# Voluntary Standard Setting: Drivers and Consequences

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This essay is about the drivers and consequences of changes in the voluntary consensus standard-setting (VCSS) system, the part of the contemporary global governance system that most of us encounter the most frequently, but that we rarely even notice. The VCSS system is made up of thousands of "technical committees" in which hundreds of thousands of experts (most of them engineers) create standards that constantly affect our lives—from the unique number that identifies this journal, to the electronic codes that translated my keystrokes into the words you are reading at the moment, to the rules governing the supply chain for the "fair trade" coffee you may have in a mug by your side. Historian Mark Mazower calls the International Organization for Standardization (ISO), the organization that stands at the apex of the largest network of groups that sponsor these technical committees, "perhaps *the* most influential private organization in the contemporary world, with a vast and largely invisible influence over most aspects of how we live, from the shape of our household appliances to the colors and smells that surround us."[1]

There are a few other powerful VCSS bodies in addition to the ISO, among which are the OpenStand alliance of private bodies that help govern the Internet[2] and the ISEAL alliance of organizations that set and monitor standards for socially responsible products.[3] In addition, there is an ever-changing ecology of hundreds of often short-lived "consortia" in which small groups of companies create voluntary technical standards that temporarily guide development in rapidly changing fields, especially information technology.[4] All of these bodies form technical committees to create specific standards. Except in the case of the consortia, these committees always include representatives of companies that produce the product in question, representatives of the companies or organizations that are

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the major purchasers of the product, and experts that the sponsoring organization chooses to represent the general interest—often engineers who teach at universities. The goal of every committee is to reach consensus on standards that will be published and made available for any company or other organization to adopt voluntarily. While the consortia are less concerned with the balanced representation of all stakeholders, the ISO, OpenStand, and ISEAL networks are committed to establishing voluntary standards through the consensus of expert representatives of *all* relevant stakeholders—that is, everyone who will be affected by the proposed standard.

While the standards created in this way are designed to be taken up voluntarily, many of the nonconsortium standards quickly become all-but-authoritative because they are convenient for all governments to adopt when contracting for private goods and services, and because firms often adopt the standards preferred by their largest customer. Moreover, many democratic governments tend to see the balanced voluntary consensus process as a legitimate way to set standards, perhaps just as legitimate as the democratic legislative process itself. Finally, the General Agreement on Tariffs and Trade (GATT) and its successor, the World Trade Organization (WTO), have considered international VCSS standards that were set by all stakeholders as neither barriers to trade nor something that confers an unfair advantage on those who adopt them. This WTO status further encourages firms and governments to use such standards in place of standards developed through any other process.[5]

For more than a century, the legitimacy and effectiveness of the ISO, OpenStand, and ISEAL form of VCSS has led some politicians and theorists to see the process as a possible supplement or replacement for the traditional intergovernmental processes of global governance.[6] Recently, this view was championed by a World Bank vice president, Jean-François Rischard, in a 2002 book with the alarming title of *High Noon: Twenty Global Problems, Twenty Years to Solve Them*.[7] Later, after the global financial crisis, the World Economic Forum's "Global Redesign Initiative" was also filled with proposals for world government through voluntary standards created by expert representatives of various stakeholders.[8]

As we will see in a later section, such advocates may overstate the promise of VCSS. But first it is worthwhile to consider why this process is so highly regarded. It has had a major impact on the world and it is likely to continue to do so. Industrial standardization has led to the more rapid development of industrial



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economies than would have been possible if the world had had to rely on markets and governments alone. Even more significantly, VCSS has played an important role in building global markets. Moreover, the men and women involved in voluntary standard setting have often had higher ambitions, expecting the VCSS process not only to strengthen industrial capitalism but also to solve many of its attendant problems: inequality, economic crises, and even war between rival industrial powers.

## Drivers: The Demand for Standards

Industrial economies need standards. In any economy, fundamental standards—units of measurement, measurement tools, and means for assessing their accuracy—are essential for processing and selling bulk commodities. As products become more complex, it becomes essential to ensure compatibility across manufacturers and markets. Lamps produced by one factory need to fit sockets made by another. Locomotives need to fit on the tracks that link one railway (or one country) to the next. As machinery, factories, offices, residences, and industrial systems become more powerful and more complex, the possibility of devastating accidents increases, as does the need for safety standards. And as companies, consumers, and guardians of the natural environment become more concerned with avoiding unfruitful competition and eliminating tawdriness and waste, so does the demand for process standards—quality management standards, environmental standards, and even broader standards for social responsibility.

In the nineteenth century engineers in all industrializing countries began to respond to these demands both by offering the assistance of engineering societies to governments and companies concerned with setting particular standards, and by developing the VCSS process that could be applied to any field. The engineers first created key technical committees representing particular stakeholders (initially, companies producing the thing that was to be standardized, their major purchasers, and a few engineers assigned to represent the common or general interest). Next, the engineers created organizations—called "standard-setting bodies"—whose job it was to establish such committees when they were needed. From the beginning, engineers established these bodies at both the national and international level. The oldest surviving international body, the International Electrotechnical Commission, was set up in 1906. Like most early international bodies, it focused on a specific field. The oldest national body, the Engineering



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Standards Committee of Great Britain (now called BSI Group), began its work in 1901 and was concerned with national or imperial standards in all fields.

By the time of the Great Depression, national bodies had been established in all major industrialized countries. Most of them, in turn, belonged to the International Federation of the National Standardizing Associations, founded between 1926 and 1928. The Depression and World War II stopped the momentum of global standard setting. In the war's aftermath, the ISO, a universal organization, was established in 1947.[9] Working in cooperation with the United Nations' technical assistance programs, ISO began encouraging engineers in developing countries and newly independent states to establish their own national bodies, a process that continues today.[10] Around 1990 a new generation of standard-setting bodies started to emerge, including the first multi-stakeholder sustainability standard setters, the early Internet governance bodies, and many company-based consortia.[11]

Why did those who wanted industrial standards turn to technical committees formed by associations of engineers? After all, most of the demand for standards comes from businesspeople—who are said to prefer the laissez-faire approach of letting the market decide. But industrial standard setting is an exception to this rule. As most businesspeople know, if industrial standards are set by the market, the process can be astonishingly slow and wasteful. For example, businesses occasionally decide to compete over differing proprietary standards, each hoping that it will eventually have a monopoly. This is what Sony and JVC (part of Panasonic) did in the 1970s with videotape: Sony's Betamax produced superior recordings, but the tapes were shorter than those of the JVC's VHS format, which were long enough to record whole movies. It took two decades for the European and North American markets to settle on the VHS format as the standard, though Betamax continued to have followers in Japan until the early 2000s, when videodiscs eclipsed both technologies. In the meantime, many consumers were inconvenienced; some felt cheated having purchased a now near-useless Betamax; and many libraries and schools, and certainly many businesses, were forced to make redundant investments in both technologies.[12]

Unfortunately, the alternative of having standards set by governments, especially by governments in democratic societies, can be equally frustrating. Not only do most legislators lack the expertise to set standards but in most well-established fields lawmakers are loath to choose among competing standards due to the potential ire of constituents who have made investments in a standard that becomes obsolete. That is why, more than a century after the ratification of the U.S. Constitution,



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which requires Congress to set standards, there were still twenty-five different fundamental units of length in use throughout the country.[13] Similarly, it took until the 1930s for the United States and the United Kingdom to agree on a single value for the inch, and even then the agreement was achieved not by the governments in question, but by businessmen and private engineers on a technical committee of the International Federation of the National Standardizing Associations.[14]

## Why Aren't All Standards Voluntary Consensus Standards?

Nevertheless, at times governments do set technical standards that could have been set by technical committees within the VCSS system. This is especially true when governments are interested in providing protected markets to national champions of the new technology, as was the case with the recurrent struggles to establish global standards for television.[15] This is only one of the reasons that those who want to extend VCSS to many more areas of global governance can seem naively optimistic. There is a great deal of politics in standard setting; and while the VCSS system can resolve many conflicts, many others remain.

Governments not only intervene in standard setting to support their own industries, they also often encourage their national standard-setting bodies to "open up" markets in less industrialized countries to their own industries (and "close" them to other countries). For example, in the 1920s the American, British, and German national standard-setting bodies all received their governments' support to promote their own national standards throughout Latin America. This caused great bitterness among the leading standard-setters in the three countries, men who had long been collaborators and friends.[16] Nevertheless, from the point of view of Latin American engineers, this competition was a boon because it encouraged the formation of their own national standards bodies to choose among the different foreign standards, or to develop more locally appropriate alternatives.[17]

A related kind of competition continues today when WTO rules mean that most new standards must be "international." Even so, most standards still originate in a single industrialized country or in Europe's regional standardization body; for example, an ISO committee may turn a British standard into an international one, as was done with the ubiquitous ISO 9000 quality management standard. In fact, national or regional standard setting bodies are often in an informal competition to set international standards, and some may be consistently more



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effective at that than others. Political scientists Tim Büthe and Walter Mattli demonstrate that Europe's coherently nested private standard-setting system more effectively aggregates the preferences of the different business users of standards than does the less coherent system of competing private standard-setting bodies that has grown up in the United States.[18] If these differences continue, and if similar patterns exist across other major national standard-setting bodies (for example, those of China, Japan, or Brazil), continuing international conflicts over the origin of global standards are likely.

At the same time, there will be transnational conflict among firms that hope that their own products will set the standards in important fields. That is why we have "standards wars" like the one between Betamax and VHS. Unfortunately for companies (if not for consumers), there is no surefire strategy for winning such wars, but it is certainly the case that if you are a very large firm that already controls a very significant part of a related market, you have a much better chance of winning. That is probably why Apple is not particularly active in the VCSS system and why, in some Internet standardization committees, other players accuse some of the big web-browser companies of delaying agreement on things like a new encryption standard in the hope that they might develop a proprietary product that all web users would end up adopting.[19]

In order to avoid this kind of strategic behavior within technical committees, and the waste of everyone's time that results, the early champions of voluntary consensus standard setting believed that it should be pursued in fields in which no further radical technological changes were likely. "Anticipatory" standard setting was to be avoided. Unfortunately, in the information technology field—the global lead industry of the past generation—technological change has been so rapid that anticipatory standard setting has become normal. This is one reason that so many standard-setting consortia have been created: Not only can small groups of like-minded companies create such standards more rapidly than any fully representative VCSS process, a consortium can embed the proprietary technology of its members into the standard and, if that standard wins out in the marketplace, the companies will profit from the royalties that will result.[20]

## Drivers: The Standardization Movement

Voluntary standard setting certainly is no panacea, but ever since its invention in the late nineteenth century it has had major supporters even among the



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governments that are its major competitor. Ironically, while democratic legislatures are very poor at setting standards, agencies within national governments often desperately want them to be established. Some of the most important early sponsors and members of the British Engineering Standards Committee were the India Office (concerned with standards for its burgeoning railway system), the War Office, and the Admiralty.[21]

Why were engineers willing to provide this service? After all, we know that it comes at a significant cost to many of the hundreds of thousands of people who sit on technical committees. And while many have their expenses paid by their companies to participate, traditionally (and still quite commonly), technical committee members are volunteers. An early text on that aspect of the "voluntary" in "voluntary consensus standard setting" helps explain why. The end of the 1913 annual report of the International Electrotechnical Commission (written by British electrical engineer Charles Le Maistre) reads:

> Finally, the Central Office takes this opportunity of paying tribute to the willing and gratuitous services rendered by the large number of Electrical Engineers who, often at much inconvenience to themselves, have so generously given of their best to further this international Movement. The result of this ungrudging expenditure of time and labor is bound to exercise, and to an increasing degree, a far-reaching effect on international commerce and the electrical industry. These regular international gatherings, at which many lasting friendships are made between electricians of different nationalities, must undoubtedly be a not unimportant factor in furthering the peace of the World.[22]

The early, self-described "standardization movement" had broad social goals, and that was reason enough for many of the participants to volunteer, especially the engineers whose role was to represent the "general" interest. Of course, for many engineers it was also part of their job. If their employer produced the product in question, the engineer wanted to ensure that the agreed-upon standard would not harm (and would, preferably, help) the company's sales. If they represented a purchaser, they wanted the final standard to ensure the production of what they needed at the lowest possible price. Nonetheless, when VCSS was just starting, few of those involved perceived any conflict between the enlightened self-interest of their employers and a broader vision that linked the engineers to the contemporary scientific management, free trade, and international peace movements.



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In 1919, in the wake of World War I, the head of the American Engineering Standards Committee (another electrical engineer, Comfort Adams) again made the connection of standard setting to larger social goals:

> In a broad sense, international standardization means a common industrial language and the removal of one of those barriers which tend to separate nations and give rise to misunderstandings. The more of these barriers we can remove and the more we come to realize that our interests are after all in common, the more likely we are to attain that lasting peace for which the world longs.[23]

Despite the failure to attain lasting peace, as demonstrated by World War II, standardizers continued to see their work as having an almost diplomatic role in fostering peace, as evidenced by their extensive and ultimately successful efforts to pull the USSR into the International Federation of the National Standardizing Associations and the postwar ISO, and by their successful mission to extend their movement to every part of the world in the 1950s and 1960s.[24]

The movement was built around a *process* as well as its goals. As Le Maistre noted, the voluntary consensus process "may necessitate the sinking of much personal opinion, but if its goal, through wideness of outlook and unity of thought and action, is the benefit of the community as a whole, standardization as a coordinated endeavor is bound increasingly to benefit humanity at large."[25] Recall that, in technical committees, engineers representing different interests arrive at standards by deliberating until they reach consensus (defined by all of the international and national standard-setting bodies as a very high level of agreement accompanied by respectful consideration of all disagreement), and this process encouraged Le Maistre's "sinking of much personal opinion" in a way that aligns with theories of deliberative democracy.[26]

In sum, the early standardizers thought of themselves as a kind of international social movement, as people who were helping to bring about international and industrial peace; end poverty; and develop civilization by rationalizing industry, eliminating waste, and demonstrating through their own cooperation that reasonable people could deliberate and agree upon what is best—no matter what national rivalries, cultural differences, or political ideologies might divide them.[27] In standardization there was (in theory) no East or West, North or South.

In fact, the international standardization bodies have always excluded countries with few engineers and, thus, no national standardization bodies. Nevertheless, the pre–World War II International Federation of the National Standardization



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Associations still included members from Latin America and East Asia. At the 1946 meeting when the ISO was set up, native engineers from standards bodies of some Asian colonies participated, and, from its beginning, ISO supported the development of the engineering profession and new national bodies throughout the developing world. The long involvement of Asian, Latin American, and African engineers in ISO standard setting has given the organization a degree of legitimacy among both firms and social movements throughout the global South that surprises many development activists and scholars in the North.[28]

The social-movement-like character of the international community of standardizers has waxed and waned, but it has always been present. After declining in the 1930s and 1940s, the commitment to a global movement was as strong in the years immediately after World War II as it had been at the end of World War I. Today, the movement-like character of the standardizers is particularly prominent in the ideology of the Open Standards and Open Source movements, which are composed of electrical engineers whose members' moral commitments, focus on process, and sense of playing an important role in the world are very similar to those of the founders of the International Electrotechnical Commission a century before. These comments of Sir Tim Berners-Lee, architect of the World Wide Web and a leader in the OpenStand alliance, are typical:

> Hopefully [the Web] will make the human race work more efficiently in many, many ways. We've already seen acceleration of commerce, and the acceleration of learning. The big question is can we use it to accelerate peace? . . . If you've just been in conversation with somebody, or somebody's parents about some common interest—whether its bird watching or global warming—you are less likely to shoot them.[29]

## Consequences: Larger Economies, More Rapid Industrialization, and Global Markets

VCSS may not have led to world peace, but it has had a significant impact on global commerce and the acceleration of learning. A widely cited German study estimates that the value of VCSS over the slower and more wasteful process of letting the market decide is now about 1 percent of the national income of advanced industrialized countries. The advantage to newly industrializing countries is probably significantly greater, because adherence to internationally recognized standards not only for products but for processes (especially quality management standards) tends to give their firms much more rapid access to global markets.[30]



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The role of the Web (and the standards that made it possible) in creating a host of new global markets is widely known, but perhaps the most significant market-creating standard was the ISO standards that made containerized shipping possible.[31] Before the container revolution, the cost of loading cargo into an average ship was $5.86 per ton. Today, that cost is 16 cents.[32] The proximate cause of this 93 percent reduction in cost was the publication, in 1965, of the ISO draft standard for most of the containers we have today—metal boxes eight feet wide and about eight feet high, usually twenty or forty feet long with doors at one end and eight reinforced corners that allow the containers to be clamped together and stacked. As a recent popular account of the industry puts it, before the container, transoceanic shipping certainly was important to the global energy system, and it played a role in global agriculture. After the container, however, transoceanic shipping became essential for the delivery of "ninety percent of everything"—especially all the manufactured goods that move across the world economy. The cost savings associated with containers were essential to the rise of global manufacturing.[33] Economist Daniel Bernhofen and his colleagues estimate that the impact of the container revolution on globalization is much larger than that of "free trade agreements or the GATT," accounting for a sevenfold increase in global trade from the establishment of the standard until 1990.[34]

Of course, the rise of global manufacturing has also gone hand in hand with the rise of China. The China of the 1960s and early 1970s—self-isolated and in the chaos of the Cultural Revolution—was not a factor in the ISO agreement on the container standard. However, the VCSS process was a major factor in China's rise. This takes us back to Mazower's assertion that ISO is "perhaps *the* most influential private organization in the contemporary world." His conclusion needs to be amended. ISO is, after all, a tiny, frugal bureaucracy (comprising only a couple of hundred people) in a very small building in Geneva, one much smaller and much less lavish than those of the World Trade Organization or of any of the nearby UN specialized agencies. ISO is so parsimonious that it does not even keep its own records, which is one reason that historians and social scientists have tended to overlook or misunderstand it.[35]

Nonetheless, ISO is only one part of the large VCSS system, which includes the hundreds of thousands of experts who sit on technical committees and the hundreds of nested organizations that sponsor and support them. The VCSS system *has* been influential, perhaps as influential as any other part of global governance, both due to the demand for its products (and the relative failure of both



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governments and the market to provide them) and to the social movements of engineers that established the VCSS system—and that have kept it going for more than a century.

NOTES

[1] Mark Mazower, *Governing the World: The Rise and Fall of an Idea, 1815 to the Present* (New York: Penguin Books, 2012), p. 102.

[2] OpenStand began in 2012 as an initiative of five major standard-setting organizations involved in the fields of "Innovation and Borderless Commerce," namely, the Institute of Electrical and Electronics Engineers (IEEE), World Wide Web Consortium (W3C), Internet Architecture Board (IAB), Internet Engineering Task Force (IETF), and the Internet Society. "Leading Global Standards Organizations Endorse 'OpenStand' Principles that Drive Innovation and Borderless Commerce," August 23, 2012, open-stand.org/openstandlaunch/.

[3] ISEAL Alliance website, "About Us," www.isealalliance.org/about-us.

[4] Andrew Updegrove, an attorney who has been involved with more than 100 such consortia maintains and updates a list of almost 1,000 current VCSS organizations, the majority of which are such company consortia. "Standard Setting Organizations and Standards List," www.consortiuminfo.org/links/#.VZFzcWCLhgv. The ISO network consists of about 160 national-level, standard-setting bodies. ISEAL includes about twenty full-member bodies. OpenStand is made up of both organizational and individual members. Updegrove lists about seventy "significant" open standards and open source organizations, many, but not all, of which endorse OpenStand.

[5] David A. Wirth, "The International Organization for Standardization: Private Voluntary Standards as Swords and Shields," *Boston College Environmental Affairs Law Review* 36, no. 1 (2009), pp. 79–102.

[6] Craig N. Murphy and JoAnne Yates, *The International Organization for Standardization: Global Governance through Voluntary Consensus* (Abingdon, U.K.: Routledge, 2009), p. 2.

[7] Jean-François Rischard, *High Noon: Twenty Global Problems, Twenty Years to Solve Them* (New York: Basic Books, 2002).

[8] Richard Samans, Klaus Schwab, and Mark Malloch Brown, eds., *Global Redesign: Strengthening International Cooperation in a More Interdependent World* (Geneva: World Economic Forum, 2010).

[9] JoAnne Yates and Craig N. Murphy, "From Setting National Standards to Coordinating International Standards: The Formation of the ISO," *Business and Economic History On-Line* 4 (2006), www.thebhc.org/sites/default/files/yatesandmurphy.pdf.

[10] Craig N. Murphy, "Globalizing Standardization: The International Organization for Standardization," *Comparativ—Zeitschrift für Globalgeschichte und vergleichende Gesellschaftsforschung* 23, no. 4/5 (2013), pp. 137–53.

[11] Craig N. Murphy and JoAnne Yates, "ISO 26000, Alternative Standards, and the 'Social Movement of Engineers' Involved with Standard Setting," in Stefano Ponte, Peter Gibbon, and Jakob Vestergaard, eds., *Governing through Standards: Origins, Drivers, and Limitations* (Houndmills, U.K.: Palgrave Macmillan, 2011), pp. 167–78.

[12] The more general argument is made in Murphy and Yates, *The International Organization for Standardization*, pp. 10–11.

[13] Robert Tavernor, *Smoot's Ear: The Measure of Humanity* (New Haven, Conn.: Yale University Press, 2007), p. 131.

[14] International Federation of the National Standardizing Associations Bulletin No. 6: Conversion Tables: Inches-Millimeters (August 1934).

[15] Jeffrey A. Hart, *Technology, Television, and Competition: The Politics of Digital TV* (Cambridge: Cambridge University Press, 2004), pp. 84–97.

[16] American, British, and German perspectives on this conflict can be found in "Introducing Industrial Standards," *Comments on the Argentine Trade* 2, no. 4 (November, 1922), p. 21; "Memorandum in Regard to the Work of the British Engineering Standards Association in Furtherance of British Export Trade," Institution of Civil Engineers, Holdings of the BSI Formerly in the Science Museum, Part 3, Envelope 5; and Thomas Wölker, "Der Wettlauf um die Verbreitung nationaler Normen im Ausland nach dem Ersten Weltkrieg und die Gründung der ISA aus der Sicht deutscher Quellen," *Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte* 80, no. 4 (1993), p. 490.

[17] José Luciano Dias, *História da Normalização Brasileira* (São Paulo: ABNT, 2011), pp. 47–53.

[18] Tim Büthe and Walter Mattli, *The New Global Rulers: The Privatization of Regulation in the World Economy* (Princeton, N.J.: Princeton University Press, 2011).



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[19] JoAnne Yates and Craig N. Murphy, "The Role of Firms in Industrial Standards Setting: Participation, Process, and Balance," MIT Sloan School Working Paper 5124-14, February 17, 2015.
[20] Ibid.
[21] Robert Coutts McWilliam, "The Evolution of British Standards" (thesis for Doctor of Philosophy, Department of History, University of Reading, September, 2002), pp. 48–51.
[22] International Electrotechnical Commission, *Fourth Annual Report*, Publication No. 24, August 1913, p. 24.
[23] "American Engineering Standards Committee," in *Power: Power Generation, Transmission, Application and Their Attendant Services in All the Industries* 49, no. 9 (March 4, 1919), p. 337.
[24] Yates and Murphy, "From Setting National Standards to Coordinating International Standards."
[25] Charles Le Maistre, "Summary of the Work of BESA," *Annals of the American Academy of Political and Social Science* 82 (March, 1919), p. 252.
[26] Jürgen Habermas, *The Inclusion of the Other: Studies in Political Theory* (Cambridge, Mass.: MIT Press, 1998); Jane Mansbridge et al., "The Place of Self-Interest and the Role of Power in Deliberative Democracy," *Journal of Political Philosophy* 18, no. 1 (2010), pp. 64–100.
[27] On the longer pattern, see Murphy and Yates, "ISO 26000."
[28] Craig N. Murphy, "Globalizing Standardization."
[29] "Sir Tim Berners-Lee Hopes Peace Will Be the Lasting Legacy of the World Wide Web," *Drum*, September 14, 2012, www.thedrum.com/news/2012/09/14/sir-tim-berners-lee-hopes-peace-will-be-lasting-legacy-world-wide-web#wKcodIEx8g7x4jSg.99.
[30] DIN German Institute for Standardization, *Economic Benefits of Standardization: Final Report and Practical Examples* (Berlin: Beuth Verlag, 2000).
[31] Murphy and Yates, *The International Organization for Standardization*, pp. 46–67.
[32] Toby Poston, "Thinking Inside the Box," BBC News, April 25, 2006, news.bbc.co.uk/2/hi/business/4943382.stm.
[33] Rose George, *Ninety Percent of Everything: Inside Shipping, the Invisible Industry That Puts Clothes on Your Back, Gas in Your Car, and Food on Your Plate* (New York: Metropolitan Books, 2013).
[34] Daniel M. Bernhofen, Zouheir El-Sahli, and Richard Kneller, "Estimating the Effects of the Container Revolution on World Trade," CESifo Working Paper No. 4136, Category: Trade Policy, February 2013, p. 1.
[35] Historians of containerization, for example, have ultimately had to hunt for the records of standardization—usually in the basements or attics of engineers who served as chairs or secretaries of the relevant technical committees. The records are typically voluminous, and they have been kept in perfect order. See Murphy and Yates, *The International Organization for Standardization*, p. 55.



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