

Summary statement

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- Standardisation is a costly, time-consuming process which results in the publishing of documents that ensure compatibility between (among others) research outputs and operating procedures once their adoption is widespread enough to generate a critical mass.
- Standardisation has the potential of significantly improving the sustainability of the EU's R&D funding. This is because well-implemented standards ensure market compatibility for project outputs, and thus reduce the barriers to entry that potential clients (read: practitioner organisations) associate with adoption.
- The on-the-ground implementation of newly adopted standards has the tendency of incurring significant short-term costs. Because there is relatively little knowledge of the long-term benefits of adopting such standards, this means that standards whose implementation is not enshrined in law and/or otherwise incentivised through top-down measures risks failing to accumulate the critical mass necessary for success.
- Actors involved in the execution of EU research projects generally have superficial knowledge of standards, and base their activities largely on information that is outlined in their projects' ToRs. Mandating the inclusion of national standardisation bodies (NSBs) in the consortia can significantly improve projects' ability to correct for standards not involved in the ToR, and has been shown to increase the degree to which consortia engage in standardisation-related activities. This results in products which are generally more mature when viewed through the lens of standardisation.
- SMEs are generally reluctant to engage with and/or adopt standards. This constitutes a complex problem which derives from the combination of the high costs associated with implementing new standards and the (general) lack of recognition within these organisations that standards pay-off in the long term. Given SMEs' commercial mindset, this requires (among others) the communication of a clear commitment to maintaining current standards from within the public sector.

Introduction

This CoU brief summarises the topic of standardisation and relevant EU-funded projects that participated in the 12th Meeting of the Community of Users (CoU) on Secure, Safe and Resilient Societies that took place 3-4 December 2018 at the BAO convention centre in Brussels.

The Community of Users is a DG Home initiative that aims to improve information transfer of research outputs and their usability by different categories of stakeholders. During the meetings and thematic workshops, policy updates and information about H2020 projects are provided and interactive discussions are facilitated to ensure that solutions and tools resulting from research will reach users.

Scope & Relevance

For most people today, the notion that one's life might be uprooted – that one might lose family and/or loved ones (or property) – to a natural or man-made crisis, is increasingly unthinkable. Even as they are confronted with overarching (and potentially catastrophic) trends such as globalisation and climate change, EU citizens are increasingly taking for granted (and, in the process, demanding) that their living situations be characterized by a high degree of security. The negative effects of modern threats (climate change and migration among them) cannot realistically be contained within national borders, and necessitate a high degree of Member State cooperation to prevent, mitigate, and recover from.

Though increasingly seamless, cooperation between EU Member States continues to present a serious challenge to the EU's collective ability to respond to crises (both natural and manmade). The vast degree of differentiation between national crisis management systems, combined with extremely diverse makeup of relevant stakeholders at the national level (whether practitioner or other) and significant differences in standard operating procedures (SOPs) between Member State agencies (and even within Member States themselves) means that the barriers to effective cooperation continue to constitute a significant obstacle to scale.

Standardisation has the potential of being an effective tool for alleviating the aforementioned cooperation problem. Standards are documents which outline specifications, guidelines, or characteristics that can be used to ensure that materials, products, processes, and services are fit for their purpose. They are concrete and shared outcomes which are workable for all stakeholders that affect them, and should – to maximise uptake – be adopted by consensus. In concrete terms, standardisation as a tool can be used to harmonize operational processes, increase the returns on investment (ROIs) of research and development (R&D) processes, ensure technical compatibility and/or interoperability by design, improve cost-effectiveness, and – in the process – reduce the barriers associated with interstate cooperation at the EU level.

Though standardisation is mainly a legislative process insofar as it results in a prescriptive document which a subscribing state can choose (or not – depending on implementation type) to adhere to, it is also – especially within the field of crisis management – a human process which requires a high degree of trust between stakeholder groups. This is because (regardless of how many standards are introduced to facilitate cooperation), such measures will not improve the EU's security situation if practitioners do not trust one-another enough to be able to work together effectively.

Current debates & stakeholder perspectives

This section describes why the topic is particularly important for each stakeholder group.

Practitioners

Depending on what is being standardised, standardisation has the potential of providing substantial benefits to stakeholders within the practitioner category. Standardisation that results in increased interoperability (whether technological or information-based) provides substantial operational benefits, and can significantly reduce the barriers to cooperating with other practitioner organisations and identifying threats and/or situations as they develop. Standardisation also has the potential of reducing the costs that practitioner organisations associate with the procurement of a new system because – once a standard is adopted and implemented – it allows increases the longevity (and modularity) of platforms¹. This principle can be clearly observed within national defence procurement, where systems are designed

to be compatible with existing platforms because the costs associated with replacing entire platforms would otherwise inhibit these organisations from improving their capabilities over time.

Practitioners also benefit greatly from efforts to introduce standards within other stakeholder groups (notably within industry and SMEs and within policymaking circles). The industry & SME and policymaker stakeholder categories respectively provide the technology which practitioners depend on (industry & SMEs) and construct the frameworks (policymakers) which defines standards that exist between countries and organisations (thus mitigating transactional barriers) and provide industry with incentives to ensure 'interoperability by design' (policymaking circles). From a practitioner perspective, the benefits associated with the aforementioned processes ranges from increased ease of procurement to increased operational effectiveness and/or agility. With regards to benefits associated with ease of procurement, this has to do with the fact

¹ It should be noted that, while the pursuit of system interoperability may reduce costs in the long term, it also has the potential of increasing costs in the short term. In cases where new systems cannot be designed to integrate with legacy platforms, the adoption of a new technology and/or capability may require the adoption of a new platform. In these cases, the associated costs can be expected to be relatively high.

that the procurement of solutions which feature ‘interoperability by design’ reduces the need for first responder organisations to concern themselves with technological aspects of ensuring compatibility with other systems during the procurement cycle. Increases in operational effectiveness and/or agility derive from the fact that the increases in information exchange between industry & SMEs and policymakers (and, more importantly, improving the climate for information exchange & interoperability as a whole) which can be derived from standardisation have the potential of providing first responders with a wealth of data that can be integrated into operational processes.

The benefits of standardisation notwithstanding, practitioners can also be adversely affected by the introduction of standards. This is particularly the case with standards in which practitioner organisations are not consulted during the formulation process, as this can result in the standards which fail to adequately correct for practitioner needs and/or which impact them negatively. Standards’ ability to negatively impact practitioners derives from the fact that they often influence the behaviour of several stakeholder categories, meaning that – once implemented – they result in system-wide changes which (depending on the standard in question) may be incompatible with practitioner operating procedures and/or which otherwise reduce operational capacity.

Industry & SMEs

Industry & SMEs play a central role within efforts surrounding standardisation. This is largely because this stakeholder category can weigh-in on the formulation of technical standards, and can (in doing so) push for technical interoperability by proposing practical implementation of innovative systems which contemplate ‘interoperability by design’. ‘Interoperability by design’ refers to the process of designing new systems with interoperability in mind. Depending on the product and/or system under development, this means developing it to be compatible with standards and/or existing systems with which it may need to interface during its life cycle.

While policymaking and practitioner circles can contribute to ensuring ‘interoperability by design’ by (among others) stipulating it as a requirement within procurement processes and by defining (and enforcing) standards (whether linguistic, cultural, legal, technical, etc.), industry actors also have a part to play. While it can be tempting to design systems which foster client dependence on the supplier (interoperability – or the domination thereof – can be a source of competition), practitioners are best served by products which a.) make use of open source (read: modular, modifiable) software, and b.) operate (where possible) within virtual environments.

Policy

Stakeholders within the policymaking category preside over several tools which can contribute to the realisation of effective standards. First and foremost – in allocating research budgets and in defining the parameters of procurement contract – policymakers

can leverage pre-commercial procurement processes (PCP) to ensure that the standards and/or technological readiness levels (TRLs) referred to within procurement notices are representative of practitioners’ future needs. This achieves the twin objectives of a.) ensuring that policymakers have enough information to judge whether or not tendered proposals adhere to the principle of ‘interoperability by design’ (this can be achieved by allocating resources towards research into future technological requirements, currently supported standards, etc.), and b.) ensuring that bids are awarded to contractors accordingly. Second, policymakers can design (and enforce) standards (whether technological or otherwise) to – wherever possible – ensure actors have a uniform understanding of and/or behaviour towards the world. Standards – particularly when they are designed in such a way that they are easier to adhere to than they are to diverge from – greatly increase the costs of engaging in R&D which does not pay lip service to the principle of ‘interoperability by design’. This is because successful standards inevitably aggregate a critical mass of users, thus effectively rendering divergence impractical.

Several policy initiatives and/or agencies relating to standardisation were discussed during the 12th CoU event on Secure, Safe and Resilient Societies that took place 3-4 December 2018 at the BAO convention centre in Brussels; namely:

- **CEN & CENELEC.** CEN & CENELEC catalyse business in Europe by removing trade barrier for European industry and consumers through the development of standards. It is a network of more than 2000 experts. CEN & CENELEC define a standard as a reference document that sets out technical specifications and that sets out the minimum requirements on the quality and/or performance on a product of service. Standards are developed with input from industry, consumer representatives, and SMEs. All standards are consensus based, which means that all committee members agree to implement them once they are established. Standards improve efficiency of key processes, facilitate systems integration and interoperability, and enable the drawing of comparisons between products. This allows users to better assess new products or services, structures the approach to developing new technologies and/or business models, and generally has the benefit of simplifying complex environments. Outside of ‘hard’ standards, CEN/CENELAC also publishes ‘lightweight’ deliverables such as technical specifications and workshop agreements (which are typically formulated by a limited constellation of stakeholders).
- **European Defence Agency (EDA).** The EDA maintains the European Defence Standards Reference System (EDSTAR), which contains references to “best practice” standards (identified on the basis of consensus between industry and government stakeholders) and “standard-like” specifications which Member States are encouraged to incorporate into their national procurement strategies. The EDSTAR is generated on the basis of the discussions conducted by an expert Group, which publishes reports periodically that outline recommendations – and the underlying rationale associated therewith – surrounding each of

the various technical domains identified within European defence operations. EDSTAR reports also provide advice regarding the most efficient way to apply the recommended standards.

- **CBRN Centres of Excellence (CoEs).** The CBRN CoE initiative is geared towards minimizing the likelihood of occurrence – and, if applicable, mitigating the impact of – CBRN events within the European neighbourhood. Given CBRN threats' tendency to spill across borders and/or to cause negative externalities which impact the European neighbourhood, the CBRN CoE project – which is spearheaded by the EC's DG DEVCO – is of high relevance to the EU's overall security. The initiative's relation to standardisation activities derives from the risk assessments which participating states conduct as part of their participation. These are geared towards identifying (among others) the likelihood that a CBRN incident might occur, the potential impact it might have, and its likely geographical and/or humanitarian scope. Risk assessments within the CBRN CoE initiative are conducted in accordance with a standardized methodology which is enshrined in the project guidelines. In the case of the CBRN CoE initiative, the use of such a standardized methodology adds value to European security by facilitating the collection of compatible results, and thus allow for the comparison of countries on the basis of uniform information format.

The EU's standardisation infrastructure derives from an expansive network of institutions and/or regulations. The STAIR4SECURITY programme provides a pre-standardisation mechanism for the evaluation and/or formulation of security-related standards, while projects such as ResiSTAND and institutions such as the EC DG JRC, the JRC DRMKC, and various ERNCIP thematic groups contribute to pre-normative standard evaluation. The formulation process is subsequently supported by CEN (more concretely, TC 391 on Societal and Citizen Security & WG3 on Crisis Management / Civil Protection), the CEN-CENELAC-ETSI Sector Forum on Smart and Sustainable Cities and Communities, and the CEN-CENELAC Security Sector Forum. The EU's activities regarding standardisation are conducted in accordance with the Annual Union Work Programme on Standardisation (AUWP).

Research

Stakeholders within the research category play (as outlined in previous paragraphs) an important role in informing the decisions of policymakers as they relate to standardisation by conducting pre-normative research. A concrete role for research stakeholders within standardisation ecosystem presents in these documents' formulation phase, during which stakeholders within the research category can contribute by analysing the (possible) negative externalities associated with the implementation of proposed sanctions.

Relevant projects & project hubs

Activities conducted as part of the following projects and/or organisations were outlined during the 12th CoU meeting:

- **BRIDGIT2** (December 2017 – December 2019; ongoing). The BRIDGIT 2 project gathered and analysed facts on the role of standardisation in innovation and research projects. The project's concrete aims were to create transparency in the process which goes into the standard formulation, evaluate the experience of stakeholder in order to extract best practices and lessons learned, and to demonstrate positive results and impact which can be associated with standardisation. The research team interviewed a wide range of stakeholders to arrive at its conclusions, including a total of 118 project representatives and 16 'demand side' experts (read: policy officers, project evaluators, etc.). Research results were validated through two in-person workshops, and will be transposed into a final report in the near future.
- **ERNICIP** (June 2017 – May 2019; ongoing). The ERNCIP project is currently being implemented by the Commission's Joint Research Center (JRC), and has been active for over 7 years. It is sponsored by the DGs HOME and CNECT. The primary aim of ERNCIP is to improve the detection of CBRN-E substances in Europe by enhanced cooperation among European research laboratories, advancing common technology standards or detection processes. More generally, it is geared towards

facilitating the creation of linkages between research and policy. As such, the project's deliverables consist of recommendations pertaining to the standardisation of research activities, recommendations pertaining to actions which support EU policy initiatives (gap analysis, input requirements, etc.), guidance of infra operators and protective security, and an online database of facilities with capabilities for testing security solutions (security related products). Given the project's wide scope, ERNCIP is divided into a number of thematic groups, each of which will undertake a pre-normative assessment to identify issues and options for harmonization. The thematic groups are chemical and biological risks to drinking water; detection of indoor airborne CB agents; detection of explosives and weapons in secure locations; protection of structures against explosive effects; radiological and nuclear threats; extended virtual fencing, and; cybersecurity. ERNCIP thematic groups are chaired by experts, but are staffed primarily by volunteers. The project has resulted in several deliverables which fall within the standardisation category. Most topically, it has produced the Introduction to the European IACS components Cybersecurity Certification Framework (ICCF), which is geared towards standardizing cybersecurity certification across EU agencies, and has provided input to various Commission regulations within the field of cybersecurity.

Possible synergies (and links to policies and practitioners' operations)

Within the field of standardisation, there are clear synergies between research outputs, practitioner needs, policymaker initiatives, and industry activities. Initiatives such as the International Forum to Advance First Responder Innovation (IFAFRI) – currently chaired by the European Commission's DG HOME – show clearly how research activities can bridge the gap between practitioner needs, limited policymaker knowledge, and industry activities, thus leading to common interoperable solutions.

Embedding research into a wider capability development process can also contribute to better streamlining the common needs of EU security practitioners and to developing innovative solutions which not only are interoperable by design, but which are also triggered by policy priorities, respond to critical and urgent operational needs, and show an adequate balance between cost and effectiveness.

For an overview of information exchange and interoperability-related projects funded under the Horizon 2020 framework prior to 2016, see section 9 (Horizontal issues) of **DG HOME, "Community of Users on Secure, Safe and Resilient Societies – Mapping Horizon 2020 and EU-funded Capacity-Building Projects under 2014-2017 Programmes," Working Paper (Brussels: European Commission, forthcoming)** The projects referenced within this section of the aforementioned document are universally geared towards tackling similar subjects as those discussed in this brief, and thus have the potential of exhibiting synergies with them.

Lessons learnt and challenges

A key lesson from the 12th CoU event on Secure, Safe and Resilient Societies is that the pre-standardisation and pre-normative phases, as well as the actual formulation phase, of the standard adoption process can benefit from a more holistic approach to stakeholder inclusion and engagement. This is not only because standards which lack input from key stakeholder categories (notably practitioners) are likely to result in negative externalities and/or be self-defeating, but because failure to include stakeholder often results in standards not being implemented throughout a system. Because the effectiveness of standards derives from their ability to generate a level playing field wherever they are applied, partial adoption significantly reduces their impact because it results in a greater – or, at the very least, a more pronounced – degree of fragmentation. The inclusion of all stakeholder groups also contributes to the process of building trust between the affected parties, and thus increases the likelihood that a.) the standard will be adhered to, and b.) relevant stakeholder groups will be willing to work together to implement it as intended.

Standards also take a long time and a lot of expert input to develop, and are costly as a result. Because of this, it is problematic that many stakeholders opt not to implement them not because over concerns relating to finances. The long-term benefits of adopting standards (particularly if their adoption is widespread) often exceed the short-term costs associated with implementing them, but stakeholders

involved in R&D and innovation (which are arguably vital to the process of streamlining the adoption of any technical and/or operational standards in practitioner organisations) tend to pay relatively little attention to engaging with them unless mandated to do so. This is particularly the case in SME organisations, which often do not have the overhead to allow for the redesigning of previously developed systems and/or products with an eye towards ensuring compliance with newly adopted standards.

In addition to these high-level observations, research conducted as part of the BRIDGIT2 project provides some useful insights into how EU contractors engage with standardisation. Perhaps most importantly, standardisation was found to play a central role in facilitating the post-project exploitation of R&D-based H2020 projects. Though H2020 contractors were found to have a general understanding of the role and benefits of standardisation, they often lacked knowledge of the resources, time, and expertise needed to address (formal) standardisation, and based their expectations vis-à-vis standardisation requirements mainly on text featured in their projects' terms of reference (ToR). Contractors also generally exhibited frustration at EU standards' inability to fluidly adapt to the needs of research projects, and resented EU proposal evaluators' general lack of training when it came to evaluating proposals' commitment to adhering to established standards.

Way forward

Observations from within the BRIDGIT2 project indicate that including EU research projects in the standard-shaping process helps to ensure not only that newly introduced standards do not clash with previous adopted ones, but also to facilitate the standard formulation process' collection of feedback from practitioner organisations. This is because many H2020 projects in the field of disaster risk management validate their research outputs through on-the-ground testing and/or through proactive stakeholder interaction, and can thus provide actionable insights into the practitioner perspective.

The BRIDGIT2 project also clearly outlined the importance of integrating national standardisation bodies (NSBs) in the European standardisation process; an outcome which can be partially achieved by providing research consortia with incentives to include NSBs within project ToRs. Projects which include NSBs have been observed as engaging more actively with issues relating to standardisation, and typically conduct more focused (and consistent) standardisation activities, with the result being that they also deliver deliverables which are more mature when viewed through the lens of European standardisation. This has multiple benefits for associated product partners, as it improves a project's

prospects of being commercialised (read: of achieving a degree of sustainability) because it reduces the barriers to entry from the practitioner perspective by ensuring project outputs are compatible with the market they are being developed for.

Addressing SMEs reluctance to engage with standards constitutes a complex problem, as it derives from these organisations' management priorities. The introduction of dedicated tools and funding to incentivise SME adoption of (and planning for) standards would partially address this issue, but – in the long run – it is likely that organisations such as these will need to undergo a mentality change. Given these organisations' typically commercial mindsets, this will necessitate educating these organisations on the long-term benefits associated with standardisation. Because the short-term costs associated with investing in the adoption of standards are significant, this requires (among others) the communication of a clear commitment to maintaining current standards from within the public sector.

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Related readings / publications

- J. E. Bruzdinski, J. Selby, and A. Tolk: Challenges to Modern Allied Force Acquisition, Integration, and Interoperability; MITRE Report, 2018, Released for unlimited distribution (Case-No. 18-1151).
- J. Selby, and A. Tolk: Interoperability Readiness Levels in Support of Operational Agility; MITRE Presentation, 2018, Released for unlimited distribution (Case-No. 17-3081-11).
- New European Interoperability Framework: Promoting seamless services and data flows for European public administrations, © European Union, 2017, SBN 978-92-79-63756-8.
- European Union: European Commission, Communication from the Commission to the European Parliament, the Council, the European economic and social committee and the Committee of the regions: European Interoperability Framework – Implementation Strategy, 23 March 2017, COM(2017) 134.
- European Union: Factsheet, Interoperability of EU Information systems.
- European Union: European Commission, Communication from the Commission to the European Parliament and the Council: Stronger and Smarter Information Systems for Borders and Security, 6 April 2016, COM(2016) 205.
- European Union: European Commission, Communication from the Commission to the European Parliament, the European Council and the Council: Seventh progress report towards an effective and genuine Security Union, 16 May 2017, COM(2017) 261.

Forthcoming CoU events & other related events

- ETSI Security Week 2019; 17 – 21 June 2019, Sophia-Antipolis.
- 14th CoU event, 16 – 20 September 2019, Brussels;