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Session Presenter:

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Session Topic:

Standardization Process & Importance in Technical Education

Session Objectives: Standardization Process & Importance in Technical Education

- Importance of Standards and Technical Education
- Participating in and contributing to ITU-T standardization
- Aligning Standardization and Technical Education Curriculum

Session Timing:

- Date: 17-May-2024
- Time: 1230 Hrs – 1330 Hrs

Session Agenda

- Technical education, standards participation and economic growth
  - 15 Min
- Approach to capacity development for global standards participation
  - 15 Min
- Contributing to ITU Standards with Precision
  - 15 Min
- Aligning Technical Education & Standardization Process
  - 15 Min

Technical Education, Standards Participation and Economic Growth

Introduction: Technical Education in today's fast evolving technology world

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Copilot

Technical education in today's world is a form of education that focuses on teaching students the skills and knowledge needed to succeed in technical or vocational fields [1]. It is designed to provide students with practical, hands-on learning experiences that can be directly applied to the modern workforce [1].

Technical education covers a wide range of fields such as engineering, architecture, management, planning, applied sciences, and other related fields [2]. It helps to prepare students for a career where they can apply scientific and technical principles to create solutions [2]. The field helps in understanding the fundamentals of how things work and how they can be designed/manufactured from the ground up [2].

In order to become a technically skilled worker, one would need to learn subjects such as mathematics, physics, chemistry, electronics, engineering, and other applied sciences [2]. Today, the demand for people with technical skills has increased exponentially, due to the growth of technology and innovations [2].

Introduction: Significance of Technical Education

- Meeting Workforce Demands:
  - Addresses the skills gap by providing a **workforce trained in the latest technologies and methods**, that can enable innovation and efficiency in agriculture and industries such as manufacturing, IT, healthcare and engineering, **which are critical for economic growth**.
- Economic Capability and Capacity:
  - Contributes to the development of a skilled workforce, which is **essential for economic competitiveness and innovation.**
- Innovation and IP Creation:
  - Enables research, development, intellectual property creation, fostering innovation and enabling local industries to incorporate cutting-edge technologies often at a lower cost and time, gain valuable skills and **improve socioeconomic status**.
- Adaptability and Lifelong Learning:
  - Prepares individuals to adapt to technological changes and advances, encourages **continuous learning and professional development.**

Introduction: Standards and Economic Growth are connected

Standards & Economic Growth:

A research conducted by ISO members on the impact of standards on their national economies shows that standards contribute to economic growth by serving as a component of Total Factor Productivity (TFP). That is, standards contribute to the overall “knowledge stock” in an economy, and therefore improve the efficiency of use of capital or labor (or both).

https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100456.pdf

The Influence of Standards and Patents on Long-term Economic Growth:

A study published in The Journal of Technology Transfer examined the long-term effects of formal standards and patents on economic growth in a panel of eleven EU-15 countries between 1981 and 2014 using panel cointegration techniques. The results showed that European and international standards foster growth for the group of countries.

The influence of standards and patents on long-term economic growth | The Journal of Technology Transfer (springer.com)

Introduction: Standards participation is an important driver of economic growth

Conclusion

Countries that actively engage in the development and adoption of global standards are better positioned to compete in the global marketplace and achieve sustainable economic development

First-Mover Advantage: Early adoption and contribution to standards can give countries a competitive edge by positioning their industries to capitalize on emerging global trends.

Consumer Trust: Products that meet global standards are perceived as higher quality and safer, enhancing consumer trust and preference.

Brand Reputation: Companies that comply with international standards can build stronger brand reputations, increasing their competitiveness globally.

Global Competitiveness: Contributing to global standards plays a pivotal role in enhancing a country's economic growth and competitiveness.

Market Expansion: Contribution to and adoption of global standards ensures that a country's products are globally acceptable, reducing barriers to entry and leading to increased export and economic growth.

Case Studies

- Germany and ISO Standards:

Germany's strong participation in ISO standard development has reinforced its reputation for high-quality engineering and manufacturing, driving exports and economic growth.

- South Korea and ICT Standards:

South Korea's contributions to international telecommunications standards have positioned it as a leader in the ICT sector, boosting its global competitiveness and economic stature.

- China and Electric Vehicle Standards:

China's active role in setting global standards for electric vehicles has enabled it to become a dominant player in the EV market, fostering economic growth and enhancing its competitiveness.

Virtuous cycle of technical education, standards participation and growth

Economic growth for a better life

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DFID Department for International Development

GROWTH

BUILDING JOBS AND PROSPERITY IN DEVELOPING COUNTRIES

The central lesson from the past 50 years of development research and policy is that economic growth is the most effective way to pull people out of poverty and deliver on their wider objectives for a better life.

Standards Participation Gap

Global standards development is in the hands of very few countries

- Global standards contribution presents a very skewed picture
- The domain of Standards is controlled by a handful of countries, top 10 of which are listed here viz. Germany, USA, France, Japan, UK, China, Sweden, Australia, Italy, Korea, Canada
- India's presence is dismal in comparison to its population and economy, and also not commensurate with India's global economy and image as a tech giant
- Currently, there is no initiative within the global SDOs, focused on developing the capabilities and capacities to be a scaled and sustainable program improve the contribution from emerging and developing countries

India: 11/ 11

ISO member bodies' contribution to the standards process

ISO Member	Number of active secretariats at TC and SC level	Number of convenorships at WG level	ISO Member	Number of active secretariats at TC and SC level	Number of convenorships at WG level
Algeria [IANOR]	0	1	Japan [JISC]	78	227
Argentina [IRAM]	1	3	Kenya [KEBS]	1	2
Australia [SA]	23	57	Korea, Republic of [KATS]	18	113
Austria [ASI]	3	17	Luxembourg [ILNAS]	0	3
Belarus [BELST]	0	1	Malaysia [DSM]	3	8
Belgium [NBN]	5	26	Netherlands [NEN]	13	61
Brazil [ABNT]	3	14	New Zealand [NZSO]	0	6
Canada [SCC]	16	104	Norway [SN]	11	30
Chile [INN]	0	1	Philippines [BPS]	0	2
China [SAC]	66	215	Poland [PKN]	2	0
Colombia [ICONTEC]	2	1	Portugal [IPQ]	1	6
Czech Republic [UNMZ]	0	4	Qatar [QS]	0	1
Denmark [DS]	3	21	Russian Federation [GOST R]	7	5
Egypt [EOS]	0	1	Singapore [SSC]	0	3
Finland [SFS]	2	12	Slovakia [UNMS SR]	0	1
France [AFNOR]	81	209	Slovenia [SIST]	0	1
Germany [DIN]	135	384	South Africa [SABS]	11	7
Ghana [GSA]	0	1	Spain [UNE]	6	22
Greece [NQIS ELOT]	0	1	Sweden [SIS]	26	52
Iceland [IST]	0	2	Switzerland [SNV]	19	25
India [BIS]	11	11	Thailand [TISI]	0	5
Iran, Islamic Republic of [ISIRI]	4	20	Turkey [TSE]	2	2
Ireland [NSAI]	0	4	Uganda [UNBS]	1	1
Israel [SII]	3	13	Ukraine [DSTU]	1	2
Italy [UNI]	21	59	United Kingdom [BSI]	77	226
Jamaica [BSJ]	1	1	United States [ANSI]	103	427

US: 103/ 427

China: 66/ 215

UK: 77/ 226

Germany: 135/ 364

Importance of Standardization Skill Development

Why Standardization Skill Development

- Global growth is fundamentally driven by rapid technology innovations
- India is a powerhouse of technical skills and education, but it lags behind in intellectual capital generation
- Although the start-up ecosystem is growing rapidly, the participation in technical innovation and standards participation presents a dismal picture
- Developing Writing technical standards skills at country-scale is crucial
- Standards writing Capability and Capacity Development is a national priority for enhancing Intellectual capital of the country

Benefits to the Country

- Technological Leadership: Standards development plays a vital role in establishing technological leadership
- Economic Growth and Digital Transformation is driven from good standards
- By actively engaging in 6G standards development, India can work towards bridging the digital divide and ensuring inclusive digital connectivity for all citizens
- Standardization drives Global Interoperability and Market Access
- Developing robust standards that address security and privacy concerns is crucial to safeguarding national interests and protecting citizens' data
- Global Collaboration and Knowledge Exchange

Intellectual Property Rights (IPR) and Standards Writing in Technical Education (TE)

Economic Benefits:

- Intellectual Property Protection: Teaching IPR enables students, faculty, and institutions to understand the importance of protecting intellectual property, increased patent filings, copyrights, and trademarks, economic growth and encourage innovation-driven industries.
- Technology Transfer and Commercialization: A course on IPR and Standards Writing equips students with the knowledge and skills necessary to commercialize their research and innovations.
- Industry Collaboration: Educating students on IPR and Standards Writing enhances collaboration between academic institutions and industries.

Innovation Benefits:

- Research and Development: A comprehensive understanding of IPR and Standards fosters an environment of creativity and encourages the generation of new ideas and technological advancements.
- Standards Development: By teaching Standards Writing, institutions promote the development and adoption of industry standards.
- Entrepreneurship and Innovation Ecosystem: Knowledge of IPR and Standards Writing empowers students to become entrepreneurs and innovators. They can protect their inventions, navigate licensing agreements, realise market value of their IP

Introducing a course on Intellectual Property Rights (IPR) and Standards Writing TE can bring several economic, innovation, and social benefits

Intellectual Property Rights (IPR) and Standards Writing in Technical Education (TE)

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Social Benefits:

- Ethical Awareness: A course on IPR and Standards Writing promotes ethical awareness among students and faculty. They learn about the responsible use of intellectual property, the consequences of plagiarism and infringement, and the importance of ethical practices in research and innovation.
- Public Awareness: Educating students on IPR and Standards Writing creates a more informed society about the importance of IP and standards in various industries, encourage compliance with relevant standards.
- Knowledge Sharing and Collaboration: Teaching IPR and Standards Writing encourages knowledge sharing and collaboration among faculty, students, and industry professionals.
- Policy Development: A strong understanding of IPR and Standards Writing among faculty members can enable them to contribute to policy development in these areas.

A formal course on IPR and Standards Writing will fuel ground up innovation and product development, accelerate entrepreneurship and a knowledge-based economy.

Approach to capacity development in standards participation

Driving Standards Writing with Technical Education Alignment Program

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IP & Standards Knowledge in TE → Promote Standards Participation → Generate economic value through SEPs → Establish Tech & Economic Leadership

AS IS: High innovation, Start-ups but low IP creation & dismal standards participation → Culture of Standards based approach in Bachelors, Masters and Doctoral Programs → Standards bring Global interoperability and acknowledgement for Academia and the Industry → Reach goal of massive participation in Global ICT standards and 10% 6G IPR

Massifying Standards Participation

- Stage 1: Awareness Program| Standards & participation overview

Proposed Curriculum for Bachelor Programs

- Why ICT Standards
- Global standards participation, innovation and intellectual capital
- India's Role in Standardization
- Important Standardization Bodies and the key agenda
- ICT Standards development process
- How to start participation in global ICT Standards

- Stage 2: Foundation Program| ICT Standards Process Overview

Proposed Curriculum for BTech/ BE Prog

- Understanding the role of Policy, Regulation and Standards
- Introduction to Indian ICT Standardization Bodies
- Introduction to ITU and ISO Standards Bodies
- Standards Development Process – example of ITU process
- What is a world class standard?
- Getting started

Approach to capability development

- Stage 3: Advanced Program| Writing Global ICT Standards

Proposed Curriculum for MTech and ME Programs

- Basic steps of Standards development
- Planning for the standard development
- Technical Content of ITU Standards
- Planning for testability, validation and evolution
- Standards drafting guidelines & ITU three-stage process
- ITU Input and Output Document Formats
- Making contributions and readying for defense
- Writing ITU Standards: Hands-on Exercises

- Stage 4: Mentorship Program| Effective Global ICT Contribution

Proposed Curriculum for Doctoral Programs

- Emerging Technologies & standards landscape
- Research and standards gap identification
- Review and identification of IPR
- Writing Clear and Concise Standards
- Reviewing and Editing ITU Standards
- Collaboration and Consensus Building
- Interoperability and Compatibility of Standards
- Quality Assurance and Review Process
- Case Studies: Analyzing Existing ITU Standards
- Hands-on Mentoring

Writing ITU Standards with Precision

Standards make our lives tick!

- Internet Connectivity: Works globally due to standards like TCP/IP (Transmission Control Protocol/Internet Protocol) for data transmission and HTTP (Hypertext Transfer Protocol) for web browsing.
- Electricity Grids: Operate efficiently thanks to standards like IEEE 1547
- Public Transportation Systems: Run smoothly with standards such as ISO 9001 and EN 13816 for the quality of public transport services.
- Water Supply and Sanitation: Ensured through standards like ISO 24510 for non-sewered sanitation systems and WHO guidelines for drinking water quality.
- Food Safety: Maintained through standards such as ISO 22000 for food safety management systems and HACCP (Hazard Analysis and Critical Control Points) for identifying and controlling food safety hazards.
- Telecommunications Networks: Function seamlessly with standards like GSM (Global System for Mobile Communications) & 3GPP
- Wireless LANs work due to IEEE 802.11 for wireless local area networks (Wi-Fi).
- Healthcare Facilities: Operate effectively with standards like HIPAA (Health Insurance Portability and Accountability Act)
- Automobiles and Traffic Systems: Conform to standards like ISO 26262 for functional safety of electrical and electronic systems in vehicles and traffic signal standards such as MUTCD (Manual on Uniform Traffic Control Devices).
- Financial Services: Governed by standards like PCI DSS (Payment Card Industry Data Security Standard) for securing cardholder data and ISO 20022 for financial messaging.

Importance of ITU-T Standards

- Without ITU-T standards it would not be possible make a telephone call from one side of the world to another
  - E.164 “International public telecommunication numbering plan”
  - Q.700-series “Signalling System N. 7 (SS7)”
  - Audio codecs (e.g. G.711, G.723.1, G.729, etc.)
- Without ITU-T standards the Internet wouldn’t function
  - G.9000 – G.9999
  - “Access Networks” (e.g. xDSL, GPON)
- Without video codecs it will be difficult to film movies with High Definition
  - H.265 (HEVC) – 8K UHD (resolution 8192×4320)
- Without IEEE Standards, there would be no Wi-Fi
  - Wi-Fi: The Wi-Fi standards are set by the Institute of Electrical and Electronics Engineers (IEEE), specifically under the IEEE 802.11 series23.

Everyday gadgets work because of Standards!

- Smartphone: Uses standards like 4G/5G for cellular communication, Wi-Fi for wireless networking, Bluetooth for short-range communication, and USB for charging and data transfer.
- Laptop: Uses standards like Wi-Fi for wireless networking, Bluetooth for short-range communication, USB and Thunderbolt for peripheral connectivity and data transfer, and HDMI or DisplayPort for video output.
- Smart TV: Uses standards like HDMI for video input, Wi-Fi for internet connectivity, and Bluetooth for connecting to wireless speakers or headphones.
- Wireless Router: Uses Wi-Fi standards (like 802.11ac or 802.11ax) for wireless networking.
- Bluetooth Headphones: Use Bluetooth for wireless audio transmission.
- Smartwatch: Uses Bluetooth for communication with a smartphone, and Wi-Fi for internet connectivity.
- Wireless Mouse and Keyboard: Use Bluetooth or proprietary wireless technology for communication with a computer.
- Wireless Charger: Uses Qi wireless charging standard.

IEEE Standards enabled popular

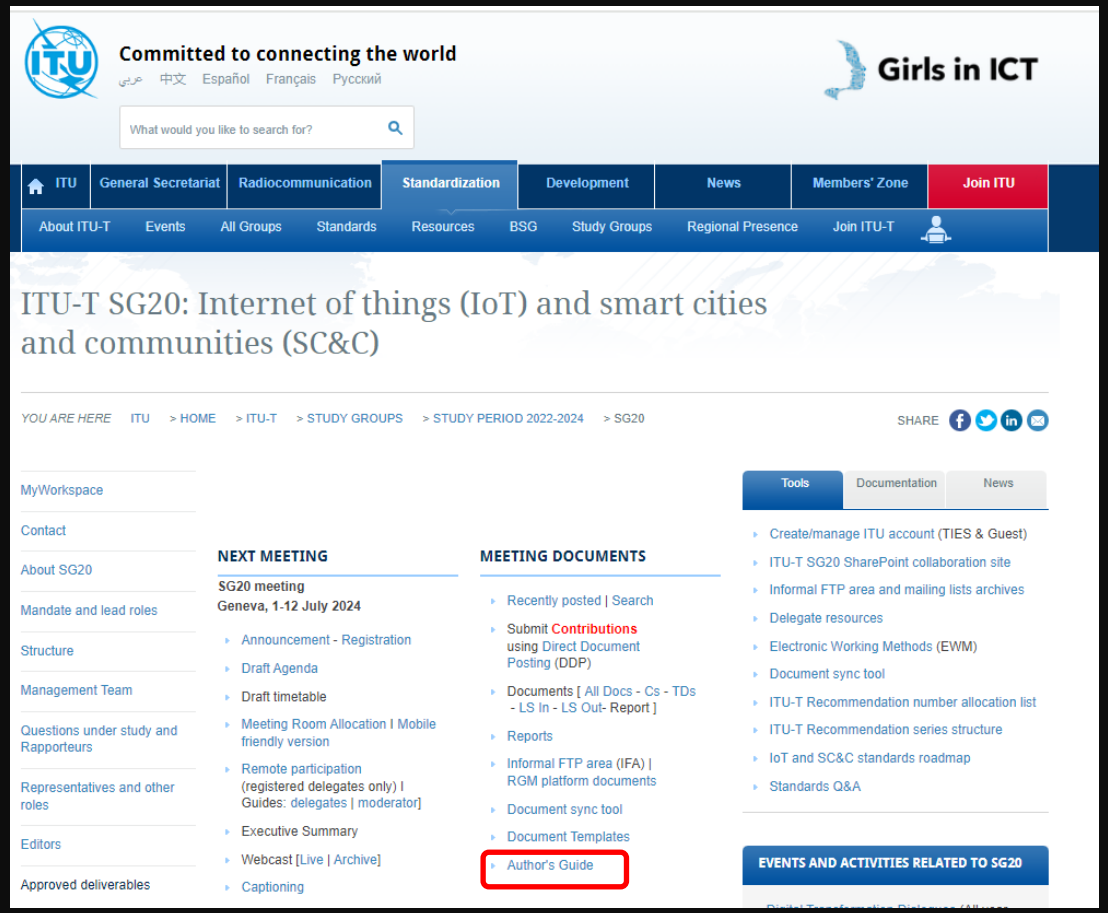
- Wi-Fi Connectivity:
  - The IEEE 802.11 series of standards, often referred to as Wi-Fi, creates a framework that enables a wide variety of devices from different vendors to communicate with one another[1]. This standardized interoperability allows people to use their favorite devices and applications, such as FaceTime or Skype, with any Wi-Fi access point[1].
- Healthcare:
  - The IEEE 11073 family of standards enables connected medical devices, such as pulse oximeters, to communicate with other hardware, such as PCs, tablets, mobile phones, and telemedicine equipment[1]. This plug-and-play interoperability frees healthcare providers and their patients to focus on treatment rather than wondering whether one manufacturer's device will communicate with another's.
- Home and Office Networks:
  - In addition to Wi-Fi networks in offices and home offices, IEEE 802 also enables wired local area networks (LANs), such as those that connect desktop PCs to the shared printer down the hall.
- Smart Cities:
  - IEEE standards foster connectivity, interoperability, and security in smart cities. They enable and sometimes reimagine what we thought was possible with everyday technologies, as well as new and emerging technologies like the Internet of Things (IoT), Augmented Reality (AR), and Artificial Intelligence (AI).

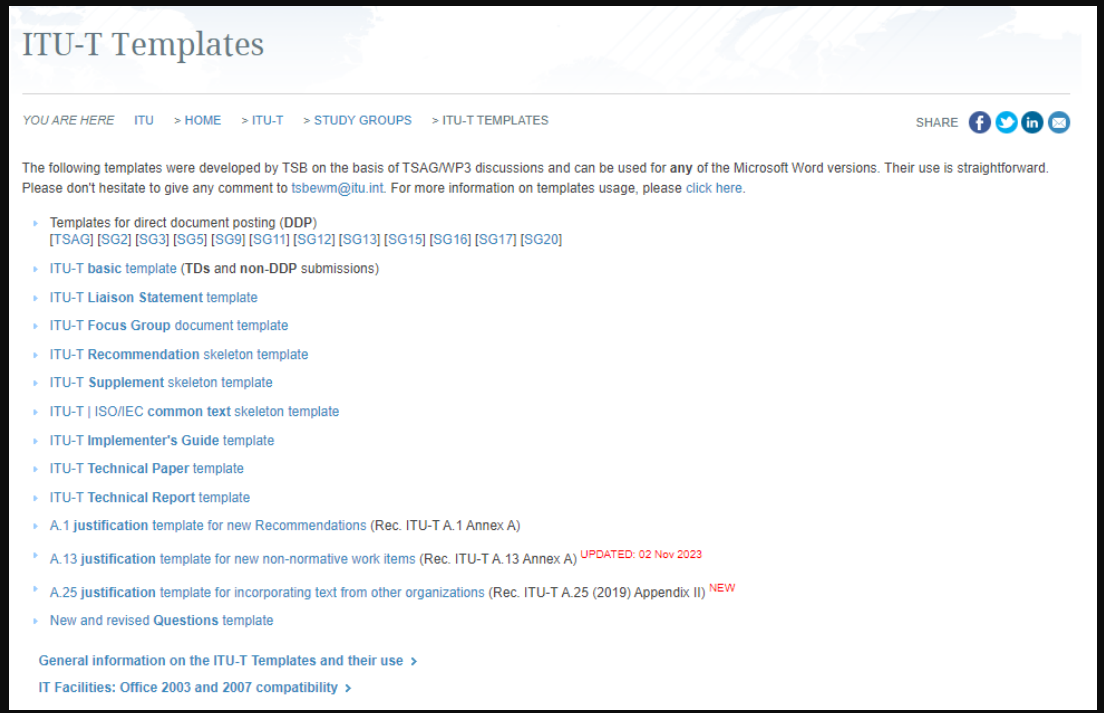
Name the standards

- E.164
- Q.700-series
- G.711, G.729
- H.265
- ITU-T P.1203
- X.509
- Y.3051 and Y.3052
- Y.3056
- Y.3059
- International public telecommunication numbering plan
- Signaling System N. 7 (SS7)
- Audio codecs
- 8K UHD Video
- Model algorithms to monitor the quality of video streaming
- Digital Certificates
- First two ITU-T standards on Trust
- Indian Contribution for Bootstrapping of Constrained Devices
- Indian Contribution for a Global Trust Registry of Devices

Getting started: A Study Group Home Page and Announcements

https://www.itu.int/en/ITU-T/studygroups/Pages/templates.aspx





Getting Started: Input Contributions

New Work Item

- Rationale for the input contribution
  - Motivation and necessity
- Proposal regarding the core technology
  - Introduction to a proposed new work item
- Gap analysis
  - Technology map
  - Related activities in ITU and other SDOs
- A skeleton of initial draft Recommendation

Revision of draft Recommendation

- Title
  - Document name, clause #, key content
- Background
- Proposal
  - Explicitly mention what a contributor proposes
- Use of MS-Word track change mode

Output Document Process – example of ITU-T SG13 Process

Output Document process

- Use ITU Basic Template (TDs)
  - https://www.itu.int/en/ITU-T/studygroups/Pages/templates.aspx
- Upload the Informal ftp site for review
  - http://ifa.itu.int/t/2017/sg13/exchange/wp3/q16/20807/
- Request a TD to the secretary after a final confirmation at the meeting
  - tsbsg13@itu.int, tatiana.kurakova@itu.int, gmlee@kaist.ac.kr

Cover page of Output Document

- Title: Y.XXX, “document title”, (Meeting dates)
- Source: Editor(s)
- Purpose, Keywords, Abstract
- A summary table for meeting results

NOTE – if the Purpose, Keywords and Abstract are not filled the Secretariat will return it for completion.

Initial Draft Recommendation

Annex A

Template to describe a proposed new Recommendation in the work programme

(This annex forms an integral part of this Recommendation.)

Question:	/	**Proposed new ITU-T Recommendation**	<Meeting date>	
Reference and title:	Recommendation ITU-T <X.xxx> "Title"			
Base text:	<C nnn> or <TD nnnn>		**Timing:**	<Month-Year>
Editor(s):	<Name, membership, e-mail address>		**Approval process:**	<AAP or TAP>
Scope (defines the intent or object of the Recommendation and the aspects covered, thereby indicating the limits of its applicability):				
Summary (provides a brief overview of the purpose and contents of the Recommendation, thus permitting readers to judge its usefulness for their work):				
Relations to ITU-T Recommendations or to other standards (approved or under development):				
Liaisons with other study groups or with other standards bodies:				
Supporting members that are committing to contributing actively to the work item: <Member States, Sector Members, Associates, Academia>				

- Scope
- Summary
- Relation to ITU-T Recommendation
- Liaison with other SGs or SDOs
- Supporting members

Initial Draft Recommendation

- Important Contents of an NWI
  - Introduction
  - Requirements
  - Functional architecture
  - Operations and Mechanisms
  - Others

- Introduction
  - Background
    - Concepts, motivation and necessity
    - Related work including references
  - Technical features, characteristics, approaches
  - Key objectives
  - A conceptual diagram
- Requirements
  - Identify specific requirements as much as possible rather than high-level requirements
    - Differentiate from existing Requirements in other Recommendations
  - Use “Conventions” for requirements

Initial Draft Recommendation

- Important Contents of an NWI
  - Introduction
  - Requirements
  - Functional architecture
  - Operations and Mechanisms
  - Others
- Functional Architecture
  - Architecture overview
    - Domain model, Reference model with associated entities
  - Generic architectural model
    - Vertical layered/horizontal approach
  - Detailed functional architecture with interfaces
  - Specification of functions and interfaces
- Operations and Mechanisms
  - Information flows
  - Specific mechanisms to support functionality
  - Deployment models
- Others
  - Security considerations
  - Supporting materials
    - Use cases
    - Some examples
    - Summary of other SDOs' approach
  - Other related or useful information

Elements of a Recommendation

Element	Clause number
Introductory material [a]	
Cover page	None[b]
Summary	None
History	None[b]
Keywords	None
Foreword	None[b]
Table of Contents	None[b]
Introduction (optional)	None
Recommendation core material	
Title	None
Scope	1
References	2[c]
Definitions	3[c]
Abbreviations and acronyms	4[c]
Conventions	5[c]
Text of the Recommendation	6 onwards[c]
Annexes (form an integral part of the Recommendation)	A onwards
Appendices (do not form an integral part of the Recommendation)	I onwards
Electronic attachment	–[d]
Bibliography	None
Index (optional and rarely used)	None

[a] These elements are not considered to be parts of the Recommendation.
[b] These elements are provided by TSB.
[c] When empty, the clause is maintained with an appropriate indication, e.g., "This clause is intentionally left blank.", or "None.".
[d] An electronic attachment may correspond to a clause, an annex, an appendix or may be a non-numbered item.

Table of Contents

Summary

This author's guide for drafting ITU-T Recommendations permits uniform, efficient preparation of texts by TSB for publication. It covers the rules for drafting a Recommendation in a standard manner. Its provisions should be applied in all instances where texts (such as draft Recommendations) are being prepared by study group authors for approval and publication. The methods presented in this author's guide are the basis for a template and will remain stable until changes to current publication procedures necessitate their modification.

In order to facilitate comparison with other presentation styles, this author's guide has been prepared in accordance with the presentation rules that it mandates. The examples used within the text, such as references, are for illustrative purposes only. Thus, this author's guide constitutes an example of the proposed presentation style. Please note that Recommendation ITU-T A.1500 is a fictitious Recommendation used to illustrate the points given in this guide.

Recommendation ITU-T A.1500[1]

Author's guide for drafting ITU-T Recommendations

(15 March 2011; 5 February 2016)

1 Scope

This author's guide is intended to provide a common approach to the preparation of ITU-T texts that are intended for publication, e.g., draft Recommendations. It attempts to cover the kind of questions likely to arise in the preparation of an ITU-T Recommendation and provides, through application of its own rules, an illustration using the normal order of the elements of drafting a typical Recommendation. To avoid confusion which may result from this approach for a first-time reader, detailed explanations of the contents of each heading are given in clauses 7 and 8 below.

Table 1 shows the arrangement of the elements that may comprise a published Recommendation. Shaded rows correspond to elements provided by TSB.

For common texts developed with ISO/IEC, [ITU-T A.23] applies instead of this author's guide.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T A.5] Recommendation ITU-T A.5 (2016), *Generic procedures for including references to documents of other organizations in ITU-T Recommendations.*

[ITU-T A.23] Recommendation ITU-T A.23, Annex A (2014), *Guide for ITU-T and ISO/IEC JTC 1 cooperation.*

Summary and Keywords

- Summary (mandatory)
  - This element shall be supplied by the rapporteur or the editor. It is placed before the main body of the Recommendation. It provides a brief overview of the purpose and contents of the Recommendation, thus permitting readers to judge its usefulness for their work.
- Keywords (mandatory)
  - This element, placed before the main body of the Recommendation, lists a limited number of words or word combinations that identify the main topics in the Recommendation. Keywords shall be placed successively in alphabetical order separated by commas.
- Scope
  - This element should appear, as clause 1, at the beginning of every Recommendation, to define, without ambiguity, its intent or object and the aspects covered, thereby indicating the limits of its applicability
- Reference
  - This element should appear as clause 2, and permits the author to list, alphanumerically in ascending order, ITU-T and ITU-R Recommendations, International Organization for Standardization (ISO), International Electrotechnical Commission (IEC) and other accepted organizations' standards referred to in the main body of the Recommendation and which are considered to be incorporated by reference into the Recommendation.
  - [ITU-T A.5] provides generic procedures for referencing the documents of organizations other than ISO and IEC in ITU-T Recommendations.
  - [ITU-T A.5] - https://www.itu.int/rec/T-REC-A.5

Bibliography and References

Dual-numbered Recommendation:

[ITU-T G.707] Recommendation ITU-T G.707/Y.1322 (2007), *Network node interface for the synchronous digital hierarchy (SDH)*.

Identical Recommendation | International Standard (or "common text"):

[ITU-T H.222.0] Recommendation ITU-T H.222.0 (2006) | ISO/IEC 13818-1:2007, *Information technology – Generic coding of moving pictures and associated audio information: Systems*.

Paired Recommendation | International Standard (or "twin text"):

[ITU-T T.50] Recommendation ITU-T T.50 (1992), *International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) – Information technology – 7-bit coded character set for information interchange*.

Series or sub-series of Recommendations:

[ITU-T M.3016.x] Recommendation ITU-T M.3016.x-series (2005), *Security for the management plane*.

[ITU-T Q.4xx] Recommendations ITU-T Q.4xx-series (1988), *Specifications of Signalling System R2*.

Recommendation ITU-T Q.816 (2001) plus all amendments and corrigenda that apply to that base:

[ITU-T Q.816] Recommendation ITU-T Q.816 (2001), *CORBA-based TMN services*.

SDOs:

[ETSI ETS 300 724] ETSI ETS 300 724 ed. 1 (1997), *Digital cellular telecommunications system; ANSI-C code for the GSM Enhanced Full Rate (EFR) speech codec (GSM 06.53)*.

[IEC 61883-4] IEC 61883-4 (2004), *Consumer audio/video equipment – Digital interface – Part 4: MPEG2-TS data transmission*.

[IETF RFC 1042] IETF RFC 1042 (1988), *Standard for the transmission of IP datagrams over IEEE 802 networks*.

The "References" element shall be introduced by the following boilerplate paragraph:

"The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation."

Elements of a Recommendation (Contd)

- Definitions
  - This element should appear as clause 3; it gives the definitions necessary for the understanding of certain terms used in the Recommendation
  - Definitions should be concise and should include only the necessary information
  - Definitions must be accurate, clear and positive
  - For clause 3.1: "This Recommendation uses the following terms defined elsewhere:".
  - For clause 3.2: "This Recommendation defines the following terms:".
  - ITU-T Terms and Definitions database http://www.itu.int/ITU-R/go/terminology-database
- Independence
  - Definitions must be able to stand alone. In other words, the meaning should be understandable without requiring reference to other parts of the Recommendation
- A term is simply a word, or group of words that is used to express a specific concept.
- A definition is a clear, concise and accurate statement that expresses the precise meaning of a term or concept.
- Use of existing terminology
- Structure – a concise, logical statement that comprises three essential elements

cryptographic algorithm:	a mathematical function	that computes a result from one or several input values.
(The term)	(The class of object)	(The distinguishing characteristics)

Elements of a Recommendation (Contd)

- Abbreviations and Acronyms
  - This element should appear as clause 4.
  - It lists in alphabetical order all the abbreviations and acronyms.
  - The first appearance of any acronym within the Recommendation should be preceded by its complete unabbreviated form, e.g., asynchronous transfer mode (ATM).
  - It is recommended to use abbreviations in figures and tables, due to lack of space.
  - e.g., ICTs (not ICTS).
  - Start with the following text - "This Recommendation uses the following abbreviations and acronyms:".
- Conventions
  - This element should appear as clause 5.
  - It describes particular notations, assumptions, styles, presentations, etc., used within the Recommendation, if any.
  - Special classes of terms or other texts that are to be capitalized throughout the Recommendation shall be listed in the "Conventions" clause
- Recommendation clauses 6 and onwards contain technical specifications
  - Causes 6 and onwards contain technical specifications
  - Non-normative material should be placed in an appendix

Elements of a Recommendation (Contd)

- Fonts
  - In general, use a serif font (e.g., "Times New Roman") with the point size set at 12
  - Equations and formulae
    - use MathType, Equation 6-3
  - Figure 1, Figure 4-3, Figure 6-a, Figure 6-b.
    - Use 9pt Times New Roman font for text within figures.
  - Table 1, Table 4-3
    - The heading of each column shall be bold-faced and centred, and its first letter shall be capitalized.

- Notes and Footnotes
  - If the text is written in a clear manner, the need for notes should be minimal.
  - If supplementary or complementary information is necessary, notes may be integrated in the text of a Recommendation.
  - NOTE – This note is an example.
  - All notes within the same numbered clause
  - E.g., NOTE 1 –, NOTE 2 –, NOTE 3 –, etc.
  - Footnotes4 may be used to provide information regarding a particular item, word or concept

Referencing and Citations

- Citing of references
  - References within the same Recommendation
    - e.g., "see Table 4", or "see clause 5" or "see clause 5.4.7“
  - References to parts of another Recommendation
    - e.g., "see Figure 1 of [b-ITU-T A.8]", "see clause 2 of [b-ITU-T A.4]" or "see clause 2.2.10 of [ITU-T A.5]"

- Bibliography
  - This element may be present in order to cite references or sources not covered by the "References" element and which are intended for background information (i.e., they are informative not normative).
  - Referencing draft standards and internal ITU documents (e.g., TDs or contributions) and other documents that are not available to all readers of the ...endation shall be

Supplements:

[b-ITU-T G-Sup.41] ITU-T G-series Recommendations – Supplement 41 (2010), *Design guidelines for optical fibre submarine cable systems*.

Book:

[b-Trischitta] Trischitta, P.R., and Varma, E.L. (1989), *Jitter in Digital Transmission Systems*, Norwood, MA, Artech House.

Article in journal:

[b-Cornaglia] Cornaglia, B., Pane, P., and Spini, M. (1995), *Errored Block Detection with Bit Interleaved Parity Failures in SDH Network*, IEEE Transactions on Communications, Vol. 43, No. 12, December, pp. 2904-2906.

Web-only document:

[b-W3C HTML 4.01] *W3C, HTML 4.01 Specification*, W3C Recommendation 24 December 1999. http://www.w3.org/TR/1999/REC-html401-19991224/

Annexes and Appendices

- Annexes
  - Annexes form an integral part of the Recommendation and shall appear immediately after the main body of the Recommendation.
  - They shall be designated A, B, C, etc.
  - e.g., clause A.2, Figure B.3, Equation C-1
  - "(This annex forms an integral part of this Recommendation.)".

Annex A

Revision to existing text

(This annex forms an integral part of this Recommendation.)

- Appendices
  - Appendices do not form an integral part of the Recommendation.
  - They shall be designated with upper case Roman numerals (i.e., I, II, III).
  - e.g., clause II.3, Table IV.2, Equation III-1
  - "(This appendix does not form an integral part of this Recommendation.)"

Appendix I

Appendices

(This appendix does not form an integral part of this Recommendation.)

Actions required to improve the quality of ITU-T Recommendations

- The draft <title of the draft>, which is proposed for approval, consent or determination:
  - has been thoroughly reviewed for technical accuracy;
  - is technically sound with as few options as feasible;
  - has content that does not conflict with the content of an already approved Recommendation;
  - does not contain case studies within the normative part;
  - has only short illustrative examples, if necessary, included in the normative part;
  - follows the author's guidelines (including the use of ITU-T templates, which can be found at: http://www.itu.int/ITU-T/studygroups/templates/index.html)
  - has been spell-checked and is grammatically correct, to the extent practicable;
  - contains definitions that have been developed after consulting the ITU-T Terms and Definitions database7 and following the guidance of the standardization committee for vocabulary (SCV) (see Annex B);
  - has all acronyms, including those in the figures and tables, correctly spelled out;
  - has the normative part making use of all references in clause 2 (References);
  - has all references in clause 2 (References) qualified in accordance with [ITU-T A.5].

Useful Materials

- ITU-T, *Manual for Rapporteurs and Editors*, 12 February 2010. http://www.itu.int/oth/T0A0F000006/en
- *ITU English language style guide* (2015). http://www.itu.int/SG-CP/docs/styleguide.doc

Introducing SDOs – ITU/ TEC/ TSDSI

Introducing ITU-T

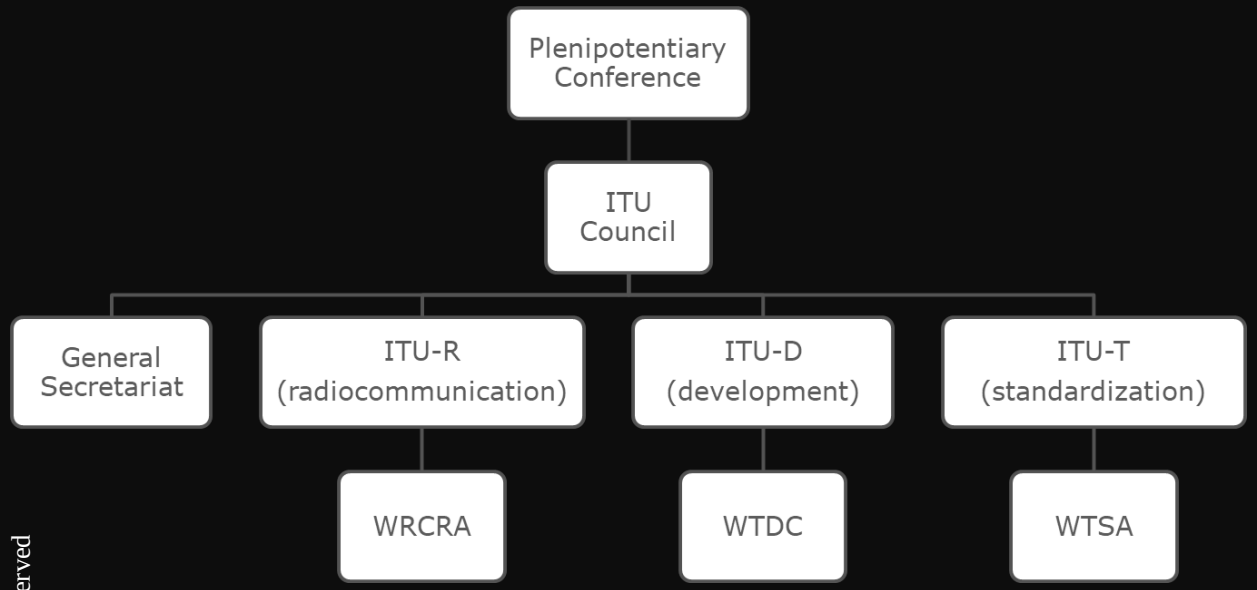
- The ITU Telecommunication Standardization Sector (ITU-T) is a platform for governments and the private sector to coordinate development of the telecommunication networks and services that connect the world.
- Manufacturers, network operators and consumers all benefit:
  - International communication and trade
  - Competitiveness
  - Efficiency and innovation
  - Lower prices and increased availability

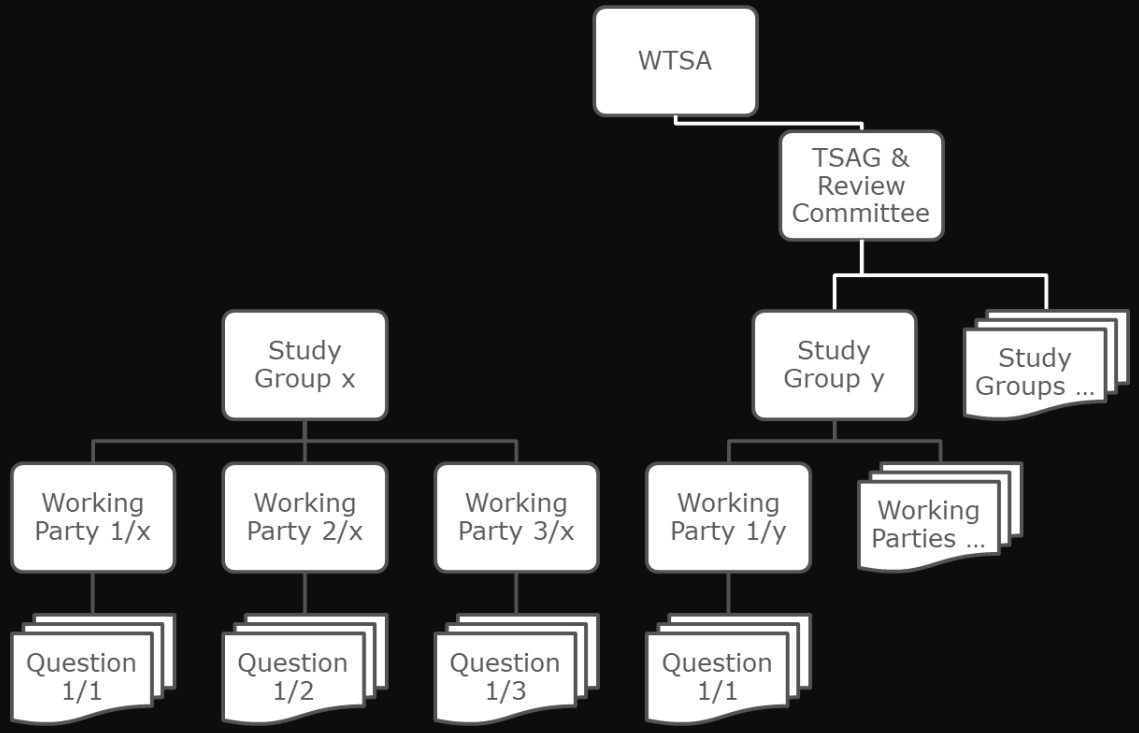
Vision: Committed to Connecting the World

- ITU-T is driven to remain the pre-eminent worldwide telecommunication standards body:
  - Developing interoperable, non-discriminatory international standards
  - Bridging the Standardization Gap
  - Extending international cooperation

- Membership
  - Member States
    Governments and regulatory bodies
  - Sector Members
    Private sector and regional/international organizations
  - Associates
    Private sector (focus on one study group)
  - Academia
    Universities and research establishments

ITU - Structure and organization





ITU - Structure and organization

- Other groups
  - Focus groups
  - Joint Coordination Activities (JCA)
  - Global Standardization Initiatives (GSIs)
  - Workshops
  - Regional groups
  - Special projects

- Study Group Roles
  - Study group chairmen (and vice-chairmen)
  - Working party chairmen (and vice-chairmen)
  - Rapporteurs
  - Liaison rapporteurs
  - Editors
  - Delegates
  - Counsellor/advisor/engineer
  - Assistant

ITU- Secretariat Services & Coordination

- Secretarial
  - Key role: facilitate standards development
  - Administrative support and technical knowledge
  - Manage meeting logistics
  - Document processing, printing and distribution
  - Ensure quality of output standards
  - Coordinate routine study group activities

- All ITU-T work relies on coordination
  - Cooperation with other organizations (Recommendations ITU-T A.4, A.5 and A.6)
  - Joint Coordination Activities (JCAs)
  - Global Standardization Initiatives (GSIs)
  - Special projects
  - Lead study groups
  - Management team (Chairmen, rapporteurs, liaison rapporteurs, editors, counsellors/advisors/engineers)

Approval and Agreement

- Traditional approval process (TAP)
  - Used for international standards (Recommendations) with regulatory or policy implications
- Alternative approval process (AAP)
  - Used for technical Recommendations
- Agreement
  - Used for non-normative texts (handbooks, guides, supplements, etc.)

- Legal rights that protect creations and inventions
  - Any IPR needed to implement Recommendations must be disclosed
  - Software Copyright Guidelines must be followed
  - No trademarks allowed in Recommendations

ITU-T Work item life cycle

- Work Item Lifecycle
  - Initiated by SG, FG or Technology Watch
  - WTSA, TSAG or SG commits to work item
  - Editor(s) and other experts develop text
  - Mature text is approved/agreed by SG
  - Texts are maintained by amendments, corrigenda and implementers' guides
  - Revised versions published periodically
  - Work items may move within and between SGs
  - Superseded work items withdrawn by agreement
- All ITU-T work relies on coordination
  - Cooperation with other organizations (Recommendations ITU-T A.4, A.5 and A.6)
  - Joint Coordination Activities (JCAs)
  - Global Standardization Initiatives (GSIs)
  - Special projects
  - Lead study groups
  - Management team (Chairmen, rapporteurs, liaison rapporteurs, editors, counsellors/advisors/engineers)

Meetings & Working Documents

- Meetings
  - Study group meetings (coordinate activities, progress work items, approve/consent texts)
  - Working party meetings
  - Rapporteur (interim) meetings
  - Focus group meetings
  - Meetings outside Geneva
  - Languages (interpretation and translation)
  - Virtual meetings
- Working Documents
  - Formal meeting documents (SG home page)
  - Contributions
  - Temporary documents (TDs)
  - Collective letters
  - Circulars
  - Reports
  - Liaison statements
  - Working documents (informal FTP area)
  - Rapporteur group coordination

ITU-T Publications

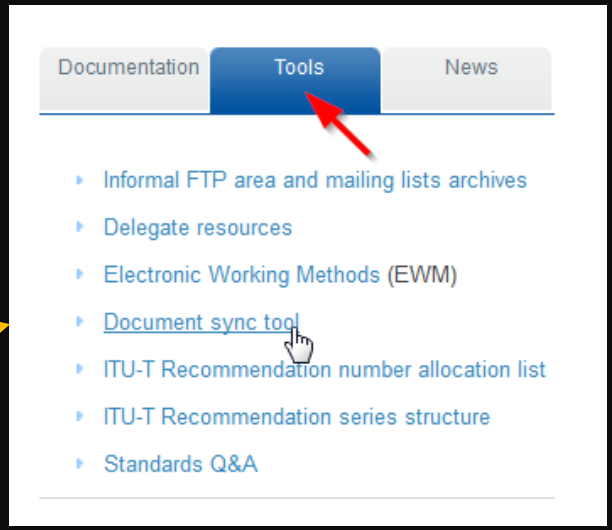
- Main products: ITU-T Recommendations
  - Recommendations are international standards
  - Grouped into themed series
  - Compliance only mandatory after adoption in law
  - Developed at the request of membership
  - Maintained through amendments, corrigenda and revisions
  - Normative texts: Approved by members
- Other publications (non-normative)
  - Supplements
  - Implementers' guides
  - Tutorials and technical papers
  - Focus groups technical specifications
  - Ad-hoc publications
  - Non-normative texts: Agreed by members

Electronic working methods (1/2)

- Web pages
- Wireless and wired network access
  - "ITUwifi"
  - Log-on credentials printed on badges
- TIES access to:
  - Meeting documents
  - Draft and published texts
  - Electronic working method services
  - Internet services
- Virtual meetings:
  - GoToMeeting/GoToWebinar, Adobe Connect
  - Cavoon (audio-conference service provider)
- Databases:
  - Recommendations
  - Liaison statements
  - Work programme
  - Test signals
  - Formal descriptions
  - IPR (patents and Copyrights)
- News feeds

Electronic working methods (2/2)

- Email reflectors
- Informal FTP areas
  - Web access
  - FTP client
  - Sync tool
- Document submission (use correct template)
  - Direct document posting
  - Web submission
  - Mail/email/fax or FTP drop box
- AAP tracking



Guiding texts & Best Practices

- Basic Texts
  - Constitution, Convention, General Rules, etc.
- Resolutions – Principles and instructions for:
  - Finance
  - Working methods
  - Work programme
  - External cooperation
  - Other strategic and technical matters
- A-series Recommendations
  - Describe organization of ITU-T's work

- Meeting conduct
  - Meeting chairman ensures smooth running
  - Participants "given the floor" before speaking
  - Speak clearly and slowly

- Reaching agreement
  - Conflicting opinions may need concessions
  - Wherever possible, aim for "consensus"

Telecom Engineering Centre – Indian Telecom Standards Setting Organization

Mashmari

Committees & Working Groups

- DCC Sub-Committee
- Development Coordination Committee
- M2M Working Groups
- Manufacturer's Forum
- National Working Groups

National Working Groups

National Working Groups (NWGs) have been constituted in TEC that are conterminous with ITU-T's Study Group (SG). Each NWG has been constituted in TEC under the chairmanship of Sr. DDG/ DDGs with members as the stakeholders from industry, academia, government, research organizations etc. The objective of the NWGs is to contribute to ITU activities keeping in view the interests of Indian Telecom Sector. The NWGs build consensus and harmonize the interests of various stakeholders and proactively make necessary contributions for the study group of ITU. NWGs have been constituted with the participation of all the stakeholders like service providers, manufacturers associations, other sectoral members, academia in addition to the members of TEC, DOT, CDOT, Govt. PSUs, etc. NWGs are corresponding with the study groups of ITU-T for uniform working. The NWGs are constituted for four years.

The NWGs consists of a Management Group and members. Working Parties (WPs) are formed based on specific needs of the NWGs. Management Group (MG) consists of Chairperson and Vice-Chairperson and one Convenor for coordination of the NWG activities. The Management Group manages, monitors and drives the NWG. The main functions of the Management Group are as given below: -

1. Prepare action plan with milestones for the NWG.

2. Prepare the methodology for the performance measurement/ assessment of the NWG.

3. Distribute the activities among the NWG members.

4. Constitute the working parties and other structures.

TEC National Working Groups

S No	Name of the NWG	ITU Study Group	Activities
1	NWG 2	ITU-T SG 2	Operational aspects of Service provision and Telecommunication Management
2	NWG 3	ITU-T SG 3	Tariff and Accounting Principles and international telecommunication/ICT economic and policy issues
3	NWG 5	ITU-T SG 5	Environment and circular economy
4	NWG 9	ITU-T SG 9	Broadband Cable and TV
5	NWG 11	ITU-T SG 11	Protocols and test Specifications
6	NWG 12	ITU-T SG 12	Performance, QoS and QoE
7	NWG 13	ITU-T SG 13	Future Networks (&Cloud)
8	NWG 15	ITU-T SG 15	Transport, Access and Home
9	NWG 16	ITU-T SG 16	Multimedia and related digital technologies
10	NWG 17	ITU-T SG 17	Security
11	NWG 20	ITU-T SG 20	IoT, smart cities & communities
12	NSG 5	ITU-R SG 5	Radiocommunication

https://www.tec.gov.in/national-working-groups-2

TSDSI – Indian Telecom Standards Development Organization

tsdsi
India's Telecom SDO

- Developing, promoting & standardizing India-specific Telecom/ICT requirements & solutions
- Taking Indian requirements & Indian Innovations to global standards organizations

Home > Overview of TSDSI

Overview Of TSDSI

The Indian Telecom Industry, comprising operators and manufacturers, Academia and R&D organizations came together to form Telecommunications Standards Development Society, India (TSDSI) on 7 January 2014, as an embodiment of the Govt.'s resolve, expressed in the National Telecom Policy 2012 (NTP 2012), to create an Indian Telecom Standards Development Organization (TSDO), for contributing to next generation telecom standards and drive the eco-system of IP creation in India, formally recognised by the Government.

Who are we?

TSDSI is an autonomous, membership based, standards development organization(SDO) for Telecom/ICT products and services in India. We develop standards for access, back-haul, and infrastructure systems, solutions and services that best meet India specific Telecom/ICT needs, based on research and innovation in India. We work closely with global standards' bodies to reflect Indian requirements into International telecom/ICT standards. We play an important role in

QUICK LINKS

TEC invites public comments for adoption of TSDSI transposed 3GPP specifications from Release 10 to 17 standards as national standards

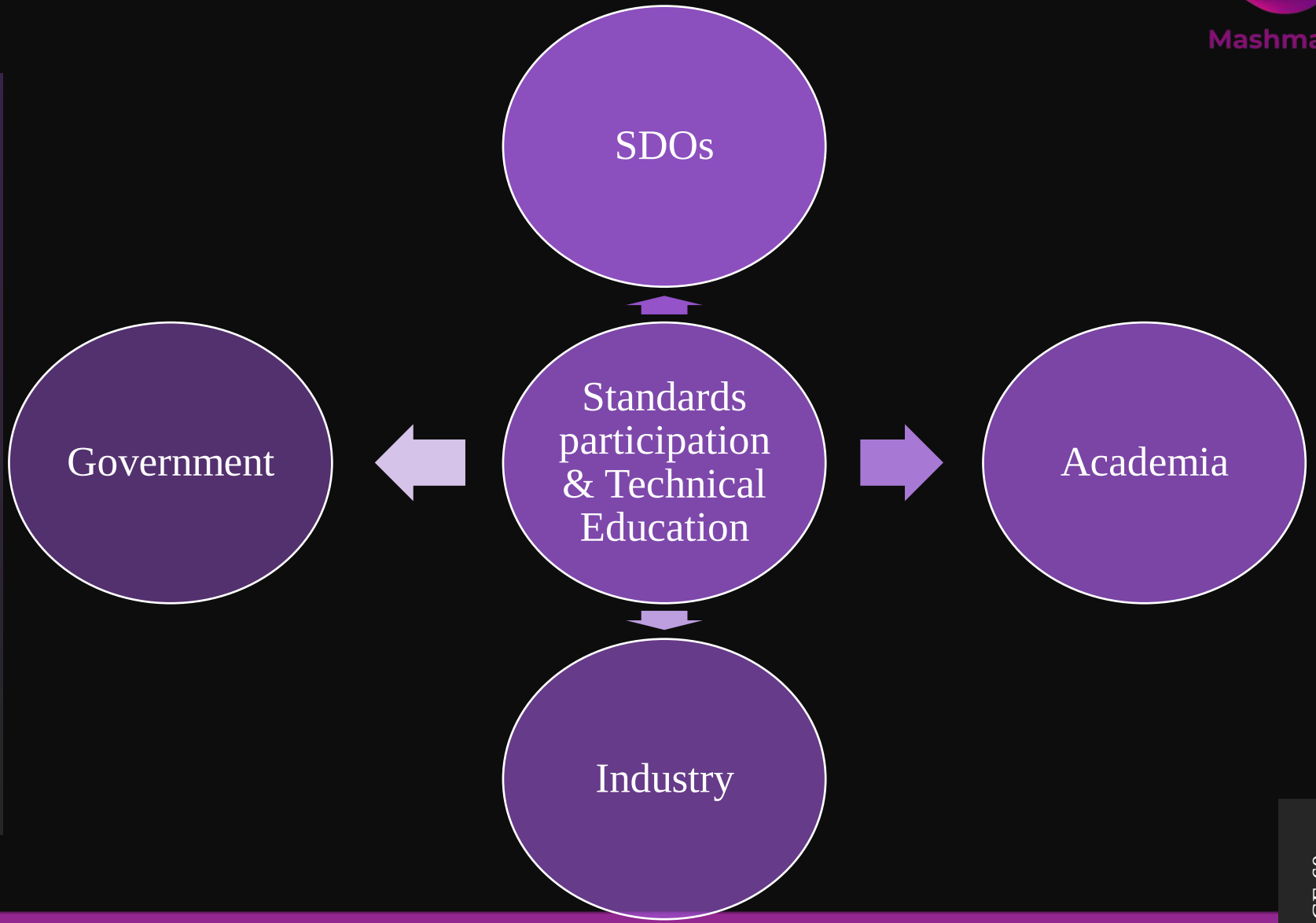
Inviting public comments on TSDSI transposed standards corresponding to the new and updated specifications of 3GPP Release 15, 16 and 17 (total 2579 documents), for their adoption into National Standards by TEC

TSDSI standardization initiatives

S No	Title	S No	Title
1	Multiple Access for 6G communication	11	Solar Panel Based Optical Wireless Communication
2	Suggested recommendations for sustainable 6G networks	12	Enablement of common edge connectivity for public utility purposes
3	Coreless RAN	13	Network Energy Saving functionality of the 5G-Advanced system and its Evolution
4	Rural Broadband Services Architecture	14	Enablement of common payload for Agricultural Automation Solutions
5	AI Architecture for RAN (SON / RRM)	15	Channel modeling and physical layer requirements for near-field communication in 6G networks
6	semi-autonomous collaborative telerobotics	16	Cloud Interoperability & Portability
7	A local language repository for financial workflows	17	Defining qualitative metrics for 6G KPI definitions
8	Joint communication & sensing in 5G networks & beyond	18	AI/ML-based Security Implementation in Wireless Communication Systems
9	Integrated communication and sensing at SUPI	19	waveforms for B5G communication systems
10	Security Enablers for 6G	20	Architecture to support tactile applications with edge intelligence over 5GS

Proliferating standards participation in Technical Education

Standards participation can be accelerated by ecosystem mobilisation

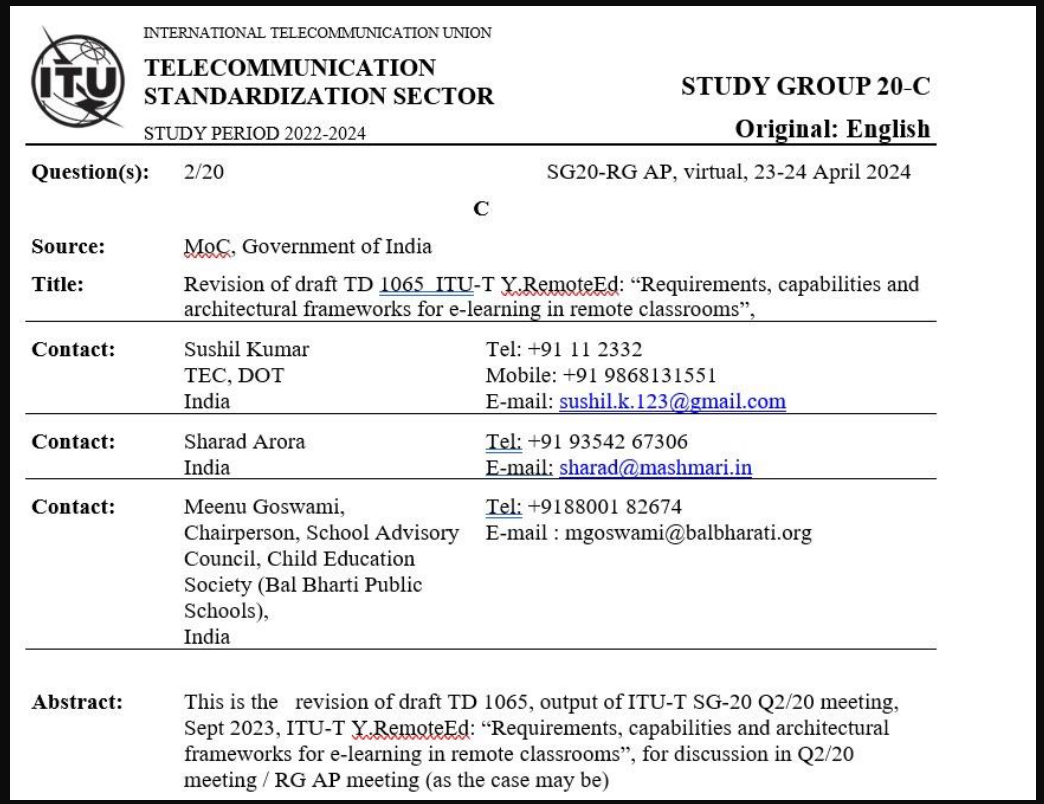


Framework for cooperation between Technical Education Curriculum/ Standards Participation

Bachelor's Degree	Master's Degree	Doctoral Degree	Post Doctoral
Semester training	Thesis Submission	Doctoral Thesis	Emeritus
NWG/ TSDSI contribution	NWI to an SDO	Draft new Recommendation till determination	Draft Recommendation consented by an SDO

Mashmari e-Learning - An example Standards contribution for global leadership

- Along with the Department of Telecommunications, Government of India, Mashmari has the proud privilege to be selected by International Telecommunication Union to draft the Recommendation (Standard) for e-learning in remote classrooms
- E-learning Pilots and Services delivered by Mashmari contribute to national and international standardization and capability development
- Collaboration with various Governments to create e-learning solutions to facilitate standards based deployment of cutting edge technologies, create a digital transformation in education whilst generating employment opportunities



INTERNATIONAL TELECOMMUNICATION UNION

TELECOMMUNICATION STANDARDIZATION SECTOR

STUDY PERIOD 2022-2024

STUDY GROUP 20-C

Original: English

Question(s):	2/20	SG20-RG AP, virtual, 23-24 April 2024
	C	
Source:	MoC, Government of India	
Title:	Revision of draft TD 1065 ITU-T Y.RemoteEd: "Requirements, capabilities and architectural frameworks for e-learning in remote classrooms",	
Contact:	Sushil Kumar TEC, DOT India	Tel: +91 11 2332 Mobile: +91 9868131551 E-mail: sushil.k.123@gmail.com
Contact:	Sharad Arora India	Tel: +91 93542 67306 E-mail: sharad@mashmari.in
Contact:	Meenu Goswami, Chairperson, School Advisory Council, Child Education Society (Bal Bharti Public Schools), India	Tel: +9188001 82674 E-mail : mgoswami@balbharati.org

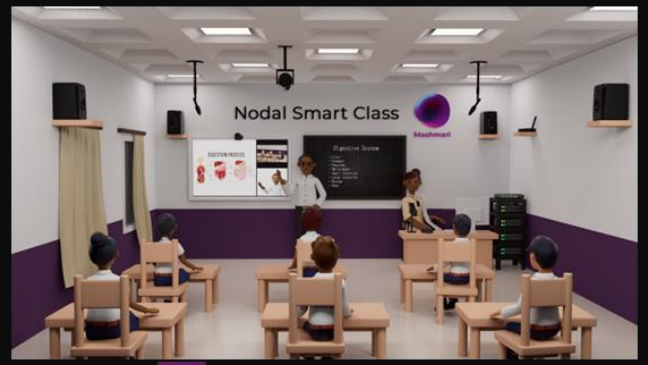
Abstract: This is the revision of draft TD 1065, output of ITU-T SG-20 Q2/20 meeting, Sept 2023, ITU-T Y.RemoteEd: "Requirements, capabilities and architectural frameworks for e-learning in remote classrooms", for discussion in Q2/20 meeting / RG AP meeting (as the case may be)

Contributing Standards is critical for growth and proliferation of Atma-Nirbhar Technologies and Solutions

Based on standards development, Mashmari's R&D is creating new e-Learning paradigms

Mashmari

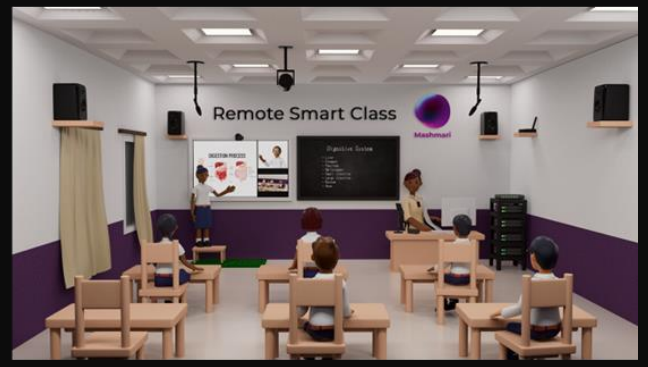
Mashmari
Remote e-learning



Realtime Collaboration using Mashmari Megh VC

Class Video Store on Megh LMS

Offline Viewing of Class Lesson from Megh Content



Overcoming geographical barriers by providing hybrid e-Learning facility in remote and underserved areas

- Last Mile Internet Connectivity and ICT Infra
- Interactive learning with multi-media equipment
- MITA pedagogy and "Saadhak" for everyday running of e-Learning SmartClasses
- Digital Content & Teacher Training
- Access to online Expert Classes
- Applications for Remote School Management and Learning Management

Leapfrog Learning, Remote and Underserved

Mashmari Consultants Pvt Ltd

At the core of our company lies a steadfast commitment to leveraging digital technologies and innovative pedagogies to revolutionize teaching-learning outcomes for remote and underserved communities. Our corporate values revolve around collaboration, customer-centricity and trust. Our mission is to equip teachers and local ecosystems with the tools and resources they need to make quality education accessible to all. Our corporate personality embodies passion, integrity, frugality and competence, embracing a culture of life long learning and development for all.

Sharad Arora International Telecom, Security & Standards Expert

E: sharad@mashmari.in M:+91 9354267306
https://www.linkedin.com/in/sharadsan/

Key Accomplishments

- Currently incubating e-Learning services for underserved
- Launch of 3G Services for Tata Teleservices, greenfield 2G for Escotel
- Development of multi profile machine embedded SIM
- Setup of Certification Authorities in India
- Launch of High End Printing Systems in India

Current Roles

- Founder and Director, MASHMARI Consultants Pvt Ltd
- Advisor, Child Education Society, India
- Member, SLR Work Group, IETS
- Liaison Rapporteur, ITU-T, Study Group 13
- Represents the Indian Administration in ITU SG 13 and SG 20
- Pro bono faculty for NTIPRIT, past faculty HUDCO HSMI

Past Roles

- Chair, Study Group Services and Solutions, & Governing Council Member, Telecom Standards Development Society of India (TSDSI)
- Founder, Sensorise Digital Services
- Chief Officer - Wireless Solutions; Tata Teleservices
- Managing Director - SmartTrust Infosolutions & GM - Asia Pacific
- General Manager - Operational Information Systems; Escotel Mobile
- General Manager; Ericsson Hewlett Packard Telecom, India
- R&D Engineer/ Product Specialist, Modi Xerox

Education

- BITS, Pilani; BE (Hons.) EEE, MSc (Hons.) Economics, 1985 – 1990
- Doon School. 1979-1885

Ongoing Publications

- Co-Author, ITU Standard on Trust Registry Hierarchy
- Co-Author, ITU Standard on e-Learning

Author

- Co-Author, ITU Standard on Bootstrapping, Y.3056 (Feb 2021), INDIA
- Co-Author, WTSA 2020, Recommendation-98 Amendments (Apr-2020)
- Co-Author, IoT Reference Architecture, BIS (May 2020)
- Co-Author, TEC TR on Intelligent Transport Systems, Vehicle to Vehicle Communications and Embedded SIMs (Nov, 2015), TEC, INDIA
- Co-Author, ITU Y-Series Supplement 53, Digital Identity and eKYC for Automotive Industry (Published, Dec 2018), NWG 20, TEC, INDIA
- Lead Author, TEC TR, Recommendations for M2M Security (Released, Jan 2019), M2M Security Workgroup, TEC, INDIA
- Co-Author, TSDSI TR, Indian Languages in Mobile Financial Transactions (Nov 2021)

Editorial Group

- Technical Report, Communication Technologies in M2M / IoT (TEC, May 2015)
- M2M Gateway & Architecture (TEC, May 2015)
- M2M Enablement in Safety & Surveillance System (TEC, Nov 2015)
- ICT deployment and strategies for Smart Cities (TEC, Jul 2016)
- Several IoT, Security, LPWAN Work Items of TSDSI

International Representations

- TSDSI, India representative to the ITU-CITS Meeting, 2021, 2022
- TSDSI, India rep at the Global SDO Meeting hosted by MTSFB, Malaysia, Putrajaya, Nov 2019
- TSDSI, India rep at the Global SDO Forum hosted by TAICS, Taiwan, Oct 2019

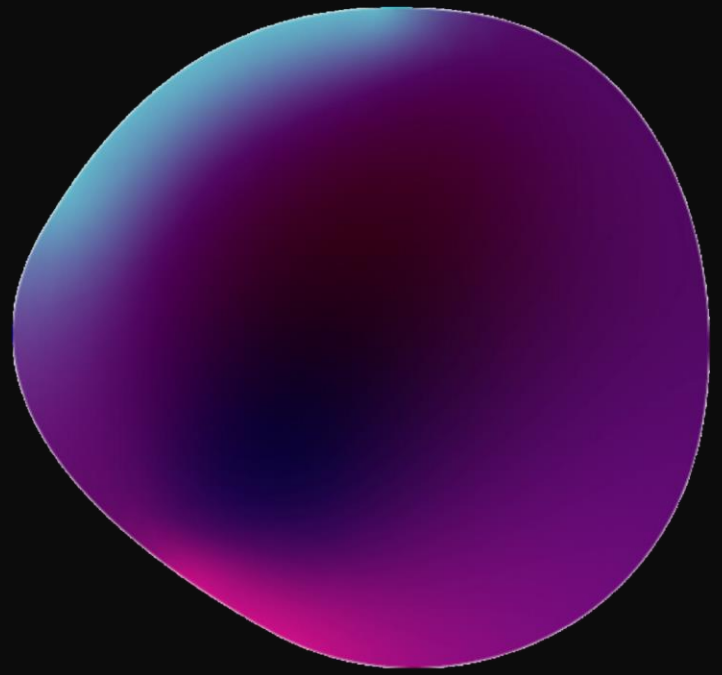
Expertise

- Telecom Technologies, Operator IT/ OSS/ BSS/ Telecom VAS
- Security Frameworks, Certification Authority Technologies, Device & App Security
- Machine to Machine Communications
- IoT, Embedded Systems, SIM Cards, Remote Management

मेरी शिक्षा, मेरा अधिकार, मेरी गति, मेरे द्वार ™

my Education, my Right, my Pace, my Place

Mashmari



MASHMARI™

Leapfrog Learning, Remote and Rural™