a very thorough plan whose progress can be monitored over time.

We have included also the following material as appendices:

Appendix 1. The composition of the IT Standards Working Group.

Appendix 2. Terms of reference of IT Standards Committee.

Appendix 3. Abbreviations used.

Appendix 4. The Singapore National Organisation for Standardization.

¹ See, for example, *An Analysis of the Information Technology Standardization Process*, Proceedings of the International Symposium on Information Technology Standardization (North-Holland, New York, 1989).

We are pleased to be able to present it to our readers and express our thanks to Mr. Choo Chun Wei and the Singapore Institute of Standards and Industrial Research.

1. Background

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2. Assumptions

The strategic direction is based on the following general assumptions about the development of IT.

- The use of IT will continue to grow at an exponential rate and increase in importance to the social, economic, political and security aspects of society on both a national and international basis.
- The merging of information processing and telecommunications and the integration of voice, data, graphics, and image information within a single system will continue to evolve as an underlying major technical direction in IT.
- Primary applications in IT such as text processing, data processing, information retrieval and realtime systems will continue to merge into integrated information systems serving multiple application disciplines.
- The basic component, programming, systems and telecommunications technologies will continue to advance at a rapid pace and will continue to promote innovation in equipment, software and application development through the fourth and fifth generation eras of IT.
- The application of IT will become increasingly more important to industry in general for achieving productivity and competitive advantage.

3. Trends

Based on these assumptions, the following major trends will continue or will develop in the IT standards area:

- Increasing demand by users for interoperability between equipment which is based on different architectures and which can be obtained from a variety of manufacturers from different countries.
- Increasing demand by users for information about what standardization activity is taking place and how it is developing; also about how these increasingly complex and interrelated standards are to be correctly implemented.
- Interrelationships between international standards organisations responsible for IT standardization and organisations involved in implementation and test development for conformance

are beginning to develop and to increase in importance.

- The conformance, interpretation and maintenance aspects of IT standardization are becoming more critical and more dynamic in nature.
- Increasing need for cooperation between international standards organisations and committees involved in IT, telecommunications and application-specific standardization.
- Increasing movement toward the acceptance and implementation of international standards at national and regional levels by governments, general users, major manufacturers, international corporations and other major international organisations.
- International IT standards are becoming major requirements in procurements particularly for governments and large national and international corporations and organisations.
- The adoption of international IT standards will help our local IT industry to develop products that will gain acceptance and competitiveness in the international market.

4. The IT Standards Committee

In view of these strategic assumptions and trends, an IT Standards Committee should be formed in Singapore to focus on issues related to IT standards.

The overall mission of the IT Standards Committee is to promote and guide the application and development of IT standards in Singapore. It is hoped that the availability and adoption of well-developed IT standards will foster the use of IT and the growth of the IT industry in Singapore.

The Working Group has prepared the Terms of Reference of the IT Standards Committee to be as follows.

4.1. Functions

1. To appoint Technical Committees and such other Committees as it deems desirable to deal with the standardization work of the various branches of Information Technology as it may deem desirable;
2. To control and guide the work of the Technical Committees in areas under its purview and to take such action as may be considered ap-

propriate for furthering standardization in those areas, and in particular to authorise the commencement of work upon a standard, to approve the final draft before submission to the Standards Council, and to determine the priorities of the various projects authorised by it;

3. To receive and deal with the reports and recommendations of the Technical Committees, and to submit recommendations thereon to the Standards Council concerning matters in which the Standards Council's decision is necessary;
4. To monitor the international IT standardization efforts;
5. To promote awareness and usage of IT standards in Singapore;
6. To facilitate feedback and discussion on IT standards issues.

4.2. Composition

1. The IT Standards Committee shall comprise such representatives of the respective interests of manufacturers, consumers, government departments, statutory boards, professional organisations, testing and research organisations, and other interest groups as may be decided by the Standards Council establishing this Committee;
2. The IT Standards Committee shall have the power to co-opt additional members;
3. The Chairman of the IT Standards Committee shall be a member of the Standards Council appointed by the Minister for Trade and Industry. Such appointment shall be for a period of three years and may be renewed for such periods as the Minister may decide;
4. The Secretary of the IT Standards Committee shall be appointed by the National Computer Board. Such appointment shall be for a period of three years and may be renewed for such period as the NCB may decide;
5. The term of office of the members of the IT Standards Committee shall also be three years.

4.3. Proceedings

1. Seven clear days' notice at least shall be given for every meeting of the IT Standards Committee, but the Chairman of the Committee, or one-third of the members of the IT Standards Committee may in case of urgency convene a

meeting on less than seven clear days' notice. Every notice to convene a meeting shall specify generally the business transacted by the meeting and shall be deemed to have been served on the next day following that on which it is posted;

2. The quorum for meetings shall be one-third of the IT Standards Committee;
3. Each member and the Chairman of the Committee shall have one vote. The advisor or any other person attending the meeting shall not have the right to vote except when substituting for a representative. When voting, the decisions of the Committee shall be taken by two-thirds of the votes cast;
4. Membership of the IT Standards Committee shall be evidenced by records to be kept by the Secretary to the Committee, which shall at all times contain the names and addresses of all the members thereof.

5. Initial scope of IT standards

The Working Group has identified an *initial set* of technology and application areas which should be studied. Tentative priorities were assigned based on the maturity of the technologies and their likely contribution to Singapore's IT push, and on the relative importance of standards in the application of these technologies.

5.1. Computer connectivity

5.1.1. Systems interconnection

Priority: 1

There is an ever-increasing demand for digital communication between computers and users. Computer connectivity enables access to computer systems in locations ranging from within the same building and between different buildings in different countries. Different components are available for communications systems design, leading to an increased number of possible systems designs and configurations, and the options open to system users. The Open Systems Interconnection model has been defined by ISO as the standard for computer connectivity, from the application layer down to the physical layer. Vendors are increasingly beginning to migrate to international stan-

dards based on the OSI model from proprietary interconnection strategies.

Examples

OSI	ISO
SNA	IBM
TCP/IP	US DOD

5.1.2. Local Area Networks

Priority: 1

Within a limited geographic area a LAN provides a means of interconnecting and integrating heterogeneous elements using a shared communication system. The structure of LANs reflects their principal functions of multiple connectivity and resource sharing; the communications resources of a LAN are shared among all devices attached to the network, allowing users easy access to one another and sharing of common resources.

Examples

IEEE 802	IEEE, ISO
OS/2 LAN Manager	IBM
FDDI	ANSI

5.1.3. Integrated Services Digital Network (especially the application layers)

Priority: 1

ISDN is a set of technologies and international standards that describe the advanced digital networking capabilities and services that will be available on the public telephone network. A single interface to the ISDN network will provide access to services for voice, data and image applications. Standards groups are working towards international ISDN standards. Singapore Telecoms is actively watching and implementing ISDN standards.

Examples

I Series	CCITT
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5.1.4. Network management

Priority: 2

Computer communication networks are becoming increasingly complex, partly due to the variety of different brands of computers and hardware resources to be linked together, and partly due to the range of data communications and telecommunications services available. Users also require a higher level of network performance, availability and reliability. Network management products enable

the planning, design, control and diagnosis of computer and communication networks.

Examples

SNA/Netview	IBM
UNMA	AT&T
OSI Network Management	OSI NM Consortium

In addition to the networks-related issues, computer connectivity encompasses the following applications-related areas.

5.1.5. Electronic mail

Priority: 1

Electronic mail interconnection on a global scale is fast evolving. International standards for interconnection between e-mail systems, corporate networks and public networks are key. At recent trade fairs, computer vendors and telecommunications suppliers have worked together to show the viability of international e-mail networks and services.

Examples

X.400, X.500	CCITT
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5.1.6. Office document processing

Priority: 2

Office documents have become more complex with the demand for publishing quality, multimedia presentation, document interchange between different application software and the transmission of documents across communication networks. Standards are needed to specify how office document descriptors and data are to be defined and interpreted.

Examples

SGML	ISO
ODA/ODIF	ISO

5.2. Software portability

5.2.1. Operating systems

Priority: 1

In the mainframe sector, operating systems based on IBM's System 370 are the industry de-facto standards. In minicomputers, proprietary OSs of the leading vendors dominate. In microcomputers, the present standard is MS-DOS or PC-DOS. Increasingly important are 'open systems', which are non-proprietary operating en-

vironments providing the benefits of portability, scalability and interoperability. Unix is presently the major open 'operating environment.' A great deal of standardization activity in operating environments is focusing on Unix and related standards. Also important for software portability is a standard operating system interface for application programs.

Examples

CAE	X/Open
Unix System V.4	AT&T, Unix Int Inc
AES	OSF
POSIX	IEEE
SVID	AT&T

5.2.2. Programming languages

Priority: 1

Standards in programming languages are needed so that users of that language share a common interpretation of the semantics of that language. Applications written in that language would then conform to the compilers and other tools that support the language. Such applications could be made portable with respect to its implementation.

Examples

COBOL	ANSI
C	ANSI

5.2.3. Databases

Priority: 1

Database technology is of importance for the computer-based management of data and information resources. Standardization in databases is taking place in a number of areas, e.g. data languages and data dictionary systems. Standards will convey a degree of flexibility in information management and ease information exchange.

Examples

SQL (FIPS127)	IBM
IRDS	ANSI

5.2.4. Graphical user interface

Priority: 1

Users would like to be able to access all applications through a single graphical interface. This interface standard would present and management graphical windows through which the user interacts with an application. The interface would also

provide a rich set of display and interface facilities to help both the user and the system developer.

Examples

X Windows	X Consortium
NeWS	Sun
DECwindows	DEC
Presentation Manager	IBM
Open Look	AT&T
Motif	OSF

5.3. Computer graphics

Priority: 2

Graphics standards are intended to be a means of communication between applications programs and graphics devices. An application program often cannot be transferred from one implementation to another without serious problems because the intelligent service functions provided by various implementations are significantly different.

Examples

GKS	ANSI, ISO
PHIGS	ANSI, ISO
CGM	ANSI, ISO
GDDM	IBM
CGI	ANSI, ISO

5.4. Electronic Data Interchange

Priority: 1

In EDI, formatted business transactions such as purchase orders are transmitted electronically between companies. Standards have a major role in permitting EDI – many systems require several parties to collaborate on the development and operation of a 'joint' computer-based system. In Singapore, EDI will play a key role in the country's 'total business centre' concept.

Examples

X12	ANSI
EDIFACT	ISO

5.5. Software development processes and methods

Priority: 1

Practical guidelines and procedures for planning, managing and developing software and for controlling the configuration of the developed product and its documentation are necessary to ensure the quality of the finished product. Many

such guidelines and standards have been developed and used in government and industrial organisations.

Examples

MIL-STD2167A	US DOD
IEEE Software Engineering Standards	IEEE
ISO 9001	ISO
AQAP 1, 13	NATO

5.6. Information security

Priority: 1

Information security addresses safeguards for the computer security in remote access, resource sharing computer systems. Standards are needed to ensure that some minimum level of security is attained by information systems. Standards address areas such as protection for electronic funds transfer, encryption devices, and automated information systems.

Examples

DOD 5200.28-STD	US DOD NCSC
DES-FIPS 46, 74, 81	US Dept. of Commerce
ANSI X9.9 FIMAS	ANSI
FS 1026, 1027	NASA
OMB A-130	US Office of Mgt. & Budget

5.7. Asian character code representation

Priority: 1

Currently computer systems are designed to process Western languages. Their common feature is a variable word length of single byte character language. When Chinese and other Oriental languages are processed by computer, special internal code representations have to be implemented.

Examples

GB2312	PRC
CCCII	Taiwan

5.8. Factory automation

Priority: 1

Factory automation encompasses a number of technologies, notably CAD, CAM, numerical control, factory LANs, robotics, resource planning systems. Standardization has been most active in the two key areas which are essential for CIM implementation – the exchange of graphical data,

and the local area communications on the factory floor.

Examples

IGES	ANSI, ISO
PDES	IGES organisation
STEP	IGES organisation
EDIF	EDIF companies
MAP	GM, ISO
TOP	Boeing

6. Organisation and functions of the IT Standards Committee

Singapore's activities in IT standards will be coordinated and facilitated by the IT Standards Committee.

SISIR, in its role as the national standards body, will provide the standardization infrastructure. SISIR shall provide the IT Standards Committee the necessary links and infrastructural support to international standards organisations and other such bodies.

NCB, in its role as the national IT authority, would support and advise the Standards Council on the development and monitoring of IT standards activities in Singapore. The NCB shall be technical specialists to the Committee, and will recommend IT standards for consideration by the Committee. NCB shall provide support for IT standards activities in line with its overall responsibilities for promoting the application of IT and the growth of the local IT industry.

The Chairman and Secretary of the IT Standards Committee shall be appointed by SISIR based on the recommendation of the NCB. The IT Standards Committee should comprise representatives from organisations in Singapore having a major interest in IT. A list of the organisational categories and proposed representative organisations has been drawn up by the Working Group as follows:

<i>Category</i>	<i>Organisations</i>
Statutory Boards	NCB, SISIR, Singapore Telecom, TD
Academic Institutions	NUS, NTI
R&D Institutions	ITI, ISS, GINTIC
Professional Organisations	SCS, IEEE, DPMA
Industry Associations	SFCI, SMA, MTAS, ABS

Major Users

Mindef, CSCP
(NCB)

Other Interested Parties

The IT Standards Committee shall initiate Technical Committees to undertake work related to IT standards. The Chairman, Secretary and members of the Technical Committees shall be appointed by the IT Standards Committee. The Technical Committees may propose the organisation of workshops and seminars to promote awareness of the standards effort and to invite discussions on IT standards under their purview.

Proposed by: IT Standards Working Group, July 1989.

Appendix 1

The composition of the IT Standards Working Group:

Dr. Wang Kai Yuen	<i>ISS (Chairman)</i>
Mr. Teo Nam Kuan	<i>Stds & QA Div, SISIR</i>
Dr. Chia Choon Wei	<i>Telecoms</i>
Mrs. Chin Tahn Joo	<i>ITI, NCB</i>
Mr. Kwok Ying Man	<i>Professional Standards Dept, NCB</i>
Mr. Song Siow Hui	<i>Mindef Software Coord Committee</i>
Prof. Chan Sing Chai	<i>DISCS, NUS</i>
Mr. Choo Chun Wei	<i>Planning Dept, NCB</i>
Mr. Lee Peng Hin	<i>Stds & QA Div, SISIR</i>
Mr. Pervez Kazmi	<i>ITI, NCB (Secretary)</i>
Mr. Wee Tew Lim	<i>Singapore Computer Society</i>
Mr. Johan Ubbink	<i>R&D Center, Nixdorf</i>
Mr. Lin Jinn Sin	<i>SFCI</i>

Appendix 2

Singapore Institute of Standards and Industrial Research terms of reference of IT Standards Committee

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4. Membership of the IT Standards Committee shall be evidenced by records to be kept by the Secretary to the Committee, which shall at all times contain the names and addresses of all the members thereof.

Appendix 3

Abbreviations used in Section 6 and Appendix 1 of the Strategy document for information technology standards in Singapore.

NCB – National Computer Board

SISIR – Singapore Institute of Standards and Industrial Research

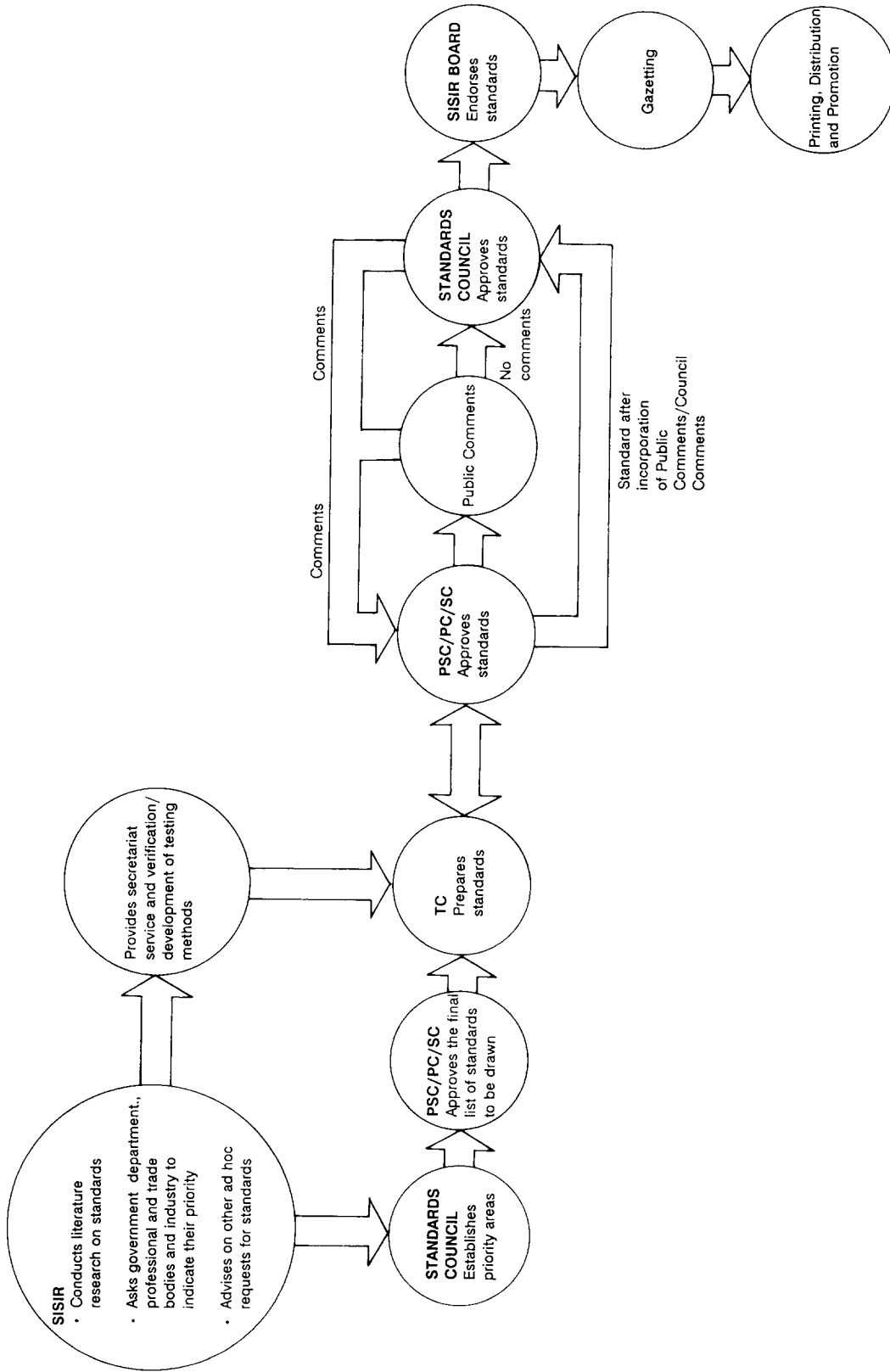


Fig. 1.

TDB	- Singapore Telecom
NUS	- National University of Singapore
NTI	- Nanyang Technological Institute
ITI	- Information Technology Institute
ISS	- Institute of Systems Science
GINTIC	- Grumman International-NTI-Cad/Cam Centre
SFCI	- Singapore Federation of the Computer Industry
SMA	- Singapore Manufacturers' Association
MTAS	- Microcomputer Trade Association of Singapore
ABS	- Association of Banks in Singapore
CSCP	- Civil Service Computerization Programme
DISCS	- Department of Information and Computer Science

Appendix 4

The Singapore National Organisation for Standardization

Singapore Institute of Standards and Industrial Research (SISIR)

SISIR was established in 1969 to be Singapore's focal point for standardization activities at the national level. It was recognised that a well-conceived national standardization programme lays the foundation for the growth of domestic skills, for the ready assimilation of imported technology, for the promotion of quality and thus ensures the success of a country's industrialisation programme. It replaced the former Industrial Research Unit (IRU) which was established in May 1983 as a technical department under the Economic Development Board and became the Singapore member of the International Organisation for Standardization (ISO) in 1966.

In October 1973, SISIR was incorporated as an independent statutory body in accordance with an Act of Parliament, the Singapore Institute of Standards and Industrial Research Act (No. 48 of 1973). The Act confers SISIR the power to:

- promote standardization in industry and trade with a view to improving the quality as well as industrial efficiency and productivity;
- establish, accept or adopt and publish, from time to time, by notification in Gazette, a standard specification and a code of practice to be known as the Singapore Standard Specification and Singapore Standard Code of Practice in relation to an article or a process and may amend or revoke such standard and code of practice from time to time by notification in the Gazette.

Standards Council

SISIR coordinates the national standardization programme with the assistance and guidance of a Standards Council which SISIR appoints with the approval of the Minister. The Standards Council is responsible for mapping out the overall standardization policies and areas of work and for providing the necessary mechanism and guidance for the implementation of the national standardization programme. Each term of office of the Council is three years. Each member of the Council will serve in his/her personal capacity.

The Council appoints seven Product Standards Committees (PSCs), three Practice Committees (PCs) and a Standards Committee (SC) to be responsible for the standardization programme in their respective areas. Each Standards Council member will have to chair either a PC, PSC or SC. The PSCs are responsible basically for establishing the product standards and the PCs for establishing the codes of practice. The Committees are as follows:

- Building Materials Product Standards Committee
- Electrical Product Standards Committee
- Electronic Product Standards Committee
- Mechanical Product Standards Committee
- Chemical Product Standards Committee
- Food Product Standards Committee
- Packaging Materials Product Standards Committee
- Building & Construction Industry Practice Committee
- Electrical Industry Practice Committee
- Industrial Safety Practice Committee
- Information Technology Standards Committee.

Each PSC/PC/SC will comprise representatives from various interest groups which include government departments, trade and manufacturing organisations, professional institutions, purchasers and users. Under each Committee, the standardization work is undertaken by Technical Committees (TCs) and special Subcommittees and Working Groups consisting entirely of voluntary representatives from various relevant organisations which are interested to contribute. The TCs comprise members who are expert in their specific fields under standardization. The TC members also represent the interest of manufacturers, consumers and other relevant parties. The Subcommittees and Working Groups are appointed to study a specific aspect of the subject under standardization.

Standardization process

Each PSC, PC or SC draws up the standardization programmes and priorities in the area under its purview. It considers and approves any request for establishing a Singapore Standard in the light of its priorities. Requests for standards can be from industry, government bodies, professional bodies, etc. The requests must be supported with justifications on the need for the standards in Singapore. On approving a request the PSC, PC or SC will appoint a Technical Committee to establish the standard.

The standardization process for establishing Singapore Standards operates on the principle of consensus which ensures that standards established contain a balanced mix of views of the various interest groups. The process for establishing consensus Singapore Standards is given in *Fig 1*.

Implementation of Singapore standards

The Singapore standards are being applied in various ways, e.g. by SISIR in the operation of its certification schemes, by industry to upgrade manufacturing quality, by government authorities in regulations relating to safety, health and energy conservation, by government procurement agencies in purchasing, by the professions, trade, etc. The standards are important not only in upgrading technology of production and improving the quality of goods and services, but also in safeguarding public health and safety. They serve various needs and contribute to a better quality of life in Singapore.