Chapter 7
Stakeholders in Smart City Standardization

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Abstract The chapter suggests a way to better integrate the expertise of societal stakeholders into the earliest possible stage of the development of technologies with significant non-technical ramifications, e.g., societal, environmental, or ethical. Based on a thorough analysis of the current situation, the chapter suggests a modified standards setting process for such technologies. Specifically, it describes how the diverse stakeholders and their different forms of knowledge may be integrated into this process and how it may be managed.

Keywords Smart systems · Smart cities · Multi-stakeholder standardization · Responsible innovation · Standardization

7.1 By Way of Introduction and Motivation

Over the past couple of years, "smart" and "intelligent" applications have become increasingly popular. Well-known examples include intelligent transport systems, smart manufacturing (aka Industry 4.0), smart grid, e-health, and smart cities. In a way, the latter represent a superset of smart applications (see Fig. 7.1). "Smartness" is the result of the integration of information and communication technologies (ICT) into rather more "traditional" technologies, i.e., of the merger of the physical world and the virtual one.

Smart applications receive information from and send instructions to the underlying infrastructure, the individual elements of which need to communicate with each other in order to meet the applications' requirements (see also Fig. 7.2). To actually reach a situation where different smart applications can seamlessly communicate via a shared infrastructure, widely accepted interoperability standards are a sine qua non. "Standards are the first step towards the holy grail of an interoperable, plug-

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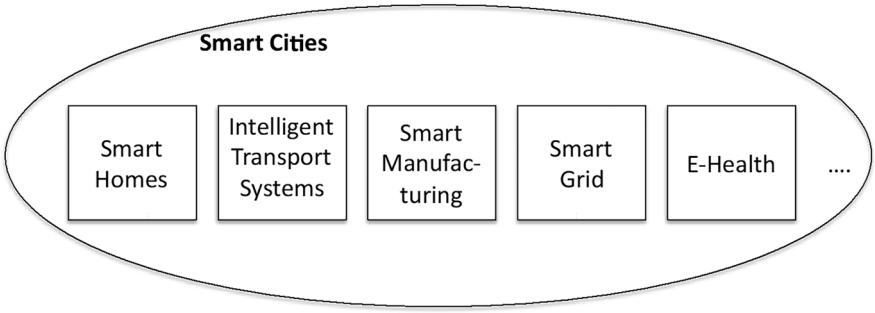

Fig. 7.1 Smart cities as a superset of different smart applications

and-play world where cities can mix and match solutions from different vendors without fear of lock-in or obsolescence or dead-end initiatives."[1]

Smart cities' major characteristic will be their true ubiquity. "The number of IoT devices worldwide is forecast to almost triple from 8.74 billion in 2020 to more than 25.4 billion IoT devices in 2030."[2] This trend suggests that smart systems will exert a tremendous impact on our lives, through this ubiquity and the associated volume of data they will collect. This, in turn, means that they will represent a major challenge for policymakers and for society as a whole, and not least will they have an enormous economic impact.

Smart systems' ubiquity may border on inescapability [think George Orwell (1949) and Aldous Huxley (1932)]. On top of that, interaction with smart systems will be (almost) continuous and "implicit," that is, no explicit action (e.g., log in) will be required. Rather, sensors will continuously collect data that will subsequently be analyzed; they may well serve as the basis for recommendations made and actions taken autonomously by some governing entity (which will most likely apply big data analytics as well as machine learning and AI techniques). Such systems have the inherent potential to either foster the good of humankind or to enable the emergence of a surveillance society. In any case, storage, analysis, and eventual action based on this massive amount of data will have major socioeconomic, legal, and ecological ramifications and directly impact citizens as well as businesses.

The severity and the sheer range of these ramifications call for the inclusion of a variety of non-technical aspects into the development process of smart systems in order to try and shape this process in a way that it aims to avoid, or at least reduce, any undesirable outcomes. This "... shaping process begins with the earliest stages of research and development" (Williams and Edge 1996, p.

[1] According to Jesse Berst (the Chairman of the Smart Cities Council); see https://www.iso.org/sites/worldsmartcity/

[2] https://www.statista.com/statistics/1183457/iot-connected-devices-worldwide/

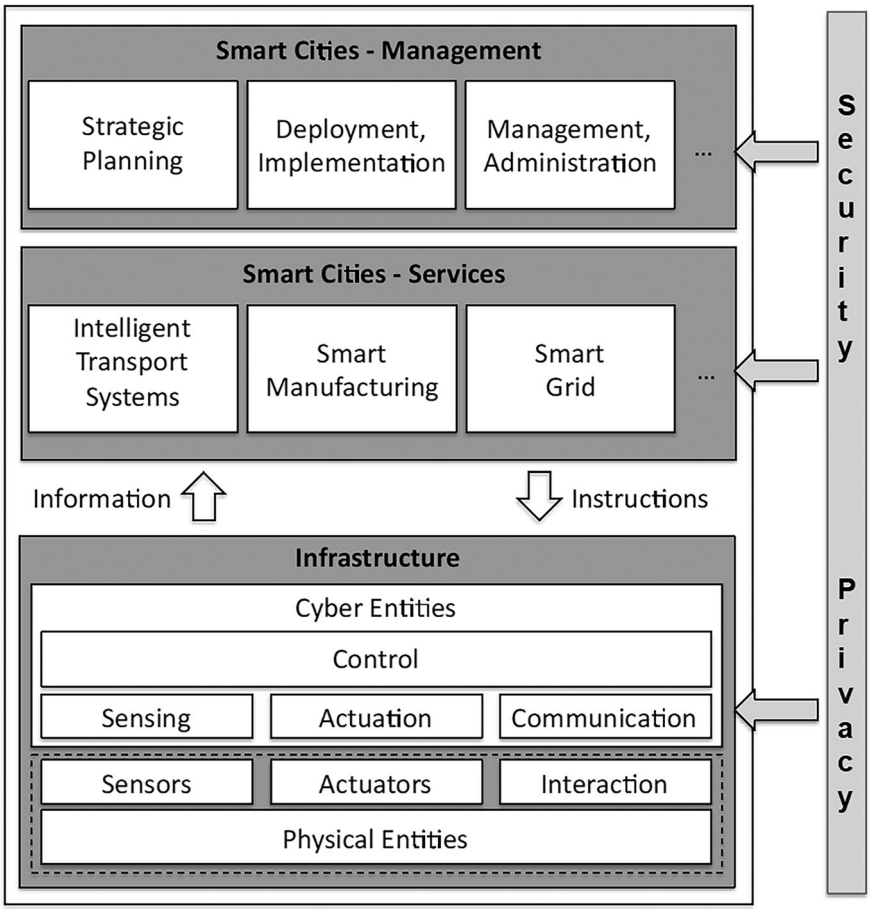

Fig. 7.2 Framework of SSC ICT standards [Adapted from NIST (2016)]

874). This view is complemented by the European Commission's observation from more than 20 years back, when they rightly stated that "Standards are not only technical questions. They determine the technology that will implement the Information Society, and consequently the way in which industry, users, consumers and administrations will benefit from it" (EC 1996, p.1). This still holds today. That is, those who develop standards today shape much of the future environment we will live in (also through subsequent standards-based innovations). Moreover, especially transnational governance increasingly builds upon soft law, notably including standards (see, e.g., (Djelic and Sahlin-Andersson 2006).

Smart systems' "smartness" results from the merger of ICTs and non-ICT technologies (see above). ICTs are in almost all cases based on international standards, and so will be smart systems. Thus, while not necessarily representing

the earliest stage of development, standardization clearly is an important early stage of the overall process that leads from R&D to products or services and is thus also subject to a shaping process. Accordingly, the non-technical aspects must be introduced into the standardization process from the outset. This, in turn, makes imperative the participation of variety of stakeholders. Most notably, these include societal stakeholders[3] (as opposed technical/economic ones[4]).

Such inclusiveness should also help increase the eventual standards' legitimacy and thus contribute to a higher degree of their acceptance (Werle and Iversen 2006). Accordingly, the chapter aims to provide an answer to the following question:

> How can stakeholder diversity in smart systems standardization be achieved, and how can the standardization process be adapted and governed to yield standards that are technically sophisticated and implementable, economically viable, and societally desirable?

The remainder of this chapter is organized as follows: Section 7.2 provides the necessary background. Subsequently, Sect. 7.3 addresses some aspects relating to different stakeholders' knowledge and activities in standards setting. Section 7.4 looks at the societal stakeholders, focussing on the governance of a standards setting process adapted to better cater for the needs and requirements of societal stakeholders. Finally, Sect. 7.5 offers some concluding remarks.

7.2 Some Background

Figure 7.2 shows the general framework for smart and sustainable cities (SSC) from an ICT perspective. So far, the vast majority of standardization activities have focussed on the "infrastructure" level. Most of the ensuing standards, however, are not directly linked to smart cities but may be applied in this environment as well. Pretty much the same holds for standards for data security and privacy.

Activities in some sectors at the "services" layer have also been going on for a while, most extensively for intelligent transport systems (since the early 1990s). Standardization efforts in the fields of smart manufacturing and the smart grid got off the ground only in the early 2000s. At this level as well, many relevant standardization activities have originally been launched without smart applications in mind. Some of these standards have then ex post been identified as being of relevance in this field as well. That is, coherent activities to develop dedicated standards for smart applications have been limited also at this level. Things look a bit different for the topmost level, "management." Here, a number of dedicated smart city standards have been developed by different standards setting organizations

[3] For smart cities, these may include, e.g., city councils, unions, NGOs, environmentalists, and citizens but also academics, legal professionals, and ethicists.

[4] Which are mostly large companies with an interest in the technology to be standardized (see, e.g., De Vries et al. 2003; Jakobs 2021).

(SSOs). These standards, however, are mostly dealing with more high-level aspects like architectures, frameworks, and vocabularies.

The following sections introduce some necessary background regarding responsibility, the standardization environment, and its stakeholders (see below).

7.2.1 Responsible Innovation

Research and innovation (R&I) need guidance to address not just the technical aspects but to also take into account any potential societal ramifications that may be an (unintended) outcome of an innovation. Moreover, R&I should also aim to contribute to solutions to any societal challenges in general. Responsible innovation (RI) provides guidelines to address these challenges.

RI is not a new phenomenon. Its roots may be traced back at least a couple of decades. In 1947, Detlev Bronk testified before a congressional committee "... that competent social scientists should work hand in hand with the natural scientists, so that problems may be solved as they arise, and so that many of them may not arise in the first instance" (Hearings 1947, p.38). More than 60 years later, v. Schomberg (2013, p.19) defines RI as "a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)." Stilgoe et al. (2013) propose four dimensions of RI. They include:

- Anticipation—to proactively take into account potential future opportunities, risks, environmental/societal, etc. ramifications.
- Inclusion—to listen to all stakeholders; some may challenge well-established attitudes.
- Reflexivity[5]—to regularly reassess research against norms and values.
- Responsiveness—to adapt with increasing experience and knowledge.

Grunwald (2011, p.17) adds the ethical dimension and observes that "Responsible Innovation unavoidably requires a more intense inter- and trans-disciplinary cooperation between engineering, social sciences, and applied ethics."

The requirement that non-technical aspects shall be taken into account during the innovation process implies that a much broader range of stakeholders has to be involved in the process, notably those that are not normally associated with R&I

[5] According to Stilgoe et al. (2013, p.1571), "Reflexivity, at the level of institutional practice, means holding a mirror up to one's own activities, commitments and assumptions, being aware of the limits of knowledge and being mindful that a particular framing of an issue may not be universally held."

(e.g., consumers, NGOs, unions, ethicists, etc.); this very much resembles the needs of the standardization process for smart cities.

Applying RI principles not just in innovation but also in standards setting would then lead to responsible standardization (Meijer et al. 2023); this will be discussed further below.

7.2.2 The General ICT Standardization Environment

As mentioned above, systems' smartness results from the merger of ICT with other technologies. The bulk of the associated standardization work is and will continue to be done by SSOs from the ICT sector. Accordingly, in the following, the focus will be on ICT standardization.

Most industry sectors have a very simple standardization environment. A number of National Standards Organizations (NSOs) contribute to the work of the international standards development organizations (SDOs), i.e. ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission). An additional regional level in between has been established in Europe through the European Standardisation Organisations (ESOs). In the USA, numerous national sector-specific SSOs exist. Following accreditation, they may contribute to the international standardization work via the American National Standards Institute (ANSI), the US national representative to ISO and IEC.

The situation is different for ICT, specifically for the telecommunication sector. In this sector, the ITU (International Telecommunication Union) represents the equivalent to ISO and IEC. In addition, a number of national/regional bodies and, particularly, a huge number (more than 200) of private standards setting consortia[6] are active in this field; they make this environment unique. The proliferation of these consortia began in the late 1980s and was primarily triggered by the fast-paced development of ICT technologies and a widely perceived slowness and non-responsiveness to users' needs on the side of the "formal" SDOs (Cargill 1995). So far, consortia have not played a major role in the realm of smart city standardization. This may well change though.

The characteristics of the individual SSOs may differ considerably in terms of, e.g., relevance, credibility, voting procedures, membership and membership levels, types of output documents, level of consensus required, and IPR (intellectual property rights) regime.

The number of consortia and the complex links that exist between them on the one hand and to the SDOs on the other yields an almost impenetrable web of SSOs (see Fig. 7.3).

These links represent some level of formal co-operation (mainly between consortia and SDOs). Such co-operation may take the form of exchanging information

[6] Private SSOs such as the World Wide Web Consortium (W3C).

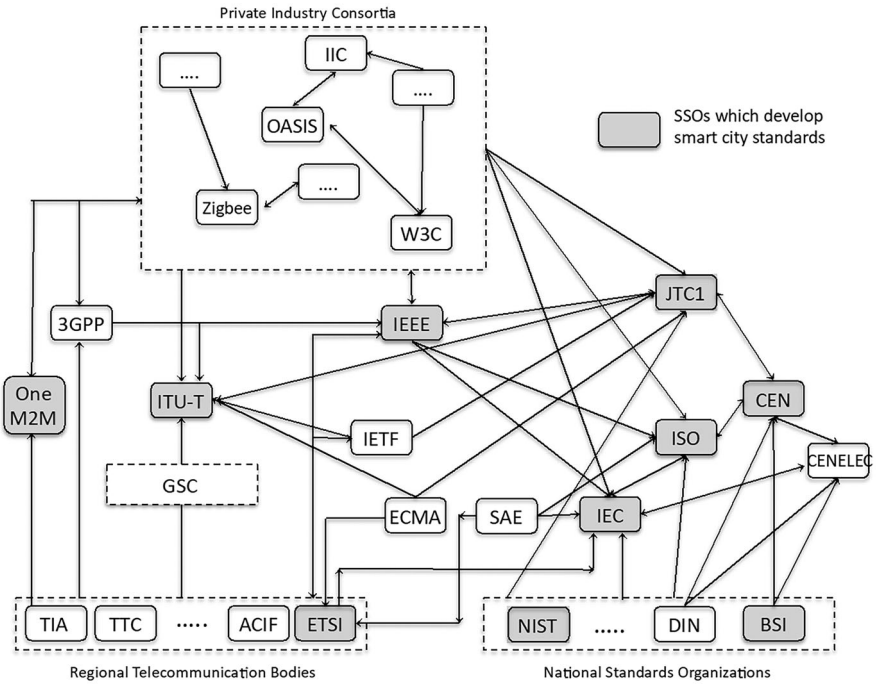

Fig. 7.3 The web of SSOs active in the ICT sector [small excerpt; adapted from Jakobs (2008)]

about planned new work items, the joint development of common standards, or anything in between. In the absence of a central coordinating entity, these links currently represent the most important (distributed) coordination mechanism in standards setting. Such links between consortia are not normally well developed, but some do exist.

To improve coordination of the different standardization activities remains an important issue. A lack of coordination, eventually resulting in the development of functionally equivalent (and thus competing) standards, will reduce market transparency, decrease interoperability and ease of use, fragment the market, and increase transaction costs (Egyedi 2014). Indeed, various coordination mechanisms have been developed over time, ranging from highly formalized high-level regulatory documents to very informal coordination through individuals who contribute to the work of multiple SSOs.

7.3 Stakeholders and Standards Setting

7.3.1 Expert vs. Lay Knowledge

At least at first glance, ICT standards setting is a purely technical activity. Experts from different engineering disciplines and from various computer science fields meet, discuss potential alternatives, and eventually come up with a good technical solution. Frequently, economic interests of the respective employers also play an important role. And in many cases, this "technology-centric" scenario will indeed be adequate—the nuts and bolts of the USB protocol (see, e.g., Anderson 2009), for example, will hardly be of interest to the vast majority of those who want to transfer data to a USB stick, and neither will they have any societal nor ethical ramifications.

Things look very different for smart systems though. They will eventually collect and process unprecedented volumes of information, including personal data. At the very least, adequate measures to render impossible any misuse of these information and to guarantee their privacy will need to be in place. Moreover, smart systems hold the promise of making energy provision, traffic, production, and cities more environmentally friendly. To actually reap such potential benefits, sustainability aspects should be considered already during the standardization process. Obviously, the above does have a strong technical dimension. Beyond that, however, legal and regulatory issues will come into play, as will societal and cultural aspects (privacy, e.g., is crucially important in some countries and much less so in others; even within countries, its perceived importance differs between groups of citizens).

Very much in line with the ideas underlying RI, the above suggests that for smart systems, technical expertise ("expert knowledge") will need to be complemented by both "lay knowledge" and "domain knowledge."[7] The former may be contributed through public engagement, the latter through experts from relevant non-technical disciplines (e.g., sociology, philosophy, jurisprudence). Problems are to be associated with both.

For one, Graz and Hauert (2019) observe that it is very difficult, yet crucial, to actually mobilize specifically "lay" (but also "domain") knowledge for the day-to-day activities of SSOs' working groups. This holds primarily for the public engagement.

Moreover, there might be an acceptance problem: "Committee members have also named technical sophistication on the side of the user representatives as a major prerequisite for meaningful participation" (Jakobs et al. 2001, p.106).

[7] Roughly speaking, "expert knowledge" relates to technical aspects, "domain knowledge" to the specifics of either the respective application domain or of the various non-technical fields (e.g., legal, ethical, environmental) domains, and "lay knowledge" to the associated more general societal issues. During the standardization process, the latter two groups initially possess knowledge that is valuable for the former; later on, they may/will eventually join the process of knowledge (standard) production (see Koizumi and Yamashita 2021).

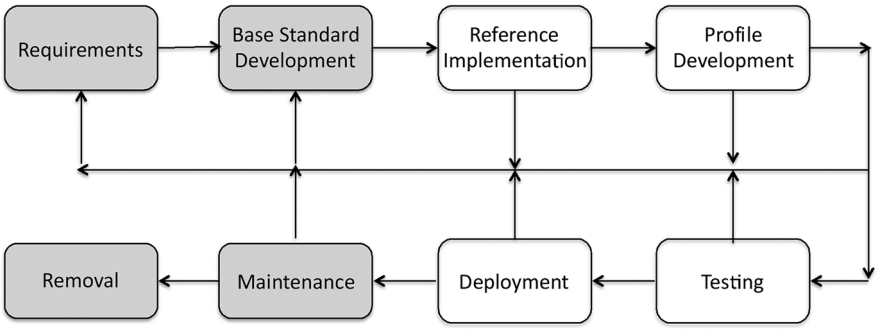

Fig. 7.4 Stages of the standards setting process

This reveals a major misconception. A lack of technical expertise is certainly a problem when purely technical topics are to be standardized. For other types of standards, notably in cases where the ensuing technology based upon these standards is likely to have major societal ramifications (like in nanotechnology and smart systems), any distinction between lay knowledge and expert knowledge becomes void. Here, what may be seen as lay knowledge for, e.g., technical deliberations will become expert knowledge when it comes to the consideration of, e.g., societal or ethical impacts of the technology to be developed (and vice versa). That is, only expert knowledge, albeit from different domains, shall be made available, and both have to be of equal value.

7.3.2 Stakeholders in the Standardization Process

The literature frequently views the standardization process as an indivisible entity, which cannot be subdivided any further (see, e.g., Iversen et al. 2004). Yet standardization is not a homogeneous process carried out under one single set of guidelines, rules, policies, and bylaws. Especially in the ICT sector, standardization work is distributed across a highly complex web of SSOs (see Fig. 7.3). Some of them work—and compete—in very similar fields; some co-operate and some just exist in parallel. Accordingly, from a stakeholder's perspective, the standards setting process has a "spatial" dimension. It also has a "temporal" dimension. Figure 7.4 shows the individual stages of a standards setting process. Most SSOs focus on the first two stages of the process and the two final ones. That is, they elicit requirements, develop the standard specification on paper, maintain, and, eventually, remove it.[8] Yet these specifications tend to also include ambiguities and/or may provide for options, which may easily lead to incompatible implementations of the

[8] A typical such process is described in ISO (2023).

standard (see, e.g., Egyedi 2007). This, in turn, creates the need for interoperability tests and/or profile specifications (which would, e.g., define parameter values and which options to implement). The Internet Engineering Task Force (IETF), for instance, requires two interoperable independent implementations as a pre-requisite for a specification to become an Internet Standard (IETF 1996).

The above suggests that all stakeholders, from large multinationals to small NGOs (or perhaps individual citizens), need to decide to which SSO activities to contribute (where to participate) and at which stage of the process their contributions would be most useful (when to participate). These are, however, just two of the questions to be answered. Others would include why participate (if at all), how to participate most effectively and efficiently, and what to contribute? In fact, these questions should be answered prior to the other two.

First, why participate at all? After all, such commitment implies major expenses, with a very uncertain "return on investment." In fact, primarily, companies with a large-enough interest in the technology to be standardized may hope for an economic gain through participation in the standards setting process. Societal stakeholders, on the other hand, will need to recognize that they stand to suffer from standards that only reflect the technically feasible and/or the economically desirable (from a corporate perspective, as opposed to a societal one). Whether or not many companies will be prepared to adequately take into account societal, environmental, or even ethical aspects, for instance, remains to be seen, all the more so if these aspects are at odds with their respective economic interests. Yet the "why participate" question has more dimensions to it. "Funding" would be one. Within limits, European stakeholders' organizations (ANEC,[9] ECOS,[10] ETUC,[11] and SBS[12]) receive funding from the European Union for their contributions to standardization. Yet to have these organizations' voices adequately heard in all relevant fields, notably including smart systems standardization, will require considerably more (public) funding. Also, whether or not these organizations actually have a widely accepted mandate may become another open question. For example, the organization to "represent social interests in the standardisation process" (EU 2012, p.31) (almost exclusively) focused on cases where "standardisation projects impact the health and safety of workers" (ETUI 2018, p. 47), no such standardization-related activities are foreseen in the current work program (ETUI 2023).

For the time being, the answer to the question of how societal stakeholders (should) participate in standardization would be "through the above stakeholder organisations," at least according to the European Commission. Yet two issues must be associated with this approach. Looking at the participation of SME user companies in standards setting, Jakobs (2005) reports that Working Group (WG) members would particularly welcome their delegates if they represented a relevant umbrella

[9] The European consumer voice in standardization.

[10] European Environmental Citizens' Organisation for Standardisation.

[11] European Trade Union Confederation.

[12] Small Business Standards.

organization (as opposed to their respective individual employer). On the other hand, requirements on a standard (and on a technology) are "... highly specific to particular operating requirements and environmental contingencies" within which it is to be implemented (Fleck 1994, p.642). An analogous argument may be made for the contributions of societal stakeholders. Obviously, this makes the contribution of more general requirements via an umbrella organization, representing a wide range of diverse stakeholders, at least much more difficult. How to realize an "adequate" representation of societal stakeholders is another relevant question. Numerically, adequate representation would probably be next to impossible to achieve. Adequate influence may be something entirely different though. There is ample evidence that representatives' diplomatic, negotiation, rhetoric, and similar non-technical skills are important (see, e.g., Dokko and Rosenkopf 2010; Isaak 2006). A representative with such skills may enable even a small organization to punch well above its weight in the process.

What could societal stakeholders contribute? At a very general level, they could establish whether or not a standard to be developed would be desirable from a broader societal perspective. Aspects to be considered in this context would include, among others, social, environmental, and ethical ones; potential legal ramifications may also need to be considered. These deliberations should result in a set of requirements that should inform and guide the technical standardization process. The different perceptions of technology held by the "technical" side (e.g., engineers or computer scientists) on the one hand and societal stakeholders on the other would be an inherent problem here. These different perceptions would need to be aligned, which would require a learning process on both sides; the "technical side" will need to gain some understanding and appreciation of the (potential) non-technical ramifications of their work, and societal stakeholders will need to have at least some idea of what technology can do and what it cannot.

Different levels of societal stakeholders' participation in standardization may be identified. The International Association for Public Participation has identified five such levels, relevant for "public participation processes" in general (IAP2 2018). Standardization is, or rather should be, one such process. Accordingly, each of these five levels has its justification also in standards setting, albeit with some adaptations to reflect the specifics of the standardization process (Table 7.1).

The respective most desirable level depends on the type of standard to be developed. "Inform" will suffice in case of purely technical standards. "Collaborate" would be the level of choice for smart cities, while "Empower," i.e. to possibly forfeit all technical expertise, would likely be disastrous (not just in the case of smart cities).

Even if the "Collaborate" category were implemented, communication problems would be highly likely to occur. That is, an initial lack of mutual common understanding may be assumed. Accordingly, trust will become all the more important for a meaningful collaboration. Rosenkopf et al. (2001, p.754) note that "frequent and sustained face-to-face meetings among firm representatives engender trust and collaboration among alliance partners." The importance of face-to-face meetings in this context is further corroborated, albeit from a slightly different angle

Table 7.1 Different levels of societal stakeholders' participation in standards setting [Based on and adapted from IAP2 (2018)][a]

	SSOs' tasks
Inform	SSOs will provide societal stakeholders with objective information regarding the standard to help them understand the problem and the proposed solution along with potentially associated alternatives, risks and opportunities
Consult[b]	SSOs will compile feedback from societal stakeholders about the standard (and possibly incorporate it)
Involve	SSOs will co-operate with societal stakeholders to understand and consider their ideas and concerns about the standard
Collaborate	SSOs will consider societal stakeholders as being at eye level with their technical experts during standard's development
Empower	Societal stakeholders will make the final decision about the standard

[a]Permission to use the material has been granted by the Intern. Assoc. for Public Participation; © of the original material Intern. Assoc. for Public Participation
[b]Citizens' assemblies allow citizens' voices to be heard by policymakers and legislators. They have been implemented in various countries. Their recommendations are non-binding though (unlike the European Commission's stakeholder consultations)

by Kramer and Cook (2004), who note that "Trust theorists have long argued the benefits of face-to-face interaction and direct experience with others in the trust-building process" (p.12). In the following, a way to circumvent these problems will be presented.

7.4 Catering for Societal Stakeholders

7.4.1 Stakeholder Identification, Classification, and Engagement

The SSC stakeholders that are likely to be (certainly should be) interested in contributing to the extended standards development process and/or in the subsequent implementation of standards are shown in Table 7.2.

In most cases, this rather "coarse-grained" list of stakeholders will need to be refined and adapted to local particularities. Eventually, representatives from all interested groups will need to be found and motivated to participate. Specifically, care should be taken to make sure that also any, e.g., ethical, legal, and environmental aspects will be given adequate consideration.

With respect to the contribution to SSC standardization, the most relevant stakeholders include "municipalities, city councils, and city administrations," "NGOs," "citizens and citizens' organizations," and "academia, research organizations, and specialized bodies"; the latter will mostly act in a rather more observing and possibly also in a consulting capacity. "Municipalities, city councils, and city administrations" are "the basis for SSC management, and are at the core of the

Table 7.2 Smart cities stakeholders and their roles (Adapted[a] from ITU (2020) and extended). *Std.* standardization, *Imp*. implementation; "Stage" according to Fig. 7.4

Stakeholders	Roles, tasks, and expertise	Std./Imp.[b]	Stage
Municipalities, city councils, and city administrations	Responsible for city management; therefore, they are the main promoters of SSC initiatives in each specific city	Std. and Imp.	1
National and regional governments	Remits on policies that can affect SSC implementation	Std. and Imp.	2
Society at large	Influences any technical development through prevailing societal norms, which may change over longer periods of time	Std. and Imp.	1 and 2
City services companies	Implement SSC solutions to increase city services efficiency	Imp.	
Utility providers	Responsible for the deployment of some of the features of an SSC, such as smart grid or smart water management	Imp.	
ICT companies (e.g., telecom operators, software companies)	Providers of global and integrated solutions, city platforms, as well as the ICT and digital infrastructure to support SSC deployment	Std. and Imp.	2
NGOs	Involved in all initiatives that can influence society and therefore are considered stakeholders in SSC, e.g., on social sustainability	Std. and Imp.	1
International, regional, and multilateral organizations	These include UN agencies and multilateral organizations. They can be promoters of initiatives toward human development, environmental sustainability, and improvement of quality of life worldwide. They can offer funding opportunities and are promoters of SSC initiatives	Imp.	
Industry associations	Since industries are interested in the deployment of SSC, industry associations also work toward the success of this new model	Std. and Imp.	2
Academia, research organizations, and specialized bodies	Study SSCs and associated trends, including their impacts on and contributions to sustainable development as well as any, e.g., potential legal and ethical issues	Std. and Imp.	1 and 2
Citizens and citizens' organizations	As inhabitants of cities, citizens are affected both directly and indirectly by SSC deployment	Std. and Imp.	1
Urban planners	Their expertise is important to better understand how to include ICTs and digital technologies in city planning, as well as to consider urban complexities	Imp.	

(continued)

Table 7.2 continued

Stakeholders	Roles, tasks, and expertise	Std./Imp.[b]	Stage
Urban planners	Their expertise is important to better understand how to include ICTs and digital technologies in city planning, as well as to consider urban complexities	Imp.	
Standardization bodies	These organizations are critical to ensure the application of common terminology and minimum characteristics of an SSC and for specifying measurement methods to assess performance and sustainability of city services based on digital technologies	Std.	1 and 2
Individual standards setters	In charge of the actual standards development. They influence standards development through technical contributions and also through, e.g., beliefs, prejudices, and non-technical skills like diplomacy, alliance formation, good rhetoric, or bullying	Std.	1 and 2

[a]Permission to use the material has been granted by the ITU, © of the original material International Telecommunication Union
[b]Designates the main interest of the stakeholder: standardization and/or implementation

SSC framework" (ITU 2020, p.8). They will also (have to) be the drivers of the associated standardization activities at Stage 1. This observation, plus the fact that standardization resembles regulation in many respects, suggests that elements of societal stakeholder engagement may be adopted from the regulatory environment. According to Alemanno (2015), engagement comprises three different components:

- Public communication enables policymakers to convey information to the public. This is a one-way information flow and corresponds to the "Inform" category (see Table 7.1).
- Public consultation serves to convey information from societal stakeholders to policymakers. This corresponds to the "Consult" category.
- Public participation represents a dialogue between societal stakeholders and policymakers. This corresponds to the "Involve" category.

The categories "Collaborate" and "Empower" will hardly be found in regulation (except perhaps for the Swiss referenda). In smart city standardization, however, "Co-operate," on a level playing field, would be desirable.

7.4.2 *Proposed Adaptation of the Standards Setting Process*

The current standardization process has been briefly discussed above.[13] There, it has also been shown that participation of societal stakeholders in standards setting is highly likely to be ridden with all sorts of problems and issues. On the other hand, and given the important role they have to play in the standardization of smart cities, their active contribution to the process, on a level playing field, will be crucial. One way out of this dilemma would be a moderately modified process that enables active participation especially of the non-technical stakeholders, provides for more inclusiveness, and caters for a greater diversity of stakeholders than the current processes do, thus also bringing responsibility to standardization (for more details, see, e.g., Jakobs (2019)]. Such inclusiveness would also increase credibility and thus acceptance of the ensuing standards (see, e.g., Werle and Iversen 2006).

The modification would largely decouple requirements elicitation and compilation from the primarily technical work. The right-hand side of Fig. 7.5 (Stage 2) represents the "traditional" standardization process (as depicted in Fig. 7.3). Societal stakeholders' tasks and input are depicted on the left-hand side[14] (Stage 1). Their first task would be a recommendation whether to proceed with or to stop a planned activity. In case of the former, societal stakeholders would subsequently contribute requirements to the technical part of the process. It should be noted that stage 1 may be set up independently from any SSO. However, the interface between the two stages will need to be clearly defined.

This approach would make sure that the technical part of the standardization work remained unchanged. Moreover, the communication between the technical and the societal world would mostly occur via one well-defined interface. Benefit number three would then be that the level of involvement of the societal stakeholders in Stage 2 (the "classical" part of the process), and thus the associated costs would be significantly reduced. This, in turn, might encourage a broader variety of these stakeholders to become active in "their" part of the process. Overall, this should contribute to a stronger societal representation.

It may be expected that this addition to the standards setting process would prolong the overall process. However, especially for ubiquitous technologies like smart systems, with huge ramifications in virtually all sectors of society, speed should take a back seat; aspects like sustainability, interoperability, and added societal value of the technology will need to take precedence.

[13] For more information about some different process, see, e.g., ISO (2023); https://www.ietf.org/standards/process/informal/ for the IETF or https://www.etsi.org/standards/standards-making for ETSI.

[14] This is pretty much in line with ETSI's Recommendation to "Ensure that for new topics, there is a clear assessment of who are the interested stakeholders and involve them fully in the process, and do so in a collaborative way between the interested SDOs in advance of the work starting" (ETSI 2020, p.29).

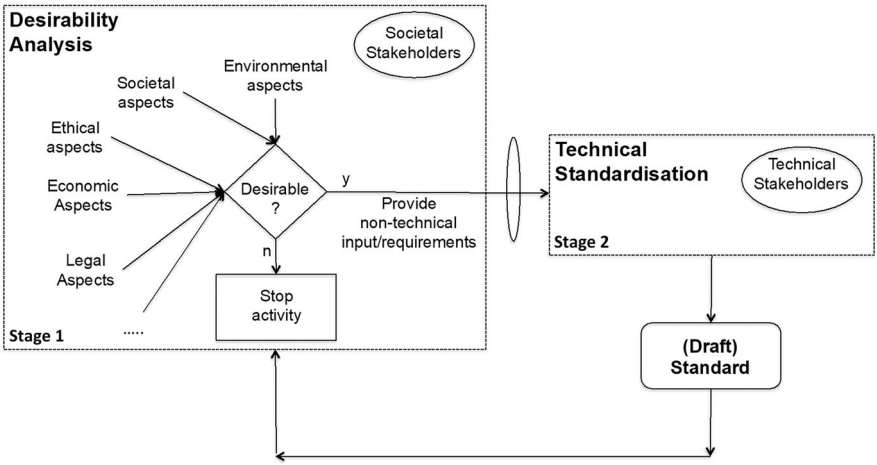

Fig. 7.5 An adapted standardization process (Adapted from Jakobs (2021); see Fig. 7.3 for more details of Stage 2)

The goals of participation of societal stakeholders differ between the stages. During Stage 1, they are "Empowered" (see Table 7.1). At the Interface, societal stakeholders will likely need to form alliances with stakeholders from Stage 2 with whom they will "Collaborate." Finally, they will be "Informed" about the ongoing activities at Stage 2. Eventually, the draft standard will be fed back to Stage 1, for approval or possible requests for modification.

The process outlined above will necessitate a number of additional management activities.

7.5 Establish or Identify the Operating Entity and Its Process

Unless Stage 1 is directly associated with an SSO (which appears to be unlikely), it will need an entity that manages and operates it. SSCs are a global development and highly likely to become of increasing economic interest.[15] This almost mandates a global, not-for-profit entity to operate this process. This might be an entity specifically established for this purpose or an existing entity like, for instance, the G20 Global Smart Cities Alliance on Technology Governance.

In any case, transparency, openness, and inclusiveness will have to be the overriding characteristics of the Stage 1 process, along with due process; national and company interests must not play any decisive role. Krechmer (2009) identifies

[15] According to a report by Research and Markets from 2021, the Global Smart Cities Market is anticipated to grow from USD457 billion in 2021 to USD873.7 billion by 2026.

ten criteria for open standards (and the underlying processes; Stage 2). In addition to "due process" and "consensus," these criteria include, e.g., that all may participate and that everyone may access and use the documents produced. Jakobs (2016) adds another six criteria. These are mainly supposed to reveal any potential, e.g., economic or political interests (on the side of the stakeholders and/or the SSO(s) involved) that may influence the standardization process and include:

- Open rules: The SSOs' bylaws, regulations, etc. are publicly available.
- Transparent membership: names and affiliations of the WG members are known.
- Open roles: names and affiliations of those holding leadership roles are made public.
- Open work programs: which SSO is doing what.
- Open links: which SSO co-operates with whom and how.
- Open history: All SSOs associated with a standard are known.

These criteria as well originally refer to the "normal" standards setting process (i.e., Stage 2) but may also be applied to a process at Stage 1.

7.6 Select SSO(s)

Picking the most suitable SSO for a given task is not a trivial endeavor. Due to the absence of a coordinating entity, individual SSOs may co-operate, compete, or just ignore each other; activities of individual SSOs may well overlap. Accordingly, technical appropriateness and proven competence in the area in which new standards are to be developed may not be sufficient selection criteria.

Each individual SSO has its own rules, guidelines, and bylaws that govern all aspects of its standards setting process (i.e., Stage 2). Individual SSOs' characteristics differ widely in terms of, e.g., openness, power distribution, means for decision-making, and obtaining and/or increasing power. The respective membership base will also be of interest; it will be beneficial if business partners (e.g., suppliers) are involved, especially if they hold any leading positions.

The ease (or lack thereof) with which new work items may be proposed and initiated (and by whom), and the boundary conditions that apply are further important aspects. Specifically, the willingness to support a two-stage process and to implement the necessary interface on the SSO side will need to be established.

7.7 Implement and Manage Interface Between Stages

This is perhaps the most difficult part. The technical and the non-technical side will need to communicate here. Societal, environmental, etc. requirements will have to be conveyed to the technical process and technical boundary conditions and potential limitations in the opposite direction. This implies that ideally individuals

with expertise in and experience with both sides (the technical and the non-technical) should communicate to avoid friction losses. These people would act as boundary spanners. This concept has originally emerged from the field of innovation studies (see, e.g., Tushman 1977) but may also be applied to standardization (Dokko and Rosenkopf 2010). To paraphrase Tushman (1977): boundary spanners serve the need of one stage of the standardization process to gather information from and transmit information to another stage.

7.8 Form Alliances

History shows that in very many cases, strong alliances (between, e.g., manufacturers, users, distributors, complementors, etc.) have been crucial for the success of standardization initiatives (see, e.g., Cusumano et al. (1992) and den Uijl and de Vries (2013) for two of the most prominent cases).

In this particular case, such alliances will need to be formed primarily between smart city authorities (Stage 1) on the one hand and, e.g., suppliers, complementors, and service providers (Stage 2) on the other. Such alliances will complement the activities of the boundary spanners (see above).

7.9 Some Brief Concluding Remarks

Smart systems are here to stay. The impact they are highly likely to exert will be tremendous, for businesses, governments, and citizens alike. The nature of this impact, however, still remains largely unclear—we do not have a crystal ball. To be able to eventually reap the potential benefits smart systems offer, their designers need to work hand in hand not just with their prospective (commercial) users (which is frequently the case in "traditional" ICT standards setting) but also with policymakers and legislators (from different levels) as well as with those whose voices are not normally heard during technology development, standardization, and implementation but who stand to benefit—or suffer—the most from smart technologies: consumers, citizens, workers, and the organizational stakeholders who represent certain groups of them.

Despite relevant ongoing developments, "responsible innovation" remains the exception, certainly in the private sector. During its implementation phase, a technology may well be adapted to its environment (and vice versa), but it can no longer be fundamentally changed. This leaves the standardization process as the one platform where societal stakeholders stand a chance to contribute their expertise to an early stage of technical development. To actually be able to do so, however, the current standardization system will need to be modified, in terms of both its structure and its processes. This chapter has discussed some potential changes, the

implementation of which would support the development of technologies that are beneficial for society, as opposed to those which benefit primarily large companies.

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