NCPI WORKSHOPS

Frameworks, Standards and Guidance

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WORKSHOP OUTLINE

Frameworks, Standards and Guidance

Frameworks, standards and guidance are critical for organisations to have the necessary support and confidence in available systems and infrastructure.

The NCPI landscape is currently fragmented and in the early stages of establishing a joined up understanding. Critically in understanding what infrastructure components are available today and expected components to be built upon for cyber-physical systems and applications.

This event explored the top-level categories through discussions for this space to capture what needs to happen within this field to both understand where early-adopters can get started whilst articulating further afield medium-term milestones to head towards.

The workshop was opened and facilitated by Jonathan Eyre, High Value Manufacturing Catapult, before having two hosted and structured roundtable sessions.

The first roundtable session was opened with a presentation by Dan Rossiter on behalf of both BSI and nima, facilitating discussions throughout the morning. Brian Bishop opened the afternoon discussions on behalf of the Open Connectivity Foundation (OCF).

NCPI Workshop on Key Challenges

Hosted at The National Composites Centre, Bristol

Agenda, 10th July

10:00 Opening remarks

10.15 Roundtable session 1 (BSI & nima - Standards and Industrial Guidance)
Dan Rossiter, British Standards Institute

12:00 Lunch

12:45 Roundtable session 2 (Open Connectivity Foundation – Standards, Frameworks and Best Practices)
Brian Bishop, Director & President of Open Connectivity Foundation

14:30 Room discussion – outcomes and next steps

WORKSHOP OUTPUT

NCPI stakeholders collectively grouped recommendations to achieve key outputs

Roundtable findings were recorded digitally across all tables, with a nominated person at each table makings sure findings were being recorded.

Two hosted structured roundtable sessions were led by the invited keynote specialists to lead into the discussions. Both enabled significant thoughts and reflections to be captured by attendees from their respective areas to convene current landscape understanding to produce key recommendations needed for cyber-physical infrastructure.

A final session was facilitated by Jonathan Eyre, HVMC, clustering findings and recommendations from across the day. This produced a set of top-level recommendations for DSIT.

In summary, the attendees representing the NCPI ecosystem recognised the nascent status of the infrastructure today, with a need for establishing the basic principles, guidelines, frameworks for prior to market acceptance as the dominate mechanism for business. Once approaches are proven within living labs and

Innovation Maturity

The ecosystem of NCPI is seeing early adoption with a shift setting in in for understanding how the future infrastructure will be used

FRAMEWORKS, STANDARDS AND GUIDANCE ISSUES

Why frameworks, standards and guidance matter

Frameworks, standards, and guidance underpin trust, excellence and positive change across industries, ultimately benefiting society. For NCPI, resilient, interoperable, and scalable infrastructure relies on common language and approaches for seamless component integration.

Maturity in best practices, frameworks, standards and regulations empower organisations to have strategic direction and increased market confidence with reduced risk. These structured approaches prevent fragmentation by driving consistency and reliability in the infrastructure that underpins business functions and economic value.

Issues highlighted in the roundtable sessions

- The level of maturity within the ecosystem is spread across earlier stages where key aspects, such as formal methods for querying over trust and ethics, are at the beginning of maturity.

- There was clarity lacking on ownership and oversight of infrastructure environments, which obfuscates coordination across diverse domains when considering multi-tenancy and multi-domain sharing mechanisms.

- Standardised vocabulary is essential, particularly for governance, ethics, trust, and security terms. Clearly defined roles and responsibilities of the infrastructure is key to ensure effective governance. A taxonomic framework of components, especially regarding organisational capabilities and maturity levels for an ecosystem is needed.

- Accessible tools and sandboxes with clear guidance is necessary to facilitate widespread adoption of regulated infrastructure, in particular towards areas highlighted by attendees such as asset ownership, data-sharing mechanisms, and liability management.

ROUNDTABLE VIEWS
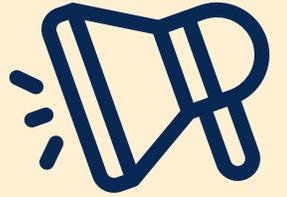
"NCPI is at the start of the innovation curve with early leadership being shown."

Innovation Curve

"The current ecosystem lacks sufficient availability and adoption of guidance and standards, particularly in governance, ethics and trust approaches."

Standards Deficiency

"Regulation has struggled to keep up with technology, creating gaps in their ability to enforce and easily prove compliance to establish trust."

Regulatory Trust

"Innovation must have early engagement with standards bodies to ensure standards can be developed, but only once value is proven."

Standards Engagement

"Frameworks, standards and guidance can be contradictory delaying innovation. Having interoperability between everything would enable that analysis."

Fragmented Frameworks

"A consortium-led approach, chaired by end users, balances the needs of industry, government and academia."

Balancing Standard- Setting

ROUNDTABLE INSIGHTS
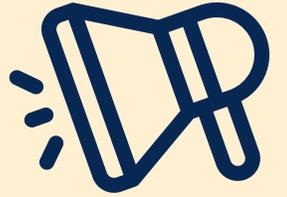
"Regulatory frameworks must be updated to reduce adoption barriers and increase ease of assessing compliance."

Regulatory
Modernisation

"Cross-sectoral knowledge transfer should be actively encouraged through case studies to accelerate innovation."

Cross-Sector
Learning

"Standards should be made once value has been proven with engagement across a wide range of stakeholders to ensure a balance view set."

Consortium
Approach

"Clear vocabulary for all areas must be established, re-using where possible, to create effective communication and understanding."

Communicati
on

"Cyber-Physical Infrastructure must be modularised that promotes flexibility towards interoperability to establish vendor neutrality."

Modularity and
Interoperability

"Pilot projects backed by government support must demonstrate the effectiveness of new standards, driving broader industrial adoption."

Pilot
Projects

CONSIDERATIONS

Considerations revolved around the positioning of the ecosystem based on the **innovation S-curve** in the context of **standards and interconnectedness of industry, academia, government with standards, governance and regulation** within this landscape. The ecosystem is **spread across early maturity** across different domains. **Governance, trust, and ethics are immature** with **use cases needing clearer definition** to understand both sector-specific needs for data sharing and innovation and the comparison to today's business models. Standardisation when value has been proven is crucial to enhance ecosystem capabilities and ensure direction is given to organisations to have trust in the market. Clarity of the **ecosystem ownership and oversight** was not yet understood for coordination across multiple sectors, and in particular technology such as digital twins.

Early language is already being used, such as federation, resilience and distributed data that were not all understood, but **essential for governance, ethics and trust**. Defining roles, responsibilities, security models, are critical to ensure effective governance. Having both of these areas formally captured both across organisational maturity and collective landscape maturity will accelerate the future market. **Case studies** are often looked towards as guidance, however within the context of NCPI, they **must transcend vendor marketing and focus on real-world applications** and lessons learned. In addition, they must be **sector agnostic where possible to enable adoption**. Failures and limitations have to be captured to ensure pitfalls and opportunities for improvement are understood.

Standards bodies and produced guidance must be **engaged early alongside innovators to address distinct challenges**, which in turn must influence policy and interoperability. Current gaps were seen around vendor neutrality and a lack of national guidance within NCPI due to its early growing stage. Further robust frameworks required to support the innovation to ensure market opportunities are accessible. Organisations also need to engage with standards bodies earlier to ensure they are based on evolving best practices and real-world problems, with many standards already available that can be leveraged. **The key challenge is understanding which standards are relevant and ensuring they are communicated effectively across the system.**

Adoption was highlighted several times, with clear guidelines on asset ownership (physical and data), data-sharing mechanisms, and liability management required. Government mandates for vendor neutrality and achieving modular solution are necessary. These should be demonstrated first through **pilot projects to encourage industrial adoption and compliance within this market** with **supporting resource for knowledge management and education** to promote best practices.

RECOMMENDATIONS

Guidance where possible and standardise when value is proven

Outline recommendations from the workshop to the Department for Science, Innovation and Technology (DSIT), for further consideration through interviews.

NCPI is at the early stages of its innovation lifecycle building on the significant advances across physical infrastructure, cyber-physical systems and distributed systems such as the internet.

Ongoing convening of stakeholders is still required during these early phases establishing key direction for vocabulary and early adoption guidance. Some early market traction is being seen from adopters where they are more mature.

Key Takeaway Actions

1. **Ensure appropriate levels of governance, trust and ethical use** are in place for early adopters of CPI. This should include increased coordination of current regulation, ensuring best practices are adopted when information is used to manage critical environments.

2. **Standards organisations should convene, publish for the ecosystem to adopt early vocabulary** with ongoing engagements to lower barriers to entry, chiefly towards more difficult concepts around security and interoperability. Existing standards should always be utilised, especially for significant pre-existing sources around cyber-physical systems and infrastructure.

RECOMMENDATIONS

Outline recommendations from the workshop to the Department for Science, Innovation and Technology (DSIT), for further consideration through interviews.

Certain identified technological approaches have already reached higher levels of industrial maturity. However, no clear market practices for working with infrastructure were identified when compared to the envisioned capabilities of cyber-physical infrastructure across federated networks.

Key Takeaway Actions

3. **Distributed use cases must be defined by the ecosystem, and explored** highlighting differences to existing practices. In particular industrial use cases that would drive early adoption towards market readiness. These should at minimum cover: future roles and responsibilities of users and operators, failure modes for security and resilience, and the benefits of having interoperability.

4. **Infrastructure component boundaries must be standardised** by technology providers for the regulatory bodies to enable compliance through interoperability. This aids collective technology benefits in supporting their clients within the ecosystem.