

### **Proposition 1:**

#### **Increased importance of Corporate Standardisation Management will lead to better trained delegates to SSOs with more diverse backgrounds and expertise (Chapter 3).**

Standards are made by people. These people may follow corporate rules or may act according to their own norms and preferences (and may have to bear the consequences; see also sections 3.4.2 and 3.5.3). The expected growing complexity especially of smart systems' standardisation is most likely to increase the diversity of participating stakeholders and of the associated expertise and interests represented in the WGs (see sect. 6.6.1; and also in other entities). This variety will further the importance of delegates' soft skills (on top of the necessary professional expertise). Specifically, these will include communication and negotiation skills as well as the ability (and willingness) to see beyond one's own nose. This, in turn, will enable delegates to act as boundary spanners and to collect social capital (see sect. 3.4.2). The former will directly benefit the process and both will be of interest to the respective employer. Accordingly, it may be expected that a more powerful and better visible CSM department will invest heavily in additional training efforts to this end and/or will try to hire well-known standards setters who already have these abilities (this happened before; see sect. 6.3).

### **Proposition 2:**

#### **Growing economic interest in smart systems standardisation will lead to a higher number of inter-firm alliances in this field (Chapters 5 & 6).**

Overall, inter-company relations in smart systems standardisation will be characterised by both co-operation and competition. Co-operation will be high on the agenda of many or most firms. This may at least in part be attributed to lessons learned from history<sup>1</sup>. Standards wars/battles/skirmishes have been a constant feature in (ICT) standardisation for decades<sup>2</sup>. They have mostly been fought in the market, but some started during standardisation and took place between standards WGs<sup>3</sup>. Of course, the market also played an important role in these cases, but the scenario was different. One of the important lessons to be learnt from these past events is the decisive role of an adequate coalition of firms that support a standard, including providers of complementing products or services and users<sup>4,5</sup>. Smart systems' main characteristic is the integration of real-world artefacts and systems with those from the cyber-world. Accordingly, alliances will have to have members from very different sectors (including e.g. ICT and various engineering disciplines). Moreover, not least for credibility and acceptability reasons, societal stakeholders will also need to be part of such alliances. Accordingly, these alliances' membership diversity will considerably exceed that of alliances in other sectors (see also sect. 5.8.1).

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<sup>1</sup> History tends to repeat itself; see [http://oer2go.org:81/wikipedia\\_en\\_all\\_novid\\_2017-08/A/Historic\\_recurrence.html](http://oer2go.org:81/wikipedia_en_all_novid_2017-08/A/Historic_recurrence.html) or e.g. [Trompf, 1979].

<sup>2</sup> Including e.g. BetaMax vs. VHS, BluRay vs. HD-DVD, Ethernet vs. Token Ring vs. Token Bus, ISO/OSI vs. the IETF's TCP/IP or WiFi vs. HomeRF and HiperLAN; see also sect. 4.2 and P4 above.

<sup>3</sup> Ethernet, Token Ring and Token Bus were even standardised in parallel by the same SSO.

<sup>4</sup> See e.g. [Shapiro & Varian, 1999], [v.d.Kaa et al., 2011].

<sup>5</sup> The case of Blu-ray vs. HD-DVD (see also sect. 4.2) highlights that lessons may indeed be learned from history – Sony didn't repeat its mistakes from the VHS (although they had to be pushed a bit to do what was good for them) – Betamax war and built a strong coalition, which eventually secured victory (see e.g. [den Uijl & de Vries, 2013] or [Gallagher, 2012]).

### **Proposition 3:**

**The outcomes of extensive standardisation activities will lead to a lack of alignment and will establish ‘standards silos’ (Chapters 4 & 5).**

Notwithstanding the above, the high economic stakes<sup>6</sup>, but also the complexity of many standards for smart systems (especially for smart applications) and the equally complex landscape of contributing SSOs increase the likelihood of the development of different and potentially competing standards. This will to no small part be done through initiatives aiming to push certain technologies or frameworks<sup>7</sup>. In addition, powerful players like GAFAM (Google, Amazon, Facebook, Apple and Microsoft) may try to push their respective proprietary technologies, relying on their powerful market position. This task of any such initiative or company will benefit from the current lack of co-ordination between the multitude of SSOs active in smart systems standardisation (see sect. 5.4). To make things worse, smart systems, like all ICT-based ones, are characterised by strong network effects<sup>8</sup>. Taken together, this suggests a high likelihood of competing future standardisation activities. This outcome may be labelled ‘standards war’, although it will not be fought in the market, but in the standardisation arena<sup>9</sup>.

### **Proposition 4:**

**More widespread smart systems standardisation will lead to more mechanisms for vertical co-operation and co-ordination between the relevant SSOs (Chapters 2 & 5).**

No single SSO will be in a position to develop all standards for smart systems. Some will focus on certain applications, others will work on the underlying communication infrastructure and yet others on the associated objectives and policies. Yet, to avoid application silos, interoperability will be crucial, both vertically (between infrastructure and application) and horizontally (between applications; see also sects. 5.4 and 5.5). P5 suggests that achieving horizontal interoperability will turn out to be problematic (and may eventually involve the deployment of gateways<sup>10</sup>). To enable vertical interoperability some form of co-ordination and co-operation of the SSOs involved will be essential.

### **Proposition 5:**

**The growing impact of non-technical factors (e.g. cultural, legal) on smart systems standardisation will shift more work to national and regional SSOs (Chapters 3 & 5).**

By their very nature, standards for ICT and smart systems are international in scope. However, due to their enormous non-technical ramifications especially the latter will be subject to a plethora of national/regional particularities. These include legislation and regulation<sup>11</sup>, but also cultural characteristics (see e.g. sect. 3.3.1). Notably, the legal and

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<sup>6</sup> See e.g. the appropriately entitled paper ‘IT Standardization: The Billion Dollar Strategy’ [Hurd & Isaak, 2009].

<sup>7</sup> Like e.g. the Industrial Internet Reference Architecture (IIRA) and the Reference Architecture Model for Industrie 4.0 (RAMI 4.0); the former is driven by industry, the latter by government.

<sup>8</sup> “... standards wars are unique to markets with powerful positive feedback based on strong network effects.” [Shapiro & Varian, 1999, p.14]

<sup>9</sup> According to Shapiro & Varian [1999, p.10], a standards more is not necessarily “confined to competition in the marketplace”, but may be “extended to the courtroom, the political arena, public relations, and academia”.

<sup>10</sup> This is not a new phenomenon; see e.g. [Hanseth, 2001].

<sup>11</sup> See also [ETSI, 2020].

regulatory aspects will be further reinforced by the close links that exist between smart systems on the one hand and Artificial Intelligence on the other; AI still being a largely unregulated technology<sup>12</sup>. In particular, security, privacy and trust are of utmost importance for smart systems<sup>13</sup>. After all, they (will) collect and analyse unprecedented volumes of data and their wide acceptance thus will depend on adequate security and privacy mechanisms (see also sect. 5.6.3)<sup>14</sup>. Yet, although ‘privacy by design’<sup>15</sup> has become a well-established concept, not least promoted by the European Commission<sup>16</sup>, standardisation to this end is largely limited to the communication infrastructure<sup>17</sup>. However, the international nature of smart systems standards will have additional ramifications. Just like legislation differs between nations and regions, so do societal norms and values. Accordingly, these different norms and values will also exert different influences on standardisation<sup>18</sup>. This may or may not be desired and desirable, but it has to be acknowledged, also by CSM. Given the national/regional nature of these efforts, it may be expected that equally national/regional standardisation activities will become more important and prominent. This will hold especially for those countries that like to emphasise their respective legal systems and national interests.

### **Proposition 6:**

#### **To do interdisciplinary research is not such a good idea if you strive for a career in academia.**

Communication problems, individual disciplines’ tunnel-vision, evaluations typically from a mono-disciplinary point of view; seen that at both European and national level.

*“A main obstacle towards interdisciplinary research careers is therefore the fact that academia and reward systems are still largely organized along disciplinary divides [12]. Because interdisciplinary research may compromise an individual researcher’s progress within her/his discipline, this obstacle may create a risk for young researchers with less-secure academic positions [23,24]. This obstacle can become prohibitive if their peers put a high value on disciplinary research output.”*

Bridle, H., Vrieling, A., Cardillo, M., Araya, Y., & Hinojosa, L. (2013). Preparing for an interdisciplinary future: A perspective from early-career researchers. *Futures*, 53, 22-32.

*“However, epistemological differences between disciplines often result in incompatibilities of method and approach, despite the existence of common goals (Campbell 2005; Max-Neef*

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<sup>12</sup> See e.g. [Scherer, 2015], [Čerka et al., 2015] and [Buiten, 2019] for accounts of the different legal issues to be associated with AI.

<sup>13</sup> They “*must be a fundamental priority*” according to [Atlam & Wills, 2020, p. 123]

<sup>14</sup> In 2018, the European Data Protection Supervisor called upon European Parliament, the Council and the European Commission “*to support privacy when adapting or creating legal frameworks which influence the design of technology, by increasing incentives and substantiating obligations, including appropriate liability rules, to integrate privacy by design in products and services, e.g. in the areas of transport, energy, finance, smart cities and IoT*” [EDPS, 2018, p.21]. “Products and services” may easily be replaced or amended by “standards”.

<sup>15</sup> See e.g. [Langheinrich, 2001].

<sup>16</sup> The General Data Protection Regulation (GDPR; notably Article 25) makes data protection by design a legal obligation for data controllers and processors.

<sup>17</sup> See e.g. [Hernandez-Ramos, et al., 2020]. The ISO 27000 series on ‘Information Security Management Systems’ is a notable exception.

<sup>18</sup> “*Standards and standard-development processes also reflect the values prevalent in society*” [Kreab, 2020 p.6].

2005; Kueffer et al. 2007; MacMynowski 2007). Interdisciplinary research therefore faces a number of cultural and practical barriers (Bruce et al. 2004; Lele & Norgaard 2005; McWilliam et al. 2008), in spite of concerted attempts to address these issues (Heberlein 1988; Klein 1990; Campbell 2005). Such research remains notoriously difficult to assess by conventional peer-review and is believed to present fewer publishing opportunities in high-ranked refereed journals (Turner & Carpenter 1999; Rhoten & Parker 2004; Tress et al. 2005a). As a result, the dynamism and creativity required by governments and funding agencies has been accompanied by the perception that the results of interdisciplinary research are often ‘compromised’ scientifically, hence of lower quality, and are marginalized by traditional disciplines (Mansilla 2006; Lowe & Phillipson 2009).”

Hicks, C. C., Fitzsimmons, C., & Polunin, N. V. (2010). Interdisciplinarity in the environmental sciences: barriers and frontiers. *Environmental Conservation*, 37(4), 464-477.

### **Proposition 7:**

**The outcome of the review process of a paper submitted for a conference or a journal is not necessarily related to this paper’s quality.**

Level of evaluators’ expertise unknown, time constraints may stand in the way of a thorough reviewing, reviews done by (PhD) students, problems with multi-/inter-disciplinarity.

*“When evaluating a study (e.g., for a journal or press) or a candidate (e.g., for a job, fellowship, or grant), opinions among social scientists are apt to vary. Reviews of the same manuscript are often at odds with one another; reviews of the same applicant, e.g., by members of a search committee, are often at odds with one another. This is why we often cite the “luck of the draw” when a paper, grant/fellowship proposal, or a job application is accepted or rejected.”*

Gerring, John, Sebastian Karcher, and Brendan Apfeld. 2020. “Impact Metrics.” In *The Production of Knowledge: Enhancing Progress in Social Science*, edited by Colin Elman, James Mahoney, and John Gerring, 371–400. *Strategies for Social Inquiry*. Cambridge: Cambridge University Press.

*“So, the evidence is that if reviewers are asked to give an opinion on whether or not a paper should be published they agree only slightly more than they would be expected to agree by chance.”*

Smith, R. (2006). Peer review: a flawed process at the heart of science and journals. *Journal of the royal society of medicine*, 99(4), 178-182.

*“The unreliability of the peer review process in the two conferences we studied means that the process is little better than chance from the point of view of recommending acceptance or rejection of papers.”*

Wood, M., Roberts, M., & Howell, B. (2004). The reliability of peer reviews of papers on information systems. *Journal of Information Science*, 30(1), 2-11.

*“It is known that, to various degrees, factors, such as author nationality, prestige of institutional affiliation, reviewer and nationality, gender, research discipline, confirmation bias and publication bias, all affect reviewer impartiality in various ways .....”*

Tennant, J. P., & Ross-Hellauer, T. (2020). The limitations to our understanding of peer review. *Research Integrity and Peer Review*, 5(1), 1-14.

*“Peer review is prejudiced, capricious, inefficient, ineffective, and generally unscientific.”*

Ralph, P. (2016). Practical suggestions for improving scholarly peer review quality and reducing cycle times. *Communications of the association for information systems*, 38(1), 13.

### **Proposition 8:**

**The quantification of research output triggers calculative behaviour of both authors and search committees.**

*“Gaming is likely to arise with respect to any metric that is used for purposes of evaluation. If the metric is quantity (number of published papers), canny scholars will divide up their publishing efforts into “minimal publishing units” or re-publish the same ideas in multiple venues (first in a peer review article, then in a book, and subsequently in edited volumes).”*

Gerring, John, Sebastian Karcher, and Brendan Apfeld. 2020. “Impact Metrics.” In *The Production of Knowledge: Enhancing Progress in Social Science*, edited by Colin Elman, James Mahoney, and John Gerring, 371–400. *Strategies for Social Inquiry*. Cambridge: Cambridge University Press.

*“Berufungskommissionen [stützen sich] oft auf quantitative Indikatoren wie die Anzahl der Publikationen oder den h- Index. Diese scheinbar objektiven Kriterien benachteiligen jedoch implizit Wissenschaftler\*innen mit unkonventionellen Laufbahnen oder familiären Verpflichtungen.”*

Witzig, V., & Seyfarth, F. (2020). Exzellenz, Diversität oder Effizienz? Implicit bias in Berufungsverfahren als Zielkonflikte sozialer Praktiken. *Zeitschrift für Hochschulentwicklung*, 15(3), 391-411.

*“... weight given in academic institutions to the quantity of publications due to the funding provided based on this output, ...”*

Davidovitch, N., & Eckhaus, E. (2020). Performance Measures of the Academic Managerial Spine. *European Journal of Educational Sciences*, 7(4), 111-130.

### **Proposition 9:**

**At least in wealthier regions of the world the proliferation of online conferences with regional ‘life hubs’ will boost national/regional co-operations (between those who meet in person at these events); the number of truly global co-operations will decrease (due to the overall events’ online-characteristic).**

*“It is also possible to combine a virtual interface with regional conference hubs. This concept is based on the idea of a scientific association or society convening at multiple sites, allowing for in-person sessions and workshops. At the same time, digital links between the regional sites would allow all attendants to participate in major events (such as keynote). In November 2019, for example, talks at a meeting organized by the European Biological Rhythms Society were broadcast from Munich to five major hubs and 69 other sites around the world. The Society for Cultural Anthropology took a similar approach when organizing the Displacements conference in 2018, and increased the number of attendees by a factor of six compared with previous years. A second version of this conference, Distribute 2020, will take place in early May.”*

*“Decentralized big conferences. Creating regional conference hubs that are reachable by more sustainable modes of transport is a promising and less radical alternative that still guarantees face-to-face networking. In this setting, intra-institutional, local or national collaborations could be formed.”*

Haage, V. (2020). Research Culture: A survey of travel behaviour among scientists in Germany and the potential for change. *Elife*, 9, e56765.

*“On average (relative to a baseline of 50 on a scale from 1 to 100), respondents were positively inclined toward collocating small workshops with large conferences (mean = 66.7, 95% CI [64.3, 69.0]), encouraging regional conferences (mean = 61.1, 95% CI [58.6, 63.6]), ..... Attitudes were also positive toward hybrid virtual/in-person conferences (mean = 59.4, 95% CI [56.8, 62.0]), international conferences held at multiple satellite locations (mean = 57.4, 95% CI [55.0, 59.8]) ....”*

Rissman, L., & Jacobs, C. (2020). Responding to the Climate Crisis: The Importance of Virtual Conferencing Post-Pandemic. *Collabra: Psychology*, 6(1).

*“To illustrate, again consider ICCB 2017. Using the multilateral hub and node model, the primary hub would be in Colombia and additional hubs would be in the 6 other regional sections of the Society of Conservation Biology (SCB). Node locations would be chosen depending on accessibility to the hub in each regional section. The hubs would facilitate international networking and in-person presentations, whereas the nodes would provide regional networking and internet access for virtual participation.”*

Fraser, H., Soanes, K., Jones, S. A., Jones, C. S., & Malishev, M. (2017). The value of virtual conferencing for ecology and conservation. *Conservation Biology*, 31(3), 540-546.

### **Proposition 10:**

**Charlemagne may not only be dubbed ‘Father of Europe’ but also ‘Father of the National Standards Organisations’.**

- *“... an interest in standardizing only in relation to essential, and broadly defined, issues, and an approach predicated on variable means.”* (p. 300).
- *“... governance defined by minimal standardization, extensive centralization, local particularity, and frequent contact with the king.”* (p. 298)
- *“This willingness to recognize limits of possibility and the persistence of local particularity constitutes the second main limit to standardization in Charlemagne’s reign.”* (p. 302).

Davis, J. R. (2015). *Charlemagne’s practice of empire*. Cambridge University Press.

### **Proposition 11**

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