Asia-Pacific Economic Cooperation

USAID FROM THE AMERICAN PEOPLE

SERVICES DOMESTIC REGULATION: ENVISIONING NEXT GENERATION TECHNICAL STANDARDS PRINCIPLES

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LIST OF ACRONYMS

AEC	Architecture, engineering, and construction
AI	Artificial intelligence
APEC	Asia-Pacific Economic Cooperation
ASCR	APEC Services Competitiveness Roadmap
BIM	Building information modeling
CORFO	Economic Development Agency of Chile
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
CTI	APEC Committee on Trade and Investment
DEA	Digital economy agreement
DDEX	Digital Data Exchange
EU	European Union
GATS	General Agreement on Trade in Services
GDPR	General Data Protection Regulation
GOS	APEC Group on Services
GRid	Global Release Identifier
ICT	Information and communications technology
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IEEE GEPS	IEEE Government Engagement Program on Standards
IFC	Industry Foundation Classes
IFRS	International Financial Reporting Standards
IoT	Internet of Things
ISO	International Organization for Standardization

ISRC	International Standard Recording Code
ITU	International Telecommunications Union
JSI	Joint Statement Initiative
MCCs	Model Contract Clauses
MIDI	Musical Instrument Digital Interface
MoU	Memorandum of understanding
OECD	Organization for Economic Co-operation and Development
SCSC	APEC Sub-Committee on Standards and Conformance
SMEs	Small and medium-sized enterprises
STRI	Services Trade Restrictiveness Index
SWIFT	Society for Worldwide Interbank Financial Telecommunication
TBT	Technical Barriers to Trade [Agreement]
UN	United Nations
US-SEGA	US-Support for Economic Growth in Asia
WTO	World Trade Organization

SECTION 1: BACKGROUND AND INTRODUCTION

Within the subject of services domestic regulation, qualification requirements and licensing have been subject to extensive policy analysis and discussions. However, technical standards have been largely overlooked in international services trade policy analysis. Standards are an important part of the institutional framework within which services markets operate. First, they can ensure the reliability and safety of products, processes, methods, and services. Second, they can enable interoperability among heterogeneous devices and systems. As such, further analysis of technical standards is a critical initiative in the services domestic regulation arena.

This study focuses on next generation services standards and the interaction between government and private standard-setting bodies. The digital transition of services is blurring the boundaries between sectors and occupations. New services and occupations are created, while others are rendered obsolete. Against this backdrop, standards can be more responsive to changes in technology and market structure than more formal regulatory instruments. Thus, non-prescriptive standards may play an important role in balancing the incentives for innovation with the imperative of a safe, inclusive, and just transition.

The negotiation of the World Trade Organization (WTO) Joint Initiative on Services Domestic Regulation—featuring participation by 70 economies, including 16 Asia-Pacific Economic Cooperation (APEC) economies—was concluded on 2 December 2021. The Joint Initiative on Services Domestic Regulation introduces disciplines in the following areas:

- Licensing requirements and procedures;
- Technical standards; and
- Qualification requirements and procedures.

The outcome of the Joint Initiative on Services Domestic Regulation is disciplines that WTO members may inscribe in their GATS schedules. Regarding standards, the scope of the disciplines on services domestic regulation covers transparency, nondiscrimination, reasonableness, and fairness in government standard setting procedures, including how governments consult with private standard setting bodies and other stakeholders. However, the *substance* of the standards as well as the activities of private standard setting bodies are not in scope of the disciplines on services domestic regulation.

In the regional context, APEC has been a leader in enhancing services domestic regulation, committing under the APEC Services Competitiveness Roadmap (ASCR 2016–2025) to ensure an open and predictable environment for access to services markets by progressively reducing restrictions to services trade and investment.[1] APEC further prioritized improved services domestic regulation practices under the 2021 ASCR Mid-Term Review, which included a recommendation to advance *de jure*

[1] APEC, 2016, *APEC Services Competitiveness Roadmap (2016–2025),* https://www.apec.org/Meeting-Papers/Leaders-Declarations/2016/2016_aelm/2016_Annex-B.

and *de facto* market opening and address regulatory heterogeneity.[2] Much like the disciplines agreed under the Joint Initiative on Services Domestic Regulation, APEC's 2018 Non-Binding Principles on Domestic Regulation of the Services Sector contains limited language on technical standards.[3] As an early-mover on services domestic regulation, the APEC Group on Services (GOS) is well-placed to explore good practices for the development and adoption of technical standards for services, which can strengthen efforts for improved regional connectivity and competitiveness, and offer findings to enhance the global services domestic regulation landscape.

While this area may be new to members of the GOS, APEC's structure presents valuable opportunities for cross-fora collaboration and knowledge sharing, enabling GOS members to benefit from existing work on technical standards. The APEC Sub-Committee on Standards and Conformance (SCSC) under the Committee on Trade and Investment (CTI) sees harmonized standards as an important vehicle for efficient production and facilitating trade. Although the work of the SCSC traditionally focuses on goods, it presents useful learnings that can be applied to services. Among its objectives are aligning each economy's standards with international standards, and, in the absence of international standards, recognizing the standards of other economies.[4][5] The SCSC's good regulatory practices documents and recommendations offer a checklist for governments to contemplate with a view to consider market-based alternatives before intervening with regulation. Such an approach would minimize the trade restrictiveness of regulation when regulation is necessary and promote use of performance-based rather than prescriptive technical regulation.[6] References to private voluntary standards should be limited to those necessary to obtain the regulatory objective.

The study starts with a discussion of technical standards in the services space with examples of well-established as well as next generation standards in Section 2. Section 3 lays out the standard-setting process, and includes the views of some of the industry, business association, and standards organization representatives interviewed for this project. Section 4 presents three case studies: building information modeling (BIM) in architecture, engineering, and construction (AEC); standards in the recorded music industry; and trustworthy artificial intelligence (AI) standards. Section 5 concludes by considering some policy implications.

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[2] APEC Policy Support Unit, 2021, *APEC Services Competitiveness Roadmap Mid-term Review*, October, https://www.apec.org/docs/default-source/publications/2021/10/apec-services-competitiveness-roadmap-mid-term-review/221_psu_apec-services-competitiveness-roadmap-mid-term-review.pdf?sfvrsn=861e0b45_1

[3] APEC, 2018, *APEC Non-binding Principles for Domestic Regulation of the Services Sector*, November 13, https://www.apec.org/docs/default-source/Publications/2018/11/2018-CTI-Report-to-Ministers/TOC/Appendix-13---APEC-Nonbinding-Principles-for-DR-Drafting-Group.pdf

[4] APEC Sub-Committee on Standards and Conformance (SCSC) and APEC Committee on Trade and Investment, 1997, *Guide for Alignment of APEC Member Economies' Standards with International Standards*, https://www.apec.org/docs/default-source/groups/scsc/2023/96_scsc_guide-standards-alignment_colour.pdf?sfvrsn=d20df757_2.

[5] The 1997 document *Guide for Alignment of APEC Member Economies' Standards with International Standards* published aimed for completing the alignment by 2010 for developed economies and by 2020 for developing APEC economies.

[6] *APEC SCSC, 2000, Principles and Features of Good Practices for Technical Regulation, 2000/SOM3/CTI/SCSC/016,* https://www.apec.org/docs/default-source/groups/scsc/2023/00_scsc3_016-principles-features-of-grp.pdf?sfvrsn=af764d34_2.

SECTION 2: THE WORLD OF TECHNICAL STANDARDS

The International Organization for Standardization (ISO) describes standards as a formula for the "best way" of doing something. In the standard-setting procedure, the best way is distilled from the expertise of stakeholders during a consensus-building process that may culminate in a voluntary standard. The best way of doing something evolves over time with changing technology, market conditions and accumulated experience. Therefore, voluntary standards are regularly reviewed, updated, replaced, or removed.

Adding detail on international standards, ISO describes that "[a]n International Standard provides rules, guidelines, or characteristics for activities or for their results, aimed at achieving the optimum degree of order in a given context. It can take many forms. Apart from product standards, other examples include: test methods, codes of practice, guideline standards and management systems standards."[7] A formal definition of a standard in the ISO/IEC guidelines is: "[d]ocument, established by **consensus** and approved by a recognized **body**, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context." (ISO 2004)[8][9].

ISO is the largest independent international standard-setting body, followed by the International Electrotechnical Commission (IEC). The two organizations collaborate in areas of common interest. Most of the next generation private standards discussed in this note were indeed developed jointly by ISO and IEC.

Services standards accounted for only 2.2 percent of new registered ISO standards in 2022. However, most of the business management and innovation standards (1 percent of total) and horizontal subjects (2.4 percent) apply to services as well. In addition, transport accounts for 12.4 percent of all ISO standards (ISO 2023). The small share of services standards in ISO reflects the fact that services have traditionally been considered non-traded, with limited private sector demand for international standards. Moreover, the services sectors that underpin the global trading system are governed by specialized international standard setting bodies such as the International Air Transport Association (IATA - independent) and International Civil Aviation Organization (ICAO – United Nations (UN)) for air transport, the International Telecommunications Union (ITU - UN) for telecommunications, the International Maritime Organization (IMO - UN) for maritime transport, the Internet Corporation for Assigned Names and Numbers (ICANN - independent) for domain name management on the internet, and the International Financial Reporting Standards (IFRS - independent) for accounting standards.[10] See Box 1 for examples of international services standards.

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[7] See https://www.iso.org/deliverables-all.html accessed 17.10.2023.
[8] ISO/IEC, "Guide: Standardization and Related Activities – General Vocabulary", https://www.iso.org/standard/39976.html.
[9] Bold in original
[10] The United States and China have not adopted the IFRS standards.

Box 1: Examples of International Services Standards

International Financial Reporting Standards (IFRS) are accounting and sustainability disclosure standards developed by the International Accounting Standards Board (IASB) and International Sustainability Standards Board (ISSB); 147 economies including 15 APEC economies have made the IFRS accounting standards mandatory for public companies.

Message Text standards for the Society for Worldwide Interbank Financial Telecommunication (SWIFT) system is mandatory for users of SWIFT and ensure secure standardized messaging services and interface software to financial institutions. The standard is being gradually replaced with ISO 20022 messaging standard for cross-border payment and reporting by 2025.

Mobile financial services ISO Technical Specification (ISO/TS) 12812 parts 1–5 2017 define the general framework of mobile financial services, security and data protection for mobile financial services, financial application life cycle management, and mobile payments to people and businesses.

Information security management systems ISO/IEC 27001 are guidance for establishing, implementing, maintaining, and improving information security management systems and addressing cybersecurity risks in any organization.

Healthcare organization management – pandemic response – temporary medical facility ISO 5741/2023 describes the requirements, operational principles, and procedures for planning, staffing, patient management, and discharging of patients in temporary medical facilities in the context of widespread community transmission of infectious diseases.

Guidance and criteria for information and communication technology organizations on setting Net Zero targets and strategies ITU recommendation ITU-L 1470 concerns greenhouse gas emissions trajectories for the information and communication technology sector, and ITU-L 1471 provides guidance and criteria for information and communication technology. organizations on setting Net Zero targets and strategies.

TYPES OF STANDARDS APPLICABLE TO SERVICES

Standards can be classified along different dimensions. Figure 1 depicts types of standards in a two-dimensional space.

Figure 1: Types of Standards

Voluntary versus mandatory distinguishes between standards developed in the market and standards imposed by governments. Voluntary standards can be developed by private standard-setting bodies such as ISO and its committees, or when a market-leading firm's way of doing things becomes the *de facto* industry standard. Market-based standards spread due to bandwagon and network effects and are self-enforcing. The more agents use them, the more beneficial they become. Voluntary standards are also referred to as coordinative. Mandatory standards are regulative and come with a set of conformity assessment regimes. Many mandatory standards are based on and refer to well-established voluntary standards that have proved effective and useful.

The other dimension in Figure 1 is *process or organization standards versus product standards*. In the services sectors, process standards dominate. Such standards are uniform ways of performing specific tasks, functions, or projects. Examples of standards for specific tasks are account opening in commercial banks,[11] patient registration in healthcare, message content and format used by in-vehicle navigation system in the transport sector (ISO 15075:2003), or security checks at airports. Examples of standards for services functions are inventory management standards in the distribution sector and customer services standards (e.g., ISO 8295: 1995), which can be adopted by any customer-facing enterprise. Examples of standards at the project-level are standards for information management in building projects (see case study below) and guidance for project management (ISO 21502: 2020). Process standards imply that the services providers follow a defined process (e.g., a checklist). Sometimes documentation of the completion of each step is required. With the digitization of services, process standardization can be a first step towards automating one or more tasks (e.g., introducing chatbots in customer services). Automation software is, in turn, subject to product standards for data management, privacy, security, and the interface with other software applications (e.g., application programming interfaces (APIs)). Finally, organization standards often come in the form of guidelines.

The Services Trade Restrictiveness Index (STRI) database of the Organization for Economic Co-operation and Development (OECD) identifies international standards in six sectors (construction, distribution, commercial banking, insurance, accounting, and road transport) and records whether local standards deviate from international standards in these sectors. Figure 2 presents the results for 2022 for the 16 APEC economies covered by the database.[12] Two economies have local mandatory standards that deviate from international standards for risk weighting set by the Basel Committee on Banking Supervision; five economies deviate from the IFRS accounting rules in banking and four in insurance; while only four APEC economies mandate aligning with international standards for road transport.[13]

According to the database, no APEC economy deviates from international standards in the construction sector. However, interviews for this study suggest that building codes tend to be less aligned with international standards than most other standards. For instance, 57 percent of standards offered by Standards Australia are identical to international standards. Another 13 percent are international standards adopted to Australian conditions, while about 30 percent are local standards. These are

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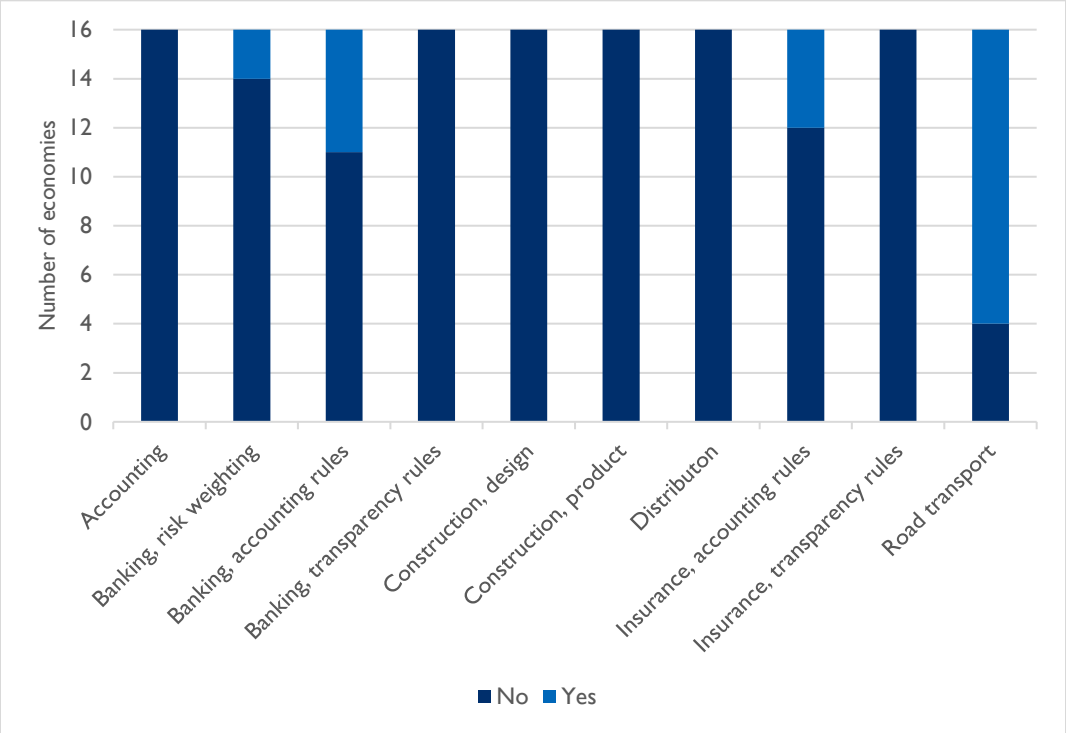
[11] Bank for International Settlements, 2015, *Basel Committee on Banking Supervisions: Consultative Document: General Guide to Account Opening*, July, https://www.bis.org/bcbs/publ/d331.pdf.
[12] When the detailed regulatory database for the APEC Index to Measure the Regulatory Environment for Services Trade becomes publicly available, all APEC economies could be represented in the figure.
[13] Interestingly, only one of them has land borders with other economies.

averages and vary across areas and sectors, with construction and building codes exhibiting the largest share of local standards.[14]

Figure 2: Mandatory Standards Deviate from International Standards, 16 APEC Economies, 2022



Source: OECD. *Services Trade Restrictiveness Index.* webpage. https://stats.oecd.org/Index.aspx?DataSetCode=STRI.

Irrespective of the type of standard, there is an optimal sweet spot for standardization. Adopting standards too early, particularly when the standard is prescriptive, may stifle innovation. In contrast, an absence of standards in cases of a bewildering variety of services may forego gains from lower transaction costs and economies of scale. However, unless there is a market imperfection or failure, there is not necessarily a need for mandatory standards at any point in a process or technology's lifecycle. Rather, market-based standards or voluntary standards developed by standard-setting bodies may take care of striking the right balance between reducing transaction costs on the one hand, and the benefit of a dynamic diversity of services and processes on the other.

THE RATIONALE FOR MANDATORY STANDARDS

As noted, the APEC Guidelines for the preparation, adoption, and review of technical regulations recommend that mandatory standards be used sparingly and only after other options have been considered. Where justified, mandatory standards should be performance-based rather than

[14] Source: Consultations with Standards Australia, 18.07.2023, and Architects Accreditation Council, Australia (AACA)18.07.2023.

prescriptive, address and rectify the market failure that triggered the need for a standard in the first place, and align with international standards wherever relevant.

A common market failure in services markets is asymmetric information, stemming from the fact that the services supplier knows the quality and cost of the service provided much better than the customer. Many services are experience or credence products. In the case of experience products, consumers cannot observe the product quality before consuming it. For credence products, the quality remains obscure even after consumption. The quality of architectural and engineering services, for example, may be revealed only after a building has been exposed to the forces of the natural environment over many years. In the health sector, the medical professional offers a diagnosis that the patient cannot fully validate and a treatment that the patient may not fully understand. These sectors are often subject to professional licensing as a regulatory measure to ensure quality, complemented with product standards for the equipment used and process standards for the procedures performed as a part of the provided service.

Asymmetric information is a common problem for repair of advanced machinery and equipment as well. For instance, a car repair shop has the knowledge and technology to diagnose the condition of a car engine while the car owner may only have a limited understanding of the problem. In such circumstances, it could be tempting for the repair shop to provide a low-quality service while charging for a high-quality service. The repair shop could also propose and perform a more expensive intervention than the customer needs. The latter case is the more difficult to reveal since the customer is unaware of the severity of the problem and happy with the outcome. Nevertheless, exploiting superior information to the detriment of consumers may not be in the interest of services providers since it not only hurts the reputation of the offending services supplier, but also lowers the level of trust – and demand – in the broader market. Self-regulation is therefore commonly observed in services subject to asymmetric information.

In cases where market solutions are inadequate and the potential damage from exploiting superior information is considerable, there is a case for regulation such as mandating disclosure of information, and minimum quality standards. Since the service often cannot be distinguished from the service supplier, the regulations are typically imposed on the service supplier in the form of codes of conduct, qualification requirements, and licensing.

Professional services are an interesting example of a mix of voluntary and mandatory standards. Most professions in most economies form professional bodies that, in turn, are members of international professional bodies such as the International Union of Architects, the International Federation of Accountants, the World Dental Federation, and many more. The professional bodies develop and monitor codes of conduct, offer skills upgrading, and pursue the interests of the members in the policy space. In addition, the professions are, to different degrees, self-regulated. They may issue, renew, or revoke licenses; organize aptitude tests; and offer training courses to stay abreast with new standards. Quite often, self-regulated professional bodies have delegated authority from government regulation, which, in turn, refers to the standards developed by the professional bodies making them mandatory.

Standards not only signal quality. Equally important, they can make products and processes interoperable. This is particularly valuable in the digital services economy where standards ensure that platforms and devices can talk to each other. Furthermore, when standards are interoperable, compliance with standards (e.g., privacy and cybersecurity) in one jurisdiction facilitates compatibility

with those in other jurisdictions pursuing substantially the same regulatory objectives and the same level of protection. Compatibility does not necessarily mean recognition, however. There is, for instance, no guarantee that certification of compliance with ISO 27701 on privacy protection is sufficient to qualify for processing personal data.

Standards for data formats, protocols, and security measures facilitate technical interoperability, while standards for data management help promote regulatory interoperability. The APEC Privacy Framework (2015), for instance, aims for interoperability between privacy frameworks within the APEC region and beyond.[15] Interoperability is also an objective in international trade agreements including the WTO JSI on e-commerce currently under negotiation.

Finally, while governments set high-level standards and regulatory objectives, private standard-setting bodies may be better placed to flesh out the technical details where needed. Interestingly, the Institute of Electrical and Electronics Engineers (IEEE), an international standard-setting body based in the United States, has introduced a Government Engagement Program on Standards (IEEE GEPS) where the IEEE offers capacity building and resources to support government standard-setting activities in a similar consensus-building manner as private standard-setting bodies.[16] Participating governments have observer status in the IEEE's standard-setting bodies.

[15] APEC, 2017, *APEC Privacy Framework 2015*, August, https://www.apec.org/publications/2017/08/apec-privacy-framework-(2015).
[16] IEEE Standards Association, n.d., "Government Engagement Program on Standards (GEPS)," webpage, https://standards.ieee.org/about/intl/government-engagement-program/.

TABLE 1: APEC ECONOMIES AND INSTITUTIONS PARTICIPATING IN THE IEEE GEPS

ECONOMY	INSTITUTIONS
Australia	Australian Communications and Media Authority Australian Digital Health Agency
Canada	Ministry of Economic Development, Job Creation and Trade
Japan	Ministry of Internal Affairs and Communications
Korea	Ministry of Science and ICT [information and communications technology] Korean Agency for Technology and Standards
Mexico	Federal Telecommunications Institute
Peru	Ministry of Transport and Communications
Singapore	AI Singapore Infocomm Media Development Authority
The United States	National Telecommunications and Information Administration National Institute of Standards and Technology Department of Homeland Security Department of State

Source: IEEE Standards Association, n.d., "Government Engagement Program on Standards (GEPS)," webpage, https://standards.ieee.org/about/intl/government-engagement-program/.

Reflecting the scope of the IEEE, all the participating institutions are either general government agencies, technology agencies, or services-related bodies.

Voluntary and mandatory standards are complementary and can be mutually reinforcing. Governments set high-level objectives and goals, while private standard-setting bodies compete for solutions by developing and selling standards to companies as well as certifying companies that satisfy those standards. As technology matures, governments may again step in and refer to a standard in legislation or regulation to harmonize and help integrate markets. For example, standards for how image recognition can be used as evidence in court require government intervention.

NEXT GENERATION STANDARDS IN SERVICES

We live in disruptive times with rapid technological developments, climate change, and a recent pandemic. During such times, established standards may become obsolete or no longer "the best way of doing something," as the ISO put it. At the same time, the uncertainty, insecurity, and vulnerability that go with disruption generate demand for governments to step in with measures to keep people safe and to instill a minimum level of predictability in the business environment. Thus, on the one hand we are not yet at the sweet spot of consensus on the best way of doing things. On the other hand, there is strong demand for standards and regulations that make us safer. How to approach this nexus through the next generation of standards is a challenge for governments and standard-setting bodies alike.

Even if the best way of doing something is not yet established, stakeholders within and across economies may agree on basic principles and objectives that next generation standards should support. For instance, the OECD AI principles have been adopted by the G20 [Group of 20] and form the basis for local standards as well as APEC discussions.[17] Furthermore, all members of the United Nations Educational, Scientific and Cultural Organization (UNESCO) have agreed on a draft document containing recommendations on the ethics of AI.[18]

A key element of the next generation services landscape is the digital transformation of services, which notably affects all aspects of the service. Therefore, next generation standards often take an ecosystem approach by including standards for management systems, and for schemes and procedures for certification and accreditation.

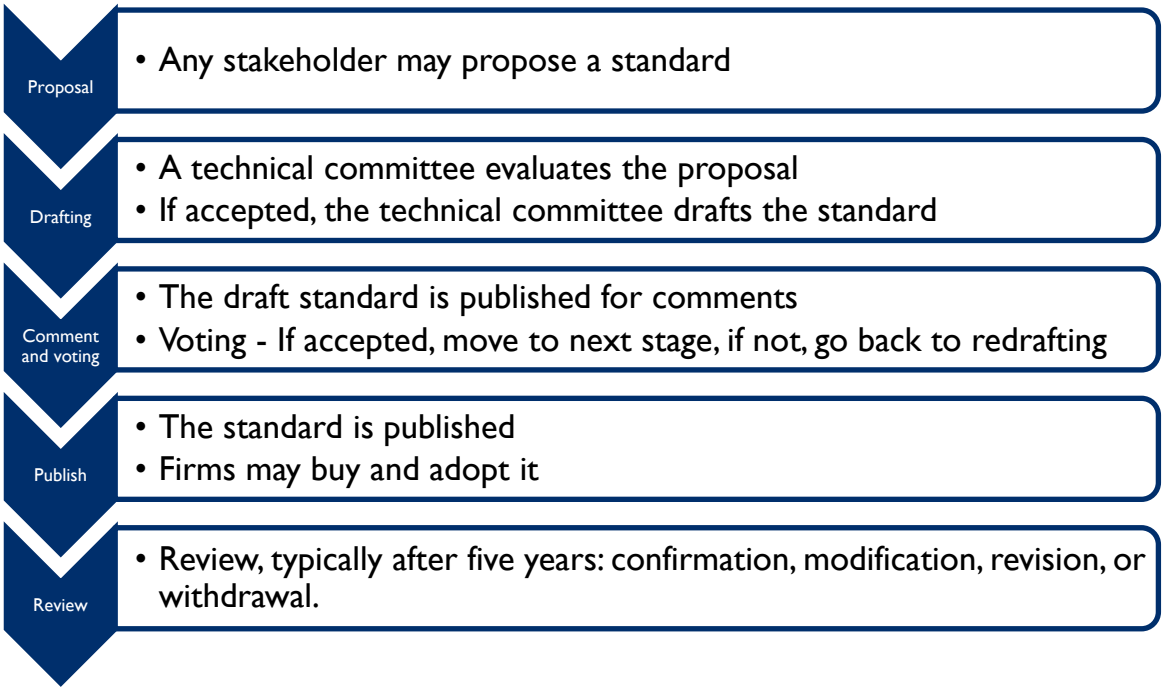
The most pressing areas of standard-setting affecting services are cybersecurity[19] and privacy.[20] These are areas where common international standards are not yet available and the right to regulate as each economy sees fit is inscribed in most trade agreements. With this situation likely to remain in place for the foreseeable future, interoperability across different sets of standards is essential. Interoperability is indeed a central concept in the WTO JSI on e-commerce as well as digital economy agreements (DEA). For instance, the Ministry of Trade and Industry in Singapore explains that: "A Digital Economy Agreement (DEA) is a treaty that establishes digital trade rules and digital economy collaborations between two or more economies. Through DEAs with key partners, Singapore hopes to develop international frameworks to foster interoperability of standards and systems and support our businesses, especially small and medium-sized enterprises (SMEs), engaging in digital trade and electronic commerce."[21] Thus, standards are at the very core of the DEA. Making standards interoperable may, however, be easier said than done as we will see in the discussions below.

SECTION 3: HOW STANDARDS ARE MADE

Standards can be demand-driven (bottom-up) or regulation-driven (top-down). Starting with the bottom-up process, a bewildering variety of services and processes may trigger private sector demand for imposing order and agreeing on a way of producing, labeling, or marketing a service in a standard-setting body. The bottom-up standard-setting process is illustrated in Figure 3.

[17] OECD.AI Policy Observatory, n.d., "OECD AI Principles Overview," webpage, https://oecd.ai/en/ai-principles.
[18] UNESCO, 2021, "Draft Text of the Recommendation on the Ethics of Artificial Intelligence," https://unesdoc.unesco.org/ark:/48223/pf0000377897.
[19] See, APEC Telecommunications and Information Working Group, 2012, *APEC Guidelines for Creating Voluntary Cyber Security ISP Codes of Practice*, https://www.apec.org/publications/2012/03/apec-guidelines-for-creating-voluntary-cyber-security-isp-codes-of-practice.
[20] See, APEC, 2017, *APEC Privacy Framework* 2015.
[21] Ministry of Trade and Industry Singapore, n.d., "What are Digital Economy Agreements (DEAs)?" webpage, https://www.mti.gov.sg/Trade/Digital-Economy-Agreements.

Figure 3: Bottom-Up Standard-Setting Process, Local Independent Standard-Setting Body



ISO standards are made in the same manner as local standards. Any stakeholder may propose a standard to the local member of an ISO committee, which brings the proposal to the corresponding international ISO committee. From there, the process follows the same steps as in Figure 3.

It is worth noticing that a standard is a *document* that contains information on, for example, procedures, checklists, and technical specifications as appropriate. The document is subject to copyright, and companies and other stakeholders get access to it by buying the document. The fee for an ISO standard document is typically around CHF 40 – CHF 250.

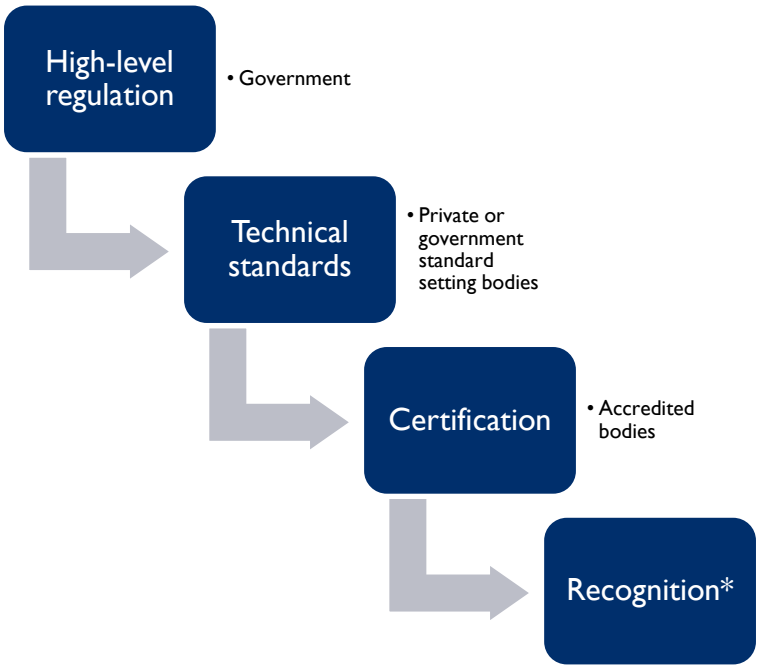
In addition to buying the standard and structuring business operations as envisaged in the standard document, a firm may want to be certified that it conforms to the standard. This may, for instance, be a requirement for becoming a supplier in public procurement as well as private sector supply chains. Certification is not cheap. For example, obtaining a certificate of compliance with the ISO standard on information security management systems (ISO/IEC 27001) costs between USD 15,000 and USD 200,000, depending on the size and capacity of the firm. The certificate lasts for three years, and annual audits for additional fees are required.[22]

The origin of private standards can also be government high-level regulation (top-down). For instance, governments set standards in the form of high-level goals and guidelines for protection of privacy, while leaving it open to firms to determine how to meet these objectives. If the regulation is not accompanied with standards, firms may face considerable risks. Private standards help translate the high-level

[22] See, e.g., Sprinto website (https://sprinto.com/home-page/) or IT Governance, "Typical ISO 270001Certification Costs," webpage, https://www.itgovernance.co.uk/iso27001–certification-costs.

objectives into practical procedures and benchmarks that could mitigate the risk. Especially when penalties for non-compliance are severe, companies seek to reduce uncertainty by developing private standards. Uncertainty can be reduced further if the regulator recognizes the private standard. Finally, if the private standard is referred to in regulation, it becomes mandatory and conformity with it ensures compliance with the underlying legislation. Figure 4 illustrates this process.

Figure 4: Top-Down Standards Development



* Recognition of the standard by the regulatory body is not automatic.

An example of the complementarity between public and private standards is the General Data Protection Regulation (GDPR) of the European Union (EU). There are guidelines for business compliance on the EU website and a checklist targeting small and medium-sized enterprises (SMEs).[23] Also the UK government offers a self-assessment toolkit tailored to SMEs.[24]

The high-level standards contained in the GDPR and other privacy protection regulations such as Korea's Personal Information Protection Act (PIPA) may, however, not give firms a clear appreciation of what they can and cannot do. To help firms comply with mandatory privacy standards, private standards have been developed. Examples are ISO 27001, which focuses on information security, and ISO 27701, which is a standard for privacy protection. Information security is a precondition for privacy protection, and ISO 27701 is often applied on top of ISO 27001.

[23] GDPR.EU, n.d., "GDPR Checklist for Data Controllers," webpage, https://gdpr.eu/checklist/.
[24] Information Commissioner's Office, n.d., "Data Protection Self Assessment," webpage https://ico.org.uk/for-organisations/advice-for-small-organisations/checklists/data-protection-self-assessment/.

Model contract clauses (MCCs) are also a commonly used tool for companies to comply with high-level standards. These incorporate the principles (e.g., of privacy standards) into contracts between data-exporting and data-importing companies. If such contracts are pre-approved by the competent authorities in the exporting and importing economies, data may flow freely between the contracting parties. The ASEAN economies, for instance, have introduced MCCs as a legal instrument for cross-border dataflows.[25][26]

The GDPR and other high-level standards create demand for consultancy and certification services. There is a host of private companies offering consultancy and certification services for compliance with ISO 27001 and 27701 and GDPR. One of the leading certification services based in the United States explains that it typically takes between six and nine months to do a self-assessment in preparation for an ISO 27701 certificate.[27] Furthermore, certification is not a definite assessment of GDPR compliance. While consultancy services help firms do gap analysis benchmarking against the ISO standards, only accredited certification bodies can issue ISO certification. Common to financial auditing, consultancy and certification services should be separated to avoid conflict of interest.[28]

STANDARD SETTING – INDUSTRY VIEWS

The industry and business association representatives interviewed for this study unanimously emphasized the complementarity between mandatory standards or regulation and private standards. Mandatory and voluntary standards can also be mutually reinforcing. Thus, governments set high-level objectives and goals while private standard-setting bodies compete for solutions by developing and selling standards to companies as well as certifying companies that satisfy those standards. As technology matures, governments may again step in and refer to a standard in legislation or regulation to harmonize and help integrate markets.

There were different views on regulatory sandboxes. On the one hand, regulatory sandboxes can be a useful step in the process for identifying an area in need of standards to meet regulation. Sandboxes can be particularly useful in determining testing requirements. On the other hand, sandboxes do not sit well in a system where companies are already free to experiment with standards and they are liable for the outcome regardless.[29]

NEXT GENERATION STANDARDS

The most prominent areas of next generation standards affecting services industries are cybersecurity, privacy, and AI. These are areas where common international standards are not yet available and the

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[25] ASEAN, 2021, *ASEAN Model Contractual Clauses for Cross Border Data Flows*, https://asean.org/wp-content/uploads/3-ASEAN-Model-Contractual-Clauses-for-Cross-Border-Data-Flows_Final.pdf.
[26] See Robinson et al. (2021) for a discussion of interoperability of privacy standards.
[27] See, Coalfire Cert, n.d., "Coalfire Certification," https://www.coalfirecertification.com/.
[28] The regulation of conflict of interest in this field is, however, less widespread and consistent than for financial auditing.
[29] A sandbox project exploring how to integrate liability into a major building industry reform was undertaken in New South Wales in 2020. It resulted in a risk-based rating system of the players in the industry. A digital platform was developed for data-sharing between regulators and inspectors. There is also collaboration between regulators, finance, insurance, and rating agencies. Government of New South Wales, n.d., "The Office of the NSW Building Commissioner," webpage, https://www.nsw.gov.au/housing-and-construction/building-commissioner.

right to regulate as each economy sees fit is inscribed in most trade agreements. With this situation likely to remain in place for the foreseeable future, interoperability across different sets of standards is essential.

Conversely, prescriptive standards in these areas would stifle innovation. Furthermore, conformity assessment, particularly for AI regulation, is hard because the objectives lack measurable benchmarks. For example, there is not yet a methodology for testing software for bias.

The digital transformation of services affects all links in the services value chain. Therefore, an ecosystem approach to standard-setting is needed, for example, for privacy, cybersecurity, and cloud computing. Examples of this are standards for management systems; for schemes and procedures related to certification and accreditation; and standards that relate to hardware, software, and the solutions, configurations, and utilizations of a technology.

In the AEC industry, with new developments in digital technologies, including AI-enabled algorithms, a broad range of experts in many fields of competence are increasingly involved in the development of buildings, which, in turn, are integral part of the urban environment. In the future, buildings, or urban quarters, will increasingly be self-sufficient in energy, produce food, and be carbon neutral. Architects' roles will increasingly be as project coordinators, bringing together the expertise of a wide range of professions.[30]

VOLUNTARY VERSUS MANDATORY STANDARDS

Concrete examples where voluntary and mandatory standards support and complement each other in the digital and AEC spheres are many. The Internet Protocol is an excellent example of voluntary standards. However, standards for how, for example, image recognition can be used as evidence in court require government standards. Another example where government standards are needed is in the use of AI for diagnosis in the health sector.

Multifactor authentication in financial markets is a great example of the complementarity between regulation and voluntary standards.

Work on developing a common terminology in the space of dataflows and protection of privacy is an example of good practice. The ISO standards for data management build on ISO standards for classification and labelling of information, which guide data management such as the level of protection of different categories of data. International standards and common definitions of data categories are then building blocks for developing both private and mandatory standards in the areas of cloud computing, privacy, and cyber security.

Within the Australian AEC sector, the development of building codes has been effective in aligning the voluntary standard development process with mandatory standards and regulation. This has resulted in voluntary and mandatory standards complementing each other in a consistent framework for the engineering/architecture/construction sectors and their customers. The government steps in to align the

[30] A research center has been established to work on architecture and buildings for the future. ARC Centre for Next-Gen Architectural Manufacturing (arch-manu), n.d., "ARC Centre for Next-Gen Architectural Manufacturing," webpage, http://www.archmanu.com.

sector with climate objectives, setting standards for e.g., carbon emissions and energy efficiency. Mandatory standards are also needed to factor in the environmental impact of buildings throughout their lifetime. A counterexample is mandatory safety standards. Their development has been time-consuming and out-of-step with the voluntary standard-setting process, resulting in contradictory standards.

Generally, regulation takes time and may be dated before it enters into force in fast moving areas. As recommended by industry representatives, a better approach is: i) stakeholders (which may include regulators) identify areas where standards are needed, ii) voluntary standard-setting bodies work with stakeholders to find solutions, iii) the proposed solutions go through a rigorous standard-setting process and become a standard iv) the standard is embedded in domestic laws and regulations where needed. When regulations refer to the standard ID, and not a particular version of it, the regulations and trade agreements referring to it are automatically updated with the standard.

EXAMPLES OF UNILATERAL STANDARDS THAT CREATE TRADE BARRIERS

Services industry representatives noted the significant barriers faced as a result of technical standards developed in silos, divergent standards across economies, and standards lacking interoperability. The following examples from the recent past were mentioned:

- Mobile connectivity standards for 3G and 4G. Divergent standards across economies raised costs for both consumers and suppliers. This problem does not appear to exist for 5G.
- Local wi-fi standards for wireless communications were introduced but abandoned after a while because they clearly stifled innovation and competitiveness.
- Local standards for payment systems turned out to be a substantial barrier to e-commerce.
- Local encryption standards created a barrier for internet services providers and favored a particular company which was the only browser offering the local standard.
- "Sender pays" regulation on the internet/telecommunications sector violates the Open Internet Regulation and contributes to fragmentation of the internet.
- Local cybersecurity standards may put foreign platforms and cloud computing entities at a disadvantage.
- Local regulation on cloud computing in public procurement creates barriers for foreign suppliers.
- Data localization requirements, implicit or explicit, may impose significant new operational costs, and may be technically or economically infeasible to implement.

STANDARD SETTING AND SERVICES TRADE GOVERNANCE

There is ample evidence that *differences* in regulations and standards raise trade costs at least as much as the regulations themselves (Kox and Lejour 2005; Nordås 2016). To avoid such costs, the Technical Barriers to Trade (TBT) Agreement in the WTO obliges economies to adopt international standards to the extent possible. However, this agreement only applies to goods and there are no equivalent provisions for services. Free trade agreements mainly follow the same architecture where technical barriers to trade cover goods trade only (Hoekman and Mavroidis, 2015). APEC, in contrast, encourages the use of international standards in goods and services alike. In addition, recent digital economy agreements make interoperable standards, including for digital services, a main goal.

Examples of unilateral standards that restrict international trade are many. Local standards for e-payment systems, encryption, cybersecurity, and cloud computing are examples. The issue of who pays for telecommunications infrastructure can potentially lead to fragmentation of the internet.

SECTION 4: CASE STUDIES

This section presents three case studies of next generation standards: (i) the building information modeling (BIM) standard suite in the architecture, engineering, and construction (AEC) industries; (ii) technical standards in the sound recording industry; and (iii) standards for trustworthy artificial intelligence.

The AEC industry plays a critical role in the green transition and climate change mitigation (Manfren et al. 2021; Minoli et al. 2017). BIM standards have the potential to substantially reduce costs, improve quality in the industry, and facilitate trade in the sector. Conversely, a lack of standards has slowed down the adoption of information technology in the AEC industries. The case study examines how Chile has embraced standards and, at the same time, built capacity to implement and enforce them. Being a latecomer to the adoption of BIM, Chile sets an example of how to combine learning from others with local resources to catch up and become a resource for other economies in the region. It also provides some general lessons for standards versus regulation during periods of rapid technical changes.

Sound recording is an example of a service where standards are market-driven and successfully ensure a seamless flow of digital music all over the world. Nevertheless, governments play an important role in setting the rules and standards for copyright and copyright management. Some economies impose mandatory standards on copyright management, but most rely on a network of private local rights management organizations. Going forward, sound recording is at the frontier of AI adoption and AI disruption. So far, it appears that the industry has accommodated AI in a manner that keeps markets open and innovative. However, AI has raised the issue of which creations can be copyrighted and what constitutes an infringement of copyright—questions that require legislation and related standards to solve. The music industry may also be affected by data flows regulation and define a borderline between what is personal data and what falls outside of privacy regulation.

This brings us to the third case study: the work of standard-setting bodies on AI, focusing on Australia. It highlights the way local standards are anchored in international standards as well as in the OECD AI principles. AI use in commercial services is relatively new and from an innovation perspective it is on the left side of the sweet spot of standard setting. Yet, there is strong demand for regulation and guardrails, including standard setting. The case study demonstrates best practice in this field, with a focus on stakeholder participation and the contribution to and adoption of international standards.

BUILDING INFORMATION MODELING IN ARCHITECTURE, ENGINEERING AND CONSTRUCTION

The architecture, engineering, and construction (AEC) industries constitute a complex supply chain. Professionals plan and design the project, artisans work with machinery and materials on building sites, and regulators monitor compliance with building codes. The supply chain is governed by a mix of regulations and standards at each link in the chain. The nature of regulations and standards varies widely along the supply chain, including materials standards, safety standards, other process standards and qualification standards to mention but a few. Furthermore, standards and regulation may also vary within economies; for example, building codes and professional licensing may be the responsibility of states, counties, and even municipalities within economies.

Delays and budget overruns have long tormented building projects in both the public and private sectors.[31] The sheer number of standards and the diversity of problems they address make building projects extremely complex. This is precisely the type of setting where sophisticated information and communications technology (ICT) has its largest potential for improving oversight, facilitating coordination, and thereby reducing costs. Recent years have seen rapid adoption of ICT tools for building project management both for specific tasks and inputs in the building sector and for coordination of the entire building project. Among the latter, building information modeling (BIM, described in more detail below) is a tool for all stakeholders in a building project to work together from the early design to the operation of a building using state-of-the-art ICT. Simply put, BIM is a set of technical standards for the sharing of knowledge on digital platforms. If fully implemented, it has the potential to tremendously reduce delays, rework, and cost overruns.

BIM was first developed and used in private building projects. Eyeing the potential for very significant cost savings without compromising quality, governments at all levels have introduced BIM standards in public procurement in the building sector. However, the full implementation of BIMs is demanding as it requires both strong technical skills and the ability to collaborate across traditional sectoral, functional, and institutional boundaries.

Architecture, engineering, and many other occupations involved in the AEC industry are regulated to protect consumers and ensure the quality of the service (Kleiner 2000). Regulation typically involves the reservation of a pre-defined set of tasks for licensed professionals a feature that may discourage the multidisciplinary teamwork that a modern building project requires.

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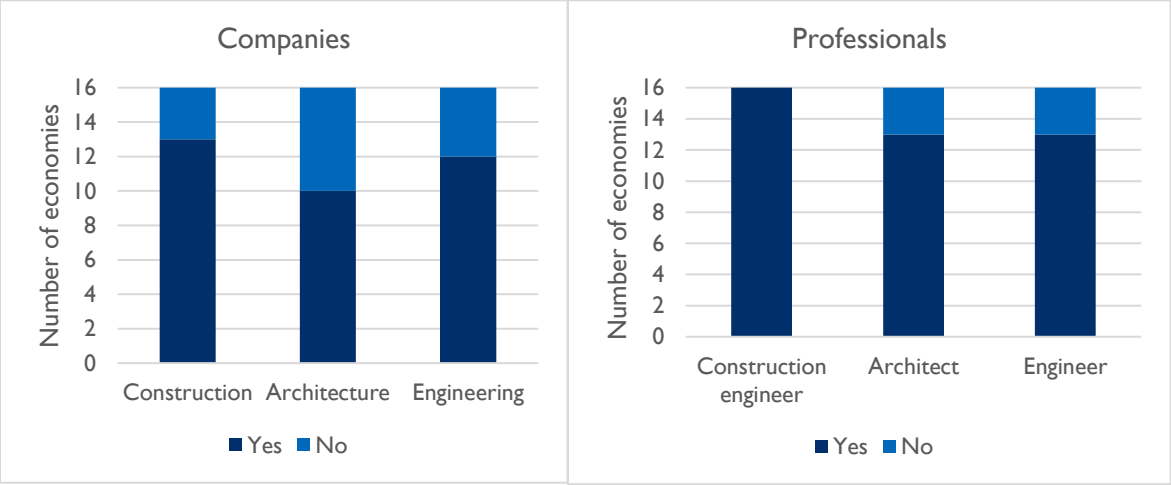
[31] Although somewhat dated, A McKinsey study from 2016 found that building projects typically take 20 percent longer than envisaged with cost overruns up to 80 percent above budget. R. Agarwal, S. Chandrasekaran, and M. Sridhar, 2016, "Imagining Construction's Digital Future," June 24, https://www.mckinsey.com/capabilities/operations/our-insights/imagining-constructions-digital-future.

Figure 5: Regulated Sectors in the AEC Industry



Source: OECD. *Services Trade Restrictiveness Index.* webpage. https://stats.oecd.org/Index.aspx?DataSetCode=STRI.

As illustrated in Figure 5, not all APEC economies require a license for architects or engineers, although the responsible engineer for a construction project needs to have a license in all APEC economies. Three APEC economies (Australia; Japan; and Russia) do not require a license for professional engineers to enter the market, while a license is not required for architects in Chile; Indonesia; and Russia. Thus, only in Russia are neither architecture nor engineering licensed.

Outside of APEC, the Nordic economies are an interesting example of economies that generally have a high level of government involvement in the economy including large public sectors and welfare states. Yet, they do not regulate the AEC professions, instead focusing on building codes, building permits, and close monitoring of building projects as a means of ensuring that buildings are safe and that consumers are protected. The Nordics are also among the leading adopters of BIM. Whether buildings projects are easier to coordinate when regulating through building standards is an interesting question for future analysis in a broader context of studying the role of standards versus regulation in services markets, both local and international.

WHAT IS BIM?

There are several definitions of BIM. The U.S. Building Information Model Standard Project defines it as follows:

> *Building Information Modeling (BIM) is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition.*
>
> *A basic premise of BIM is collaboration by different stakeholders at different phases of the life cycle of a facility to insert, extract, update or modify information in the BIM to support and reflect the roles of that stakeholder.*
>
> *The US National BIM Standard will promote the business requirements that BIM and BIM interchanges are based on:*

- *a shared digital representation,*
- *that the information contained in the model be interoperable (i.e.: allow computer to computer exchanges), and*
- *the exchange be based on open standards,*
- *the requirements for exchange must be capable of defining in contract language.*[32]

BIM allows architects to manage all the information associated with a building project and use digital simulations as part of the design process. In addition to three-dimensional images of the building, the most sophisticated BIMs (level 4 and upwards[33]) integrate the systems with real-time data from the Internet of Things (IoT) and add a timeline and a cost dimension so that changes are instantly reflected in the project time schedule and budget. When one element of the system is changed, the whole system is instantly updated using digital twins. All project participants as well as regulatory authorities can have access to the BIM system.

The information flows in a BIM are supported by software and hardware systems for delivering information from the design to the field; robotic applications for executing construction operations in the field; and software and hardware applications for gathering information from the site and delivering it to the controlling functions (Sacks et al. 2020). Open standards and platforms are available from BuildingSmart International, a not-for-profit company based in the UK.

BIM STANDARDS: WHY ARE THEY NEEDED AND HOW ARE THEY DEVELOPED?

As noted, BIM was developed to solve coordination problems and facilitate seamless information flows in building projects. Many vendors entered the market with a broad variety of software solutions and systems, resulting in a plethora of services and systems that were not interoperable. Hence, an industry-driven call for standardization, starting in the UK, ensured that BIMs could communicate with each other across projects, firms, and international borders.[34] Standardization is also a precondition for regulators to access the project information flow and monitor progress and compliance with, for example, building codes as well as health and safety standards at the building site. Finally, the environmental impact of a building project throughout its lifetime is largely determined in the early design phase. BIM facilitates the build-for-sustainability objective in a cost-effective and coherent manner also in developing economies (Berges-Alvarex et al. 2022).

BIM standards are still a work in progress. Essentially, BIM is a suite of standards for information sharing. However, the underlying information is not always standardized. Thus, technological challenges remain, such as syntactic and semantic interoperability across building codes and integrating images and text in

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[32] National BIM Standard-United States, n.d., "Frequently Asked Questions About the National BIM Standard-United States," webpage, https://www.nationalbimstandard.org/faqs.
[33]See, "What are BIM Levels?" in S. Lorek, 2022, "What is BIM (Building Information Modeling)?" online article, Trimble Construction. April 6, https://constructible.trimble.com/construction-industry/what-is-bim-building-information-modeling.
[34] BIM services are traded internationally and India is a leading exporter. See, Outsource2India, n.d., "BIM Services," webpage, https://www.outsource2india.com/engineering/bim-services/.

the models. There are also technical challenges related to integrating IoT into BIMs (Tang et al. 2019). One step in the direction of interoperability is the development of the Industry Foundation Classes (IFC), released as ISO 16739: 2018. The standard specifies a data schema and an exchange file format structure that allows project participants working with different applications to use files from other links in the supply chain as inputs, although users cannot change the files. Finally, adopting BIM standards requires system-wide changes for which stakeholder interests are not necessarily aligned.[35]

The UK BIM standard proved useful and was rapidly adopted by other economies and became an international standard (ISO 19650) in 2019. ISO describes the standard as "an international standard for managing information over the whole life cycle of a built asset using building information modelling (BIM)." It is managed by ISO committee ISO/TC 59/SC 13. Ten APEC economies are members of the ISO/TC 59/SC 13.[36] According to the committee's website, its task is:

> *[I]nternational standardization of information through the whole life cycle of buildings and infrastructure across the built environment:*
>
> - *To enable interoperability of information*
> - *To deliver a structured set of standards, specifications and reports to define, describe, exchange, monitor, record and securely handle information, semantics, and processes, with links to geospatial and other built environment information*
> - *To enable object-related digital information exchange*[37]

The APEC SCSC developed a startup guide for member economies interested in introducing BIM to enhance performance and energy efficiency in the commercial building sector in 2014.[38]

Public procurement accounts for a large part of the AEC market and the use of BIM in public procurement could potentially reduce costs and improve efficiency tremendously. To facilitate this, the Global BIM Network was established in 2021, at the UK's initiative.[39] It is a platform for information sharing and collaboration among governments and international organizations to identify best practices.

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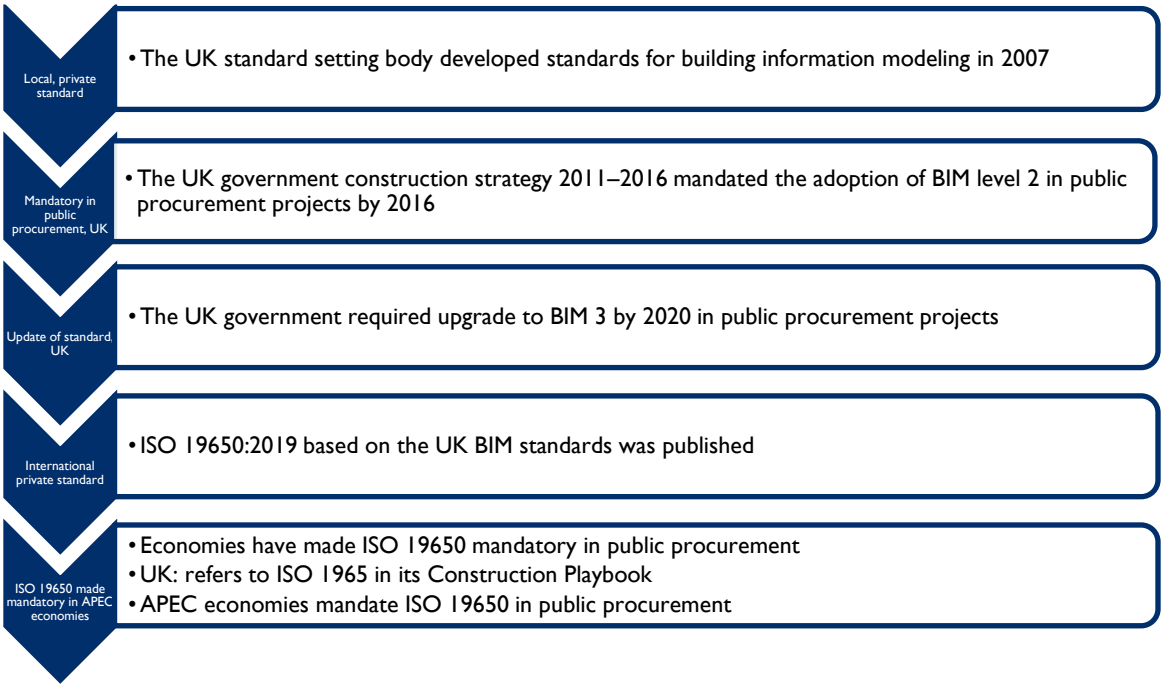
[35] Finland is one of the pioneers and most successful adopters of BIM. Nevertheless, the expected systemic evolution of the AEC industry towards integrated and aligned ecosystems has not materialized (Aksenova et al. 2019).
[36] APEC ISO/TC 59/SC 13 members are Australia; Canada; Chile; China; Japan; Korea; Peru; Russia; Singapore; and the United States.
[37] ISO. n.d. "ISO/TC 59/SC 13," webpage, https://www.iso.org/committee/49180.html.
[38] APEC SCSC, 2014, *Start-Up Guide, Building Information Modeling.* February, https://www.apec.org/publications/2014/02/startup-guide-building-information-modeling.
[39] Global BIM Network, n.d., "Global BIM Network," webpage, https://www.globalbim.org.

Figure 6: From Local to International BIM Standards



Some APEC economies, including Australia; Hong Kong, China; Korea; Malaysia; and Singapore, and some individual states within the United States have made ISO 19650 mandatory for public procurement construction projects.

CHILE

Chile is an early adopter and at the frontier of BIM adoption in Latin America. The technology started to spread among AEC industry firms in the early 2000s, with architecture taking the lead. However, two surveys in 2013 and 2016 revealed that while almost half of the respondents used BIM, most used it occasionally and very few used it as a tool for collaboration across professions and firms in building projects. The most important reasons given for this were the absence of standards that make information formats compatible for sharing, and lack of skills and implementation capacity, particularly in engineering (Loyola and Lopez 2018).

Realizing the potential benefit of the integrated use of BIM in building projects, the Chilean government in close collaboration with the AEC industry, introduced a BIM strategy, Planbim, in 2015/16. The overall objective is to improve productivity in the AEC industries by gradually adopting BIM standards in the entire industry. The specific objectives are to:

- Improve quality;
- Raise productivity;
- Save costs;
- Promote transparency and traceability of project information;
- Increase collaboration and the use of common standards;
- Ensure regulatory compliance and reduce construction permit approval times;

- Serve as a tool for stakeholder engagement;
- Improve predictability and cost control and eliminate delays.[40]

To this end, the government leverages its buying power by phasing-in a requirement to use BIM standards in public works. The BIM strategy is promoted by the Ministry of Economy and the Economic Development Agency of Chile (CORFO) while pilot projects were carried out in the Ministry of Housing and Urban Planning and in the Chilean Air Force.

The implementation of BIM and capacity building go hand-in-hand. BIM was integrated in the architecture curriculum at universities up-front and the architects' association promoted its use. Between 2016 and 2021 the share of universities teaching BIM in their architecture and engineering courses increased from 53 percent to 84 percent, while in vocational schools the share increased from 15 percent to 80 percent for relevant trades during the same period.[41] To coordinate and monitor the implementation of BIM, Planbim was established. It is both a plan and a team which is working on the implementation of the plan. Planbim organizes training courses for government officials, as well as e-leaning courses provided for free to the private sector. Planbim has also published *BIM Standards for Public Projects* together with the construction industry.[42] It is based on international standards and protocols with explanations and guidelines for local users. This book has become essential for the AEC industry and has been translated into Portuguese and English and used by governments in other Latin American economies as well. The institutional framework also includes the Chilean BIM forum, a platform for knowledge sharing coordinated by the construction industry.

Chile is a member of the BIM Global Network, which aims to promote public sector leadership to collaborate with industry on digitalization of the built environment. It also reflects a strong commitment to align Chilean standards to international standards. Indeed, international collaboration has been part and parcel of the strategy from the start when the government entered a memorandum of understanding (MoU) with the UK as a partner in developing the strategy in 2017. Chile also participates in the Latin American Governments BIM network together with Argentina; Brazil; Colombia; Costa Rica; Mexico; Peru; and Uruguay.[43]

Going forward, the government plans to use its regulatory power to promote the use of BIM in private projects through the building permit application process.[44] A complicating factor in this work is that building permits are awarded by local municipalities which may have different procedures and requirements.

The Planbim website includes a tool for self-assessment of BIM maturity, featuring five levels ranging from basic (having implemented 25 percent of the listed applications) to BIM being fully integrated in the

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[40] Planbim, n.d., "General Objective of Planbim: Increase the Productivity and Sustainability of the Construction Industry," webpage, https://planbim.cl/que-es-planbim/objetivos-y-metas/.
[41] Source: Consultation with Planbim, July 11, 2023.
[42] Planbim, n.d., "BIM Standard for Public Projects," webpage, https://planbim.cl/documentos/estandar-bim-para-proyectos-publicos/.
[43] BIM Network of Latin American Governments, n.d., 'What is the Latam BIM Network?" webpage, https://redbimgoblatam.com/en/us/.
[44] See presentation by Planbim Executive Director Carolina Soto at the Construction IT alliance in Dublin, September 19, 2023, https://www.youtube.com/watch?v=Usy6M1n_630.

organization. The latest information suggests that both the public and academic sectors are at level 1, while the average for the private sector is marginally into level 2 (27 percent). Despite considerable efforts to introduce BIM through training and a path to mandating BIM standards in public procurement, there is a lot of ground to cover before the objectives are achieved. Three obstacles to its uptake have been identified. First, resistance to change. Second, BIM requires substantial, up-front investment along the supply chains. The benefits materialize when a critical mass implements it. It has proved difficult to reach that critical mass. Third, lack of interoperable standards for some of the underlying information to be shared still limits the use of BIM for information sharing and project coordination.

The Chilean BIM case study is an example of government taking a leading role in the local adoption of international voluntary standards, contributing to adoption capacity while gradually integrating the standards in local regulation to make them mandatory once the adoption capacity is in place.

TAKEAWAYS

- The AEC industry plays a key role in the green transition. The sector is complex, suffers from delays and cost overruns, and is subject to a broad range of standards that are often not interoperable.
- There is a huge potential for the AEC industry to benefit from recent developments in ICT and AI for project coordination and information sharing.
- There are network effects in the adoption of standards in the AEC industry—which makes coordination failure an obstacle to their adoption. As a major customer of the industry through public procurement and as a regulator, governments can play a key role in fostering the adoption of BIM standards.
- The realization of the potential gains requires interoperable standards across sectors and along the AEC supply chain. Breaking down silos between regulated professions could help address coordination failure.
- Additional lessons from the Chilean case study include the following:
    - International collaboration and learning from economies that are more advanced in the implementation of BIM is essential for a latecomer.
    - Nevertheless, standards and processes in other economies need to be adjusted to local conditions.
    - The full implementation of the suite of BIM standards is a tall order and requires skills and ICT investments on the part of the users.
    - Therefore, investment in human capital and capacity building, in parallel with the gradual introduction of mandatory standards, is essential for success.
    - A gradual implementation of BIM is faster when starting with the nodes in the AEC supply chain and projects that involve major suppliers, such as the building of hospitals or airports.
    - Consistent support from the authorities is essential for keeping up the momentum for the implementation of BIM in the AEC industry.

SOUND RECORDING

Sound recording is essentially about fixating music to a medium and creating a market for the right to listen to music. Thus, the value of recorded music has always been the music, not the vinyl or the CD on which it was printed. Nevertheless, before the digital revolution, buying the right to listen to music

involved buying a physical product. The price of that product included royalty payments to the rights holders and copyright enforcement was embedded in the business model of the industry.

The international standard and legislation that underpins the recorded music industry is first and foremost the Berne Convention for the Protection of Literary and Artistic Works. Based on this, the WIPO Copyright Treaty and WIPO Performances and Phonograms Treaty deal with copyright in the digital environment. In our classification of standards, these fall into the categories of principles and objectives that governments incorporate into local laws and regulations, while the practical implementation and enforcement of the copyright is typically left to be fleshed out by private standard-setting bodies.

Recorded music is arguably the most global of all services industries. Yet, as part of the broader audiovisual services sector, it is among the least committed in international trade agreements. Only 16, (of which eight are APEC economies) out of 164 WTO members have included the sector in their GATS schedules.

Recorded music is not only the most global among services industries. It is also the industry that has been the most disrupted by technological changes. As described by Singer and Rosenblatt (2023) the ICT revolution is the ninth (and the AI revolution the tenth) technological disruption to face the industry within roughly the last century. Over just a couple of decades, recorded music has changed from being fixated onto physical goods in the form of vinyl and CDs, which are defined as goods in the WTO trade agreements, to music-as-a-service with traits common to, for example, software-as-a-service. The industry has always found ways to adapt, and it appears that the major record labels have managed to reinvent themselves during each disruption since they gained prominence in the industry. The dominant business model for recorded music nowadays is streaming, which makes music a non-rival product. With the decoupling of buying the right to listen to music and the purchase of a medium to which it is fixed comes new challenges for enforcing copyright regulations.

THE DIGITAL TRANSFORMATION OF SOUND RECORDING AND THE MARKET FOR RECORDED MUSIC

The recorded music industry essentially consists of a large number of artists, recording studios, and individual consumers. Between the end points of the supply chain are aggregators and distributors that play important roles in creating a market and matching artists with an audience. The digital transition was expected to lead to disintermediation. However, like in many other industries, this has not happened. To the contrary, the market for recorded music is global and heavily concentrated. Three major record labels (Universal Music Group, Sony Music Group and Warner Music Group) constitute an oligopoly with a combined global market share of 83.5 percent in 2022.[45] At the consumer-facing end, streaming services have taken center stage. Like the labels, they are global and highly concentrated, with the four largest (Spotify, Apple Music, Tencent Music, and Amazon) accounting for about 70 percent of the global number of subscribers.[46]

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[45] Source: D. Rys, 2023, "Record Label Market Share Q4 2022: Republic's 'Midnights' Outpaces a Surging Sony," Billboard, January 11, https://www.billboard.com/pro/record-label-market-share-q4-2022-republic-surges-sony-big-year/ .

[46] Source: Statista, n.d., "Music Streaming Worldwide – Statistics and Facts," webpage, https://www.statista.com/topics/6408/music-streaming/#topicOverview.

The music industry has in many ways succeeded in creating a seamless global market where consumers all over the world can access a hundred million songs on their smartphones at affordable rates. The streaming services' catalogues include music from all over the world, the barrier to entering the streaming services for artists is low, and even lower on YouTube, which constitutes a competitive fringe for new artists and for exploring music. In addition, TikTok has become an important teaser for artists to attract consumers to listen to their songs on streaming services (Stokel-Walker 2021).

NEXT GENERATION TECHNICAL STANDARDS

The unsung facilitator of a seamless global recorded music market is international standards. What are these standards and how have they been developed and kept up to date – and by whom? First, there are technical standards related to how to mix music so that it sounds like it was intended to on the streaming platforms. Running behind the transformation of human voices and the sound of musical instruments to zeros and ones in digital formats and back to human voices and musical instruments is a suite of technical products and process standards. The next generation technical standards revolve around the adoption of AI in the industry.

Music is an early adopter of AI, dating back at least as far as the 1970s when it was used to support music creation. Technical standards were important right from the start. An early example is the Musical Instrument Digital Interface (MIDI). Developed by a consortium of synthesizer manufacturers in 1983, it ensures that electronic instruments and computers can talk to each other. MIDI is a communication protocol, a digital interface, and electrical connectors for playing, editing, and recording music. It is also the acronym for the standard-setting body managing it in collaboration with ISO/IEC JTC 1/SC29.

The recorded music industry is not only heavily concentrated on the aggregation and distribution side of the market. Rights holders have also joined forces in rights management organizations or collection societies. They negotiate royalties and terms and conditions with labels and sometimes directly with streaming services and other media. They also collect royalties on behalf of members, distribute the royalties, and enter agreements with sister organizations abroad for collection and distribution of royalties accrued in other economies.

Such complex management systems rely strongly on standards for identifying and tracking copyrighted material, of which the International Standard Recording Code (ISRC) is the most important. It uniquely identifies each recording and follows the recording in all its uses. The ISRC is the basic standard for identification adopted globally in ISO 3901. In addition, there are specific standards for identifying musical compositions (International Standard Musical Work Code (ISWC)) and a standard for digital products (Global Release Identifier (GRid)). GRid differs from ISRC in that it identifies a bundle of items such as audio, video, images, and text that constitute a release. Finally, Digital Data Exchange (DDEX) is a recent standard-setting body (established in 2006) for setting standards for how metadata is consistently communicated along the entire value chain of digital music.

TABLE 2: THE USE OF AI AND RELATED STANDARDS IN THE MUSIC INDUSTRY		
AGENT	AI USE	STANDARDS
Artists	Support music creation Support recording Support rights management	Musical Instrument Digital Interface (MIDI) The International Standard Recording Code (ISRC) ISO standard 3901 Global Release Identifier (GRid)
Labels	Identify recorded music	The International Standard Recording Code (ISRC) ISO standard 3901 Global Release Identifier (GRid)
Streaming services	Recommendations Tracking	Loudness Units Full Scale (LUFS) Digital Data Exchange (DDEX, digital value chain standards for the music industry)
Rights management	Identify and track music	World Intellectual Property Organization Good practice toolkit for Collective Management Organizations (CMOs)
Consumers	Create and share playlists	Parent advisory labels (PAL) Loudness Units Full Scale (LUFS)
Regulators		Is AI-generated music copyrightable? Is use of music for training AI an infringement of copyright?

Consumers probably unknowingly benefit immensely from the Loudness Units Full Scale (LUFS) which ensures that all songs are streamed at the same volume (rather than blasting some songs into the ears while others are hardly audible). Parents benefit from parent advisory labels that have been developed based on standards and algorithms implementing them.

VOLUNTARY VERSUS MANDATORY STANDARDS

The standards described above are voluntary, integrating the high-level mandatory principles of copyright into the way the music business is organized. Going forward, the music industry is entering unchartered territory with the proliferation of AI at all levels and links in the supply chain.

AI is used for supporting the creation of music, which raises the question about standards for what is copyrightable and what is not. APEC economies differ on this question. Hong Kong, China and New Zealand are open to awarding copyright to computer-generated work which could cover AI-generated work when applicable, while the other economies are not. Most would agree that AI-*assisted* work is copyrightable. In cases where AI-created music is not copyrightable, standards are needed to draw the line between AI-created and AI-supported music creation.

Another issue that arises from the use of AI in the creation of music is to what extent using copyrighted music in the training of AI is a copyright infringement. This question is being tested in courts of law. Since copyright infringement brings heavy fines, legal clarity on this question would substantially reduce uncertainty for the recorded music industry. These are areas where governments need to step in to pin down the principles and goals so that the private standard-setting bodies have a legal framework to

work within. It would also be of utmost importance that international principles are developed in this field.

AI is also used for curating and sharing playlists, which involves the collection of users' streaming behavior such as preferences for songs and genres and variance in such preferences over time and space. The adoption of such technology exposes the recorded music industry to privacy regulation.

These questions have come to the forefront in the music industry but are highly relevant for other content providers and digital products as well.

TAKEAWAYS

- The music industry has developed a set of private international standards that underpin a seamless global streaming service.
- Based on high-level regulation and principles, the music industry has developed private standards that by and large ensure that copyright is enforced and that royalties are paid across platforms and borders.
- Next-generation high-level regulation and principles on copyright and copyright enforcement are needed to guide the music industry's adoption of AI at all links in the supply chain.
- The music industry is at the frontier of AI adoption in digital content-producing services sectors. There are lessons from the experience of the music industry for other sectors, including the broader audiovisual services sector, design, architecture, software, and engineering.

ARTIFICIAL INTELLIGENCE WITH EXAMPLE FROM AUSTRALIA

AI applications have taken the public debate by storm, triggering awe and high expectations of the benefits as well as fear of potential disasters that unfettered AI could instigate. It is worth keeping in mind that AI has gone through several cycles of optimism and euphoria, followed by disappointment and so-called AI winters. We are currently experiencing a period of optimism and euphoria when considering the potential for having a tool at hand that can help humanity cope with pressing problems such as the climate crisis, the demographic transition, and poverty. At the same time, the rapid proliferation of AI raises concerns about downsides including biases, a jobless future, and loss of human agency.[47] In the last couple of years, such concerns have become louder, calling for regulators to step in and minimize the risks (Tirole 2021; Smuha, 2020). AI can be particularly disruptive for information and knowledge intensive services sectors (Susskind and Susskind 2015), making them both susceptible to automation and exposed to international trade (Baldwin and Forslid 2023).

Standards play an important role in the development of trustworthy AI. For instance, point 2.5 in the OECD AI principles states that "Governments should promote the development of multi-stakeholder, consensus-driven global technical standards for interoperable and trustworthy AI."[48] However, AI technologies are evolving rapidly, and effective regulatory tools such as measurable benchmarks are yet

[47] The narrative of a rapidly proliferating AI entering all facets of our lives seems somewhat at odds with data on the uptake of AI in firms. Surveys from the United States as well as the European Union suggest that 10–20 percent of firms, mainly the large ones in ICT, finance, and high-skill business services, use AI.
[48] OECD Council on Artificial Intelligence, 2019, "Recommendation of the Council on Artificial Intelligence," OECD.AI Policy Observatory, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449.

to be developed. In such a situation, standards in the form of guidelines and high-level objectives are useful compasses staking out the direction of innovation and drawing the red lines for safety and security. The OECD AI principles is an example of this.[49] Information gathering for better policy making is also taking place in various APEC Committees. Examples include the recent reports *Best Practices to Detect and Avoid Harmful Biases in Artificial Intelligence Systems*[50] and *Artificial Intelligence in Economic Policy Making*.[51]

Work in the ISO on AI standards is in an exploratory phase. The standards documents published so far are largely descriptive. Examples are a collection of use cases (ISO/IEC 24027), concepts and definitions (ISO/IEC 22989), and topics related to trustworthiness in AI systems (ISO/IEC 24028). In addition, work is underway in a host of specific technology areas and horizontal topics such as transparency taxonomy in AI systems, environmental sustainability in AI systems, AI systems impact assessment, functional safety, and benchmarking of AI system quality characteristics.

AUSTRALIAN STANDARDS[52]

The Australian government's high-level principles and goals for AI is set forth in the AI Action Plan.[53] It focuses on the opportunities that AI will bring for inclusive growth and spells out strategies for seizing on the opportunities while avoiding possible adverse effects. Standards are mentioned under the focus area on "Making Australia a Global Leader in Responsible and Inclusive AI." Standards play a role in the action plan first and foremost for governance of public sector data and for contributing to setting international standards.

In addition to the action plan, Australia has developed the AI Ethics Framework,[54] and an artificial intelligence standards roadmap.[55] The AI Ethics Framework commits Australia to the OECD AI Principles. It also states the decision to become a founding member of the Global Partnership for Artificial Intelligence (GPAI). These documents firmly align Australia's AI standards with international standards.

Standards Australia is responsible for the AI standards roadmap. It is a private body that develops voluntary standards, represents Australia in the ISO governance committees, and has an MoU with the

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[49] OECD.AI Policy Observatory, n.d., "OECD AI Principles Overview," webpage, https://oecd.ai/en/ai-principles.
[50] APEC Digital Economy Steering Group (DESG), 2023, *Best Practices to Detect and Avoid Harmful Biases in Artificial Intelligence Systems*, September, https://www.apec.org/publications/2023/09/best-practices-to-detect-and-avoid-harmful-biases-in-artificial-intelligence-systems.
[51] APEC Policy Support Unit, 2022, *Artificial Intelligence in Economic Policymaking*, November, https://www.apec.org/publications/2022/11/artificial-intelligence-in-economic-policymaking.
[52] The case study builds largely on a consultation with Standards Australia and information from Standards Australia's report entitled *An Artificial Intelligence Standards Roadmap: Making Australia's Voice Heard* (Standards Australia, 2020, https://www.standards.org.au/documents/r-1515-an-artificial-intelligence-standards-roadmap-soft).
[53] Australian Government Department of Industry, Science, Energy and Resources, 2021, *Australia's AI Action Plan*, June, https://wp.oecd.ai/app/uploads/2021/12/Australia_AI_Action_Plan_2021.pdf.
[54] Australian Government Department of Industry, Science, Energy and Resources, 2019, "Australia's Artificial Intelligence Ethics Framework," webpage, November 7, https://www.industry.gov.au/publications/australias-artificial-intelligence-ethics-framework.
[55] Standards Australia, 2020, *Final Report: An Artificial Intelligence Standards Roadmap: Making Australia's Voice Heard*, May, https://www.standards.org.au/documents/r-1515-an-artificial-intelligence-standards-roadmap-soft.

Australian government. Australia contributes to international standard setting by forming mirror committees to ISO committees in priority areas for Australia. They prepare Australia's position in the ISO committees and governance bodies. Standards are reviewed every five years. Those that are found to be outdated are removed.

The AI standards roadmap further underscores the importance of international standard setting in the AI space. The strategy is to engage in and influence the international standard-setting process, notably in the ISO Artificial Intelligence Joint Technical Committee (ISO/IEC JTC 1/SC 42). Australia has established a mirror committee (IT-043) to the ISO/IEC JTC 1/SC 42, which follows and engages actively in ISO's work in the AI field. It includes representatives from technology companies, consumer groups, legal practitioners, management consultants, medical regulators, academia, government departments and industry bodies. However, the roadmap recommends a broader representation, including services sectors that can potentially benefit the most from AI. Among these are finance, health, and transport, which are encouraged to participate.

The Standards Roadmap argues that the best way to adopt the OECD AI principle to "promote the development of multi-stakeholder, consensus-driven global technical standards for interoperable and trustworthy AI" is through work in the ISO and IEC. In addition, the IEEE's work on algorithmic bias, privacy, and fail-safe design of autonomous and semi-autonomous systems is a priority. Collaboration with economies at the AI frontline, particularly the United States is also recommended.

Standards Australia takes part in the National AI Centre's Responsible AI Network, which brings together all local stakeholders.[56] It aims at supporting responsible AI adoption and getting business ready for AI. It also brings the end user into the process earlier than previous standard-setting processes, facilitating a timely, flexible, and inclusive standard-setting process.

[56] CSIRO (Commonwealth Science and Industrial Research Organisation), n.d., "National AI Centre's Responsible AI Network," webpage, https://www.csiro.au/en/work-with-us/industries/technology/national-ai-centre/responsible-ai-network.

Figure 7: Australia's Responsible AI Network

Note: The Responsible AI Network is coordinated by CSIRO (Commonwealth Science and Industrial Research Organisation), Australia's domestic science agency. AIIA = Australian Information Industry Association; CEDA = Committee for Economic Development of Australia.

The most pressing areas for next generation standard setting are set forth in the *Iconic Nation Report*.[57] The priority areas are critical emerging technologies (CET) and include privacy and security in 5G mobile technology, responsible AI, quantum computing, and the Internet of Things (IoT). Standards Australia is working with an active academic community. Expert advisory groups have been established for 5G connectivity standards and smart cities. Australia has ambitions to play a leading role in the development of international standards for quantum computing.

AI is thus part and parcel of the broader digital society as envisaged in the Australian Data Strategy. Laws and regulations are being reviewed to ensure they are fit-for-purpose, supporting the sustainable and inclusive adoption of AI. The Privacy Act and the sharing of public sector data under the Data Availability and Transparency Bill are among the regulations being reviewed.

Australia has taken a remarkably open and optimistic approach to AI standards. The focus is on opportunities and the inclusive growth potential. An envisaged path to prosperity is through aligning with international standards. Furthermore, the strategy demonstrates ambitions to shape international standards.

[57] Standards Australia, 2022, *Iconic Nation Report*, https://www.standards.org.au/documents/j-1870-the-standards-australia-iconic-nation-report .

TAKEAWAYS

- AI is not new, but the speed at which it has been applied in services consumed on a daily basis has raised concerns and demand for regulation.
- The development of AI requires huge amounts of data, and the leading developers are the large technology firms. AI governance therefore requires international cooperation.
- Best practice AI regulation and standards are yet to be developed.
- At this point, high-level principles and guidelines developed through international collaboration among governments as well as voluntary standard-setting bodies, combined with local AI plans and experience gathering, is the best way forward.
- The Australia case study demonstrates how an inclusive local AI strategy can be combined with engagement in shaping the international standard-setting process, as well as aligning local guidelines and principles with international ones.

SUMMARIZING THE THREE CASE STUDIES

The three case studies illustrate the bottom-up and the policy-driven top-down processes of standards development nicely. Technical standards in the music industry that ensure that digital music can be seamlessly streamed across borders and platforms follow the consensus-building private standards process. Technical standards related to the management of copyright, however, come from international treaties and conventions, which, in turn, are incorporated in local legislation. Within this legal framework, the music industry has developed standards that define the practical steps to register and monitor the use of copyrighted material as well as the collection and distribution of royalties.

The AI regulation in Australia follows a similar pattern, adopting and streamlining international standards into the local regulatory framework. The current wave of AI applications is evolving rapidly, and the technology has not reached a maturity level where the best way of doing things has been established and agreed upon. Therefore, standards come in the form of principles and guidelines within which private standard-setting bodies as well as large enterprises experiment with designing ecosystems of interoperable applications. For instance, Microsoft, Google, OpenAI, and Anthropic have established the Frontier Model Forum, which aims to identify best practices in ensuring safe and responsible development of AI models.[58] The Forum is open to other companies that share the same goals.

The BIM standard aims to solve a coordination problem in the AEC industry. Successful implementation promises huge cost savings in public and private building projects alike. Governments have therefore used their buying power as well as regulation to promote the standard, with mixed results. The case study suggests that the integration of the BIM standards in the education of AEC professionals and artisans, training, and capacity building are essential for the BIM standards to reach their potential for environmentally sustainable and cost-effective built environments. International standards for interoperability across text, images, and other formats are being developed and will facilitate further adoption of BIM as well as lowering the barriers to trade in the AEC sectors.

[58] OpenAI, 2023, "Frontier Model Forum," blog, July 26, https://openai.com/blog/frontier-model-forum.

SECTION 5: POLICY DISCUSSON AND RECOMMENDATIONS

The APEC Information Notes on Good Practice for Technical Regulation reiterates the WTO Technical Barriers to Trade (TBT) Agreement provision that technical regulation shall not be more trade restrictive than necessary to fulfill a legitimate objective.[59] It also calls for alignment with international standards where relevant and recommends that government intervention should be a last resort where market solutions do not suffice to reach legitimate objectives. While the TBT Agreement applies to goods only, the APEC information note at least does not explicitly exclude services.

This study documents that standards are increasingly important for international services markets to reach their full potential. Indeed, lack of standards keeps services markets fragmented even when digital transformation has made electronic networks the main channel for delivery, and such networks until recently did not know any borders. Contrasting the music industry and the AEC industry illustrates both the potential and the obstacles to making digital services interoperable both within and across borders. In both industries, standards are driven both from a top-down and a bottom-up perspective. However, where the music industry has managed to sustain interoperability from the artist to the final consumer, by and large in compliance with copyright regulation, the AEC industry remains fragmented even within economies.

In the music industry, the major labels have played the coordinating role in bringing the links in the supply chain together into a seamless customer experience globally. The BIM technology could play a similar role in coordinating the suppliers, regulators, and clients in AEC industry. Admittedly, building projects and operations are much more complex than recorded music, but with the rapid development and adoption of AI, the technology for adopting BIM effectively should be in place. On the face of it, BIM aims to achieve what the DDEX standards do for the music industry: namely, improve efficiency and aid the automated exchange of information along the digital music value chain. Thus, a better understanding of the drivers behind the development and adoption of the private DDEX and BIM standards, what the obstacles are and how they have been overcome could inform the role that the government plays in fostering the standardization of information flows in the AEC industry. Finally, the IFC standards for file sharing in the AEC industry is conceptually similar to the MIDI standards in the music industry.

Mandatory standards in new areas such as privacy in the provision of digital and AI-enabled services reveal a trade-off between leaving space for innovation on the one hand and regulatory certainty and predictability on the other. For instance, if the fines for non-compliance are substantial while there are grey areas where compliance cannot be ascertained ex ante, firms may find it better to over-comply to be on the safe side, while SMEs may find compliance too risky and costly and thus hesitate to enter or continue business in the market altogether.

RECOMMENDED PRIORITY AREAS FOR THE APEC GROUP ON SERVICES:

- The APEC services index contains measures on deviation of local standards from international standards for most, but not all, services. Next generation services standards have not been fully considered in this work. An update, in collaboration with the OECD, could further improve its

[59] APEC, 2000, *Information Notes on Good Practice for Technical Regulation.* https://www.apec.org/docs/default-source/groups/scsc/2023/00_scsc3_017-info-notes-on-good-regulatory-practice-(final)_.pdf?sfvrsn=4e722321_2.

usefulness in monitoring the implementation of the Joint Initiative on Services Domestic Regulation as well as analytical work on next generation services standards.

- Previous APEC work underscores the complementarity between private and mandatory standards. The IEEE GEPS project is an interesting example of public-private collaboration on e.g., next generation services standards. A GOS - SCSC study of the IEEE GEPS project could provide valuable insights for future policy design in this space.
- Next generation services standards could play a role in reducing transaction costs as the digital transformation blurs the boundaries between sectors and professions. The AEC industry is an understudied example of the potential as well as the obstacles to productivity growth and cost savings through better coordination of projects. A comparative study across selected APEC economies, and possibly beyond, on the interaction between standards and regulation would bring new insights that could help design policy for a cost-effective green transition within and across economies.
- Policy recommendations for APEC members.
    - Consider including TBT provisions in the services trade rule book at all levels.
    - Mandatory standards should, where possible, take the form of high-level principles and goals. Where regulatory uncertainty ensues, check lists and guidance should be considered as a complement to the standard.

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