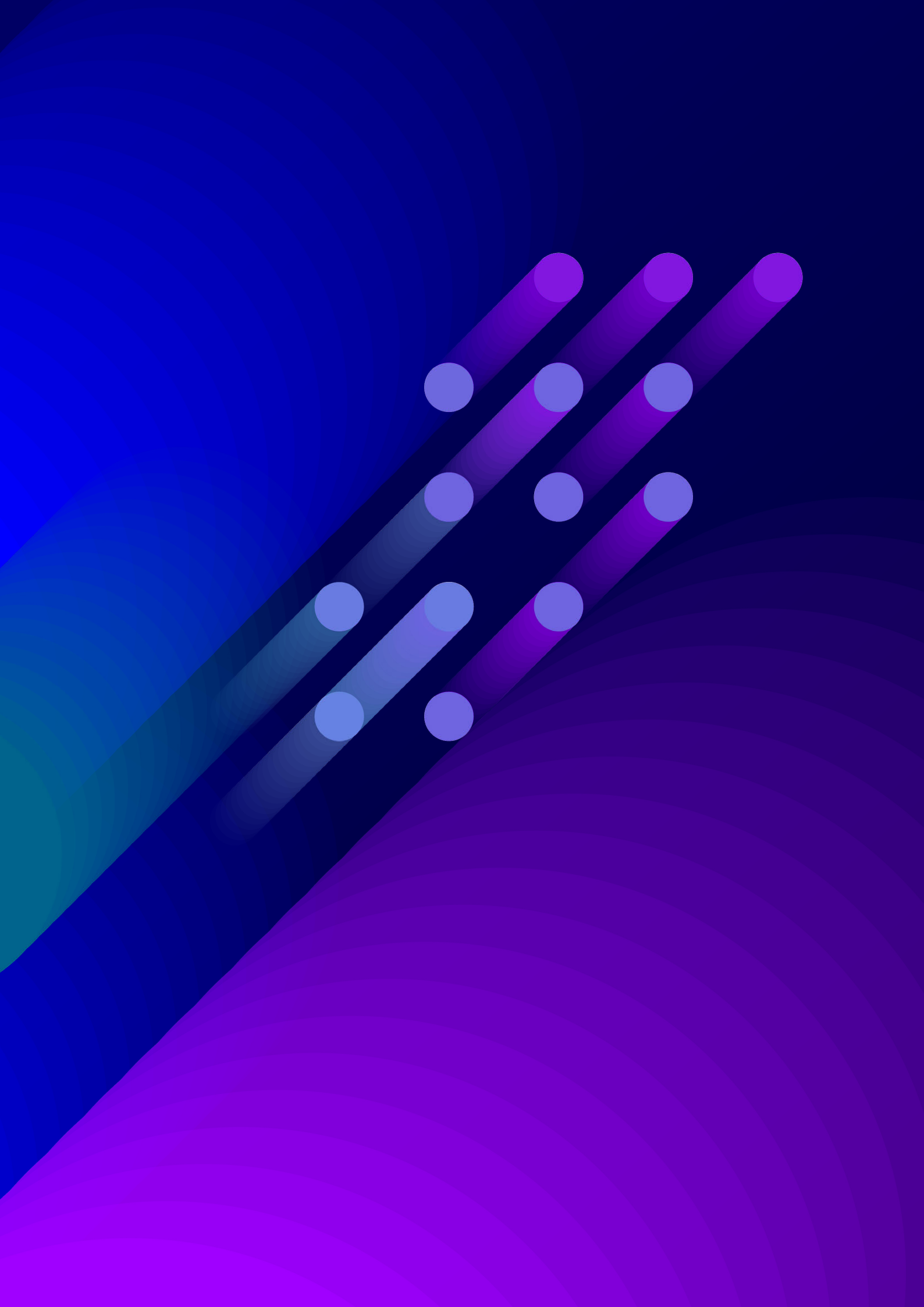
# International Standards as Strategic Infrastructure

Special Publication of the German Standardization Panel (DNP, 2013–2025) with a specific Focus on Electrical, Electronic, and Information Technologies Sectors for the 2026 IEC General Meeting in Hamburg, Germany

# International Standards as Strategic Infrastructure



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Evidence from the DNP used: More than ten survey waves (2013–2025), longitudinal panel of German organizations active in standardization (members of DIN), findings based on repeated observations across multiple survey years with a yearly weighted sample of between 1.000 and 2.000 organizations.

Technische Universität Berlin

Under the patronage of the Federal Ministry for Economic Affairs and Energy

DIN

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# International Standards for a Connected World

## Why this publication?

The 2026 IEC General Meeting in Hamburg brings together experts from industry, government, and standardization organizations to discuss the future of international standards. As global value chains become increasingly interconnected and digital technologies continue to transform industries, international standards are increasingly considered to be a strategic asset for economic competitiveness and innovation.

The German Standardization Panel (DNP) provides unique longitudinal evidence on how organizations perceive, use and benefit from standards. Since 2013, the survey has polled between 1,000 and 2,000 organizations throughout Germany each year, allowing for the analysis of long-term trends in the field of standardization over time.

This publication summarizes key findings for sectors particularly relevant to the international electrotechnical standardization community, represented by the International Electrotechnical Commission (IEC) – including electrical engineering, information and communication technologies, energy and automotive industries (referred to as IEC sectors in this document) – and discusses what these findings imply for industrial competitiveness and technological transformation.

# A Distinct Pattern of Standardization

This analysis of the DNP panel dataset reveals a distinctive pattern of standardization among the IEC related sectors in Germany. Compared to the overall sample of other German economic sectors that participated in the DNP, companies in these sectors attach greater importance to formal international standards and European standards, while internal company standards are viewed as significantly less important. This pattern is already visible in the earliest wave of surveys and remains remarkably stable over time. The findings suggest that competitiveness in these sectors is driven less by proprietary approaches and more by participation in internationally coordinated standardization frameworks, particularly those developed within IEC and CENELEC.

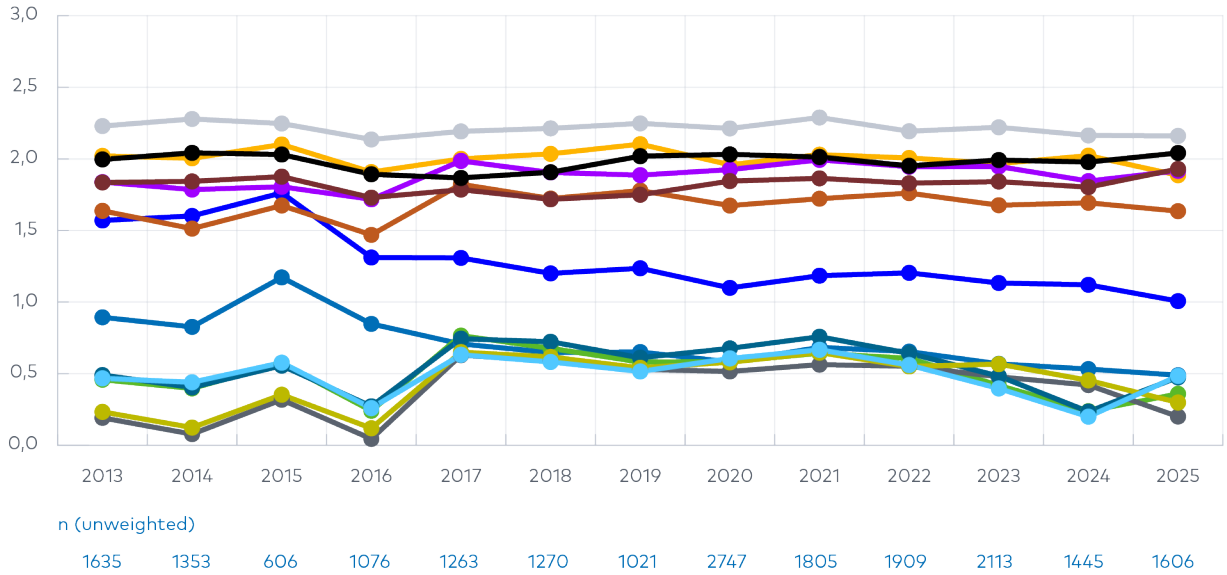
The results point to a structural characteristic of technology intensive industries that operate across global markets and complex value chains. In these environments, interoperability, regulatory alignment, and market access depend heavily on shared technical specifications that enable compatibility across products, systems, and national borders. Consequently, internationally recognized standards appear to function not only as technical references but also as strategic enablers of innovation, trade, and productivity growth.

At the same time, the comparatively lower relevance assigned to company specific standards indicates that competitive advantage in these sectors is achieved less through isolated proprietary solutions and more through active participation in standardization committees in shaping common technological frameworks. This observation supports the view that formal standardization still serves as a key mechanism for coordinating innovation and facilitating the dissemination of technology in globally interconnected industries. As a result, the IEC sectors provide a particularly illustrative example of how standardization can contribute to economic performance by creating the foundations for scalable and interoperable markets.

# Importance of different types of standards over time

**Year by average importance** (scale -3 - +3)

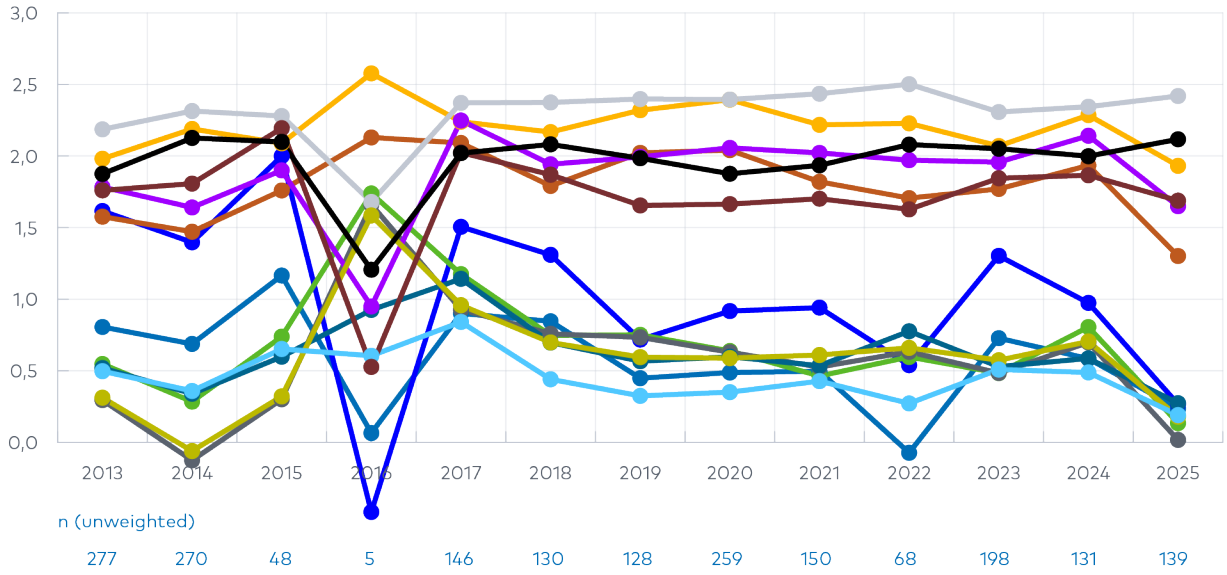
**Weighted by DIN sector distribution**




n (unweighted)

| 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1635 | 1353 | 606 | 1076 | 1263 | 1270 | 1021 | 2747 | 1805 | 1909 | 2113 | 1445 | 1606 |

**IEC-related sectors**




n (unweighted)

| 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 277 | 270 | 48 | 5 | 146 | 130 | 128 | 259 | 150 | 68 | 198 | 131 | 139 |

External Company Standards
Internal Company Standards
International Consortia Standards
International formal Standards
International tech. Specifications
International De-Facto Standards
European Consortia Standards
European formal Standards
European Tech. Specifications
European De-Facto Standards
Nat. Consortia Standards
National tech. Specifications
National formal Standards

# Interoperability Enabled by International Standards

Interoperability is a key prerequisite for the digital and sustainable transformation of modern economies. As technologies, systems, and markets become increasingly interconnected, seamless interaction between products and infrastructures is essential for innovation, efficiency, and global market access.

International standards provide the common technical foundation that is indispensable for interoperability. In this context, IEC has a vital role to play as it develops globally recognized standards that enable products, systems, and services from different manufacturers and regions to work together safely and effectively. By creating a shared technical framework, IEC standards reduce complexity, support innovation, and facilitate international trade for organization in the whole world.

The findings presented in the following figures underscore the economic relevance of interoperability. Data from the German Standardization Panel show that stakeholders engaged in standardization in IEC-related sectors consistently attach greater importance to interoperability than stakeholders engaged in standardization in other sectors in Germany. This underlines the crucial role of international standardization in fostering innovation, enabling integrated systems, and supporting competitiveness in an increasingly connected world.

## Examples of Systems that rely on interoperability



**Smart Grids**
Interoperable components enable reliable, cross-border ernergy systems.



**Connected Mobility**
Standards allow vehicles, infrastructure and services to work together.



**Internet of Things**
Interoperability connects devices, platforms and data across ecosystems.



**Digital Infrastuctures**
From data centers to networks: compatibility enables scalability.



**Industrial Automation**
Interoperable systems increase flexibility and efficiency.

# The Standardization Chain

**International Standards**

Developed with DKE expertise in IEC and other bodies

**Interoperability**

Compatibility of products, systems and infrastructures

**Integrated Systems**

Seamless operation across organizations and borders

**Innovation & Global Markets**

New solutions, higher efficiency and sustainable growth

# Standards as Economic Infrastructure

While standards are primarily considered technical instruments, the literature suggests that their effects extend beyond product specifications and technical requirements and may have broader economic implications. By establishing common rules, enabling interoperability, and creating trust across markets, standards form an essential part of modern economic infrastructure. They reduce transaction costs, facilitate market access, provide legal certainty, and support innovation by ensuring that products, services, and systems can function seamlessly across borders.

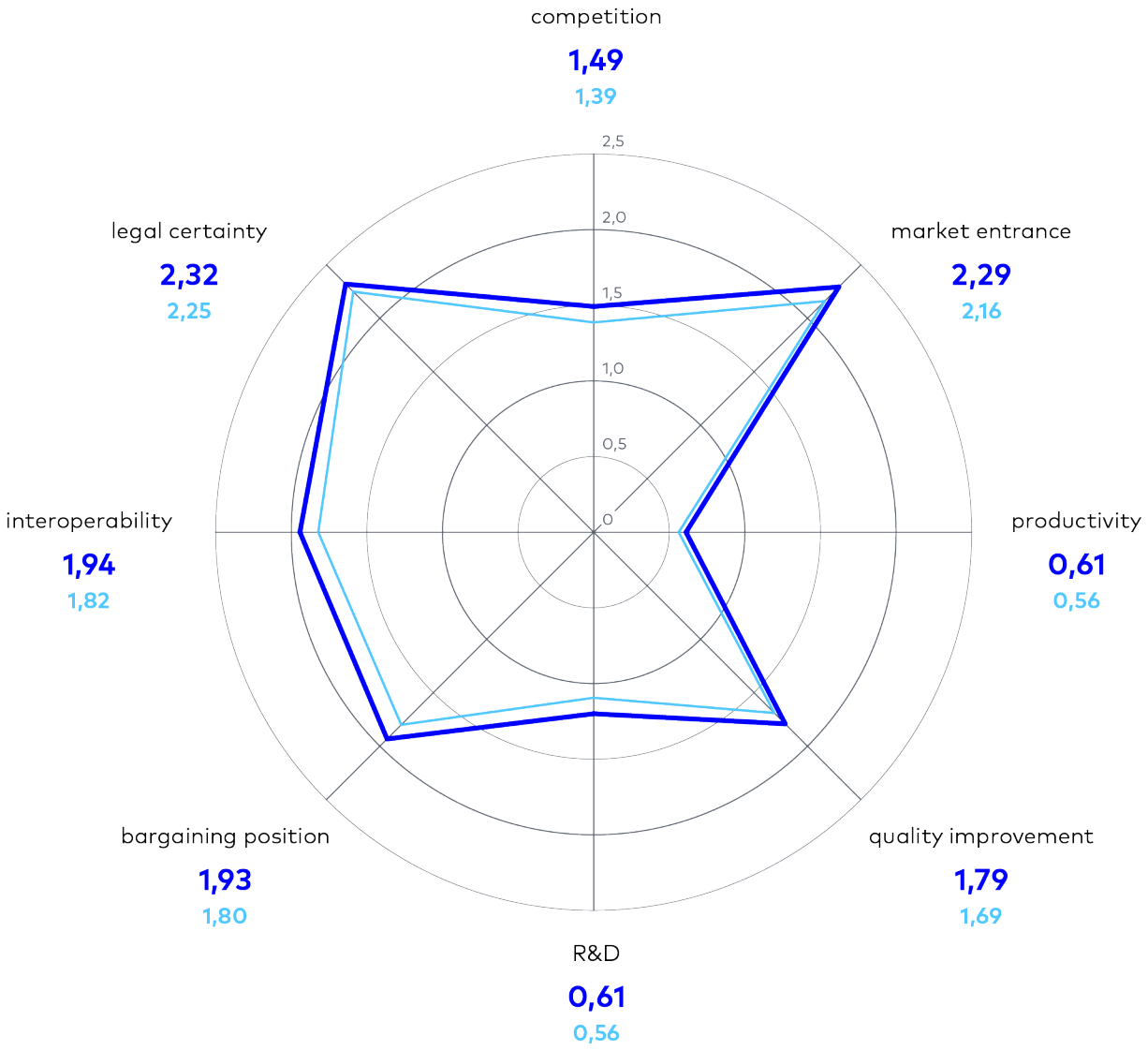
Recurring findings from the German Standardization Panel show that organizations with a high degree of involvement in standardization report greater economic benefits associated with standards than organizations with lower levels of involvement, particularly in areas such as market access, competitiveness, legal certainty, and bargaining power.

The impact of standards is particularly evident in technology-driven sectors, where rapid innovation, global value chains, and regulatory requirements demand efficient mechanisms for coordination. In these environments, standards act as a bridge between innovation and market adoption, helping organizations bring new technologies to market more quickly while ensuring compatibility, safety, and reliability.

As economies become increasingly digital, interconnected, and sustainability-oriented, standards are becoming even more important as enablers of growth and resilience. They provide the foundation upon which industries, governments, and consumers can confidently engage in global markets and shape the technologies of the future.

# DKE sectors attribute higher economic benefits to standards

**Average importance by year** (2013-2025, net values; scale -3 - +3)



# Standardization as a Catalyst for Industrial Transformation

Industrial transformation is reshaping economies worldwide, driven by digitalization, electrification, sustainability objectives, and rapidly evolving technologies. In this environment, standards have become a strategic instrument that enables innovation, interoperability, and market access across increasingly complex value chains. From artificial intelligence and cybersecurity to energy management and circular economy solutions, standardization provides a common framework that helps organizations adopt new technologies with confidence and scale innovation across borders.

Recent findings show that standardization stakeholders widely recognize the growing importance of standards for competitiveness, resilience, and sustainable growth. At the same time, a significant implementation gap remains between the perceived value of standards and their effective use in practice. Bridging this gap is essential in order to unlock the full economic and societal benefits of standardization, but also to realize the full potential that they could have on the development of the IEC industry.

The following analysis highlights how international standards support industrial transformation, strengthen global competitiveness, and contribute to innovation-driven growth. It also demonstrates why greater participation in standardization and stronger adoption of standards are critical for turning technological potential into tangible economic impact.

## The role of standards in transformation



**Emerging technologies & policy challenges**
Digitalization, AI, cybersecurity, energy transition, sustainability



**International standards & shared frameworks**
Developed in IEC and other international bodies



**Implementation**
In products, processes and infrastructures



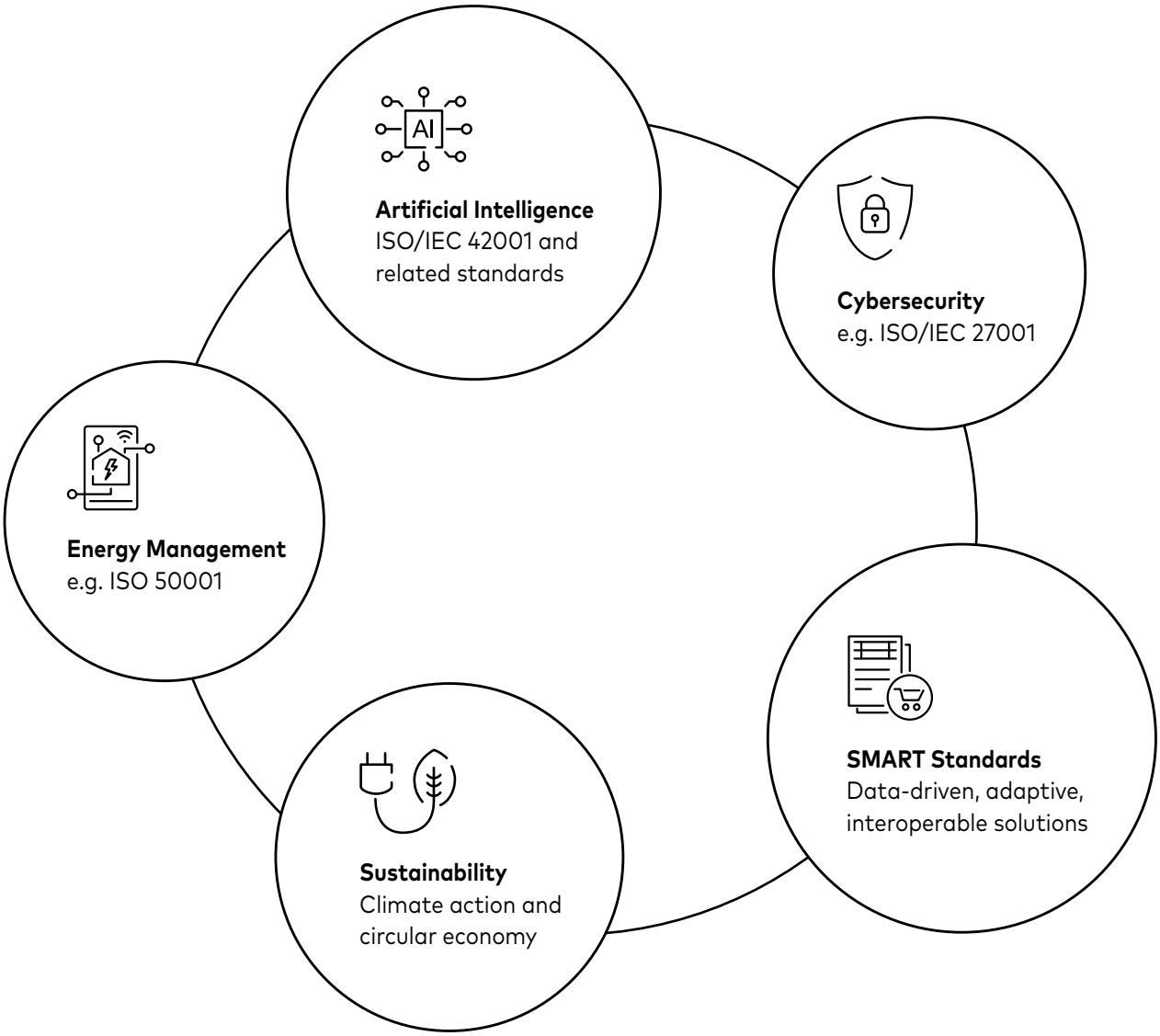
**Interoperability, resilience & trust**
Compatibility, security and reliability across systems and borders



**Industrial transformation & global competitiveness**
Innovation, efficiency and sustainable value creation

Recent DNP surveys highlight the growing strategic importance of standards in emerging technological fields.

Special survey modules conducted between 2022 and 2025 demonstrate increasing relevance of standardization for:




At the same time, the data reveals an important gap. Many organizations recognize the strategic value of standards, yet their practical implementation often remains below the perceived potential. Closing this gap represents an important opportunity for both industry and standardization organizations.

# Digital Maturity Level

**Level of Digitalization and Connectivity**
Experts' Self-Assessment 2023

**Digital Champion**

Operative and administrative processes are globally networked, often virtualized, optimized, and increasingly automated. Operative business focuses on core segments as well as product and service portfolios enlarged with new business models.

**Horizontal Collaborator**

Value chain and product and service portfolio, digitally interconnected both vertically and horizontally. Standardized methods are used to manage risk and assure compliance.

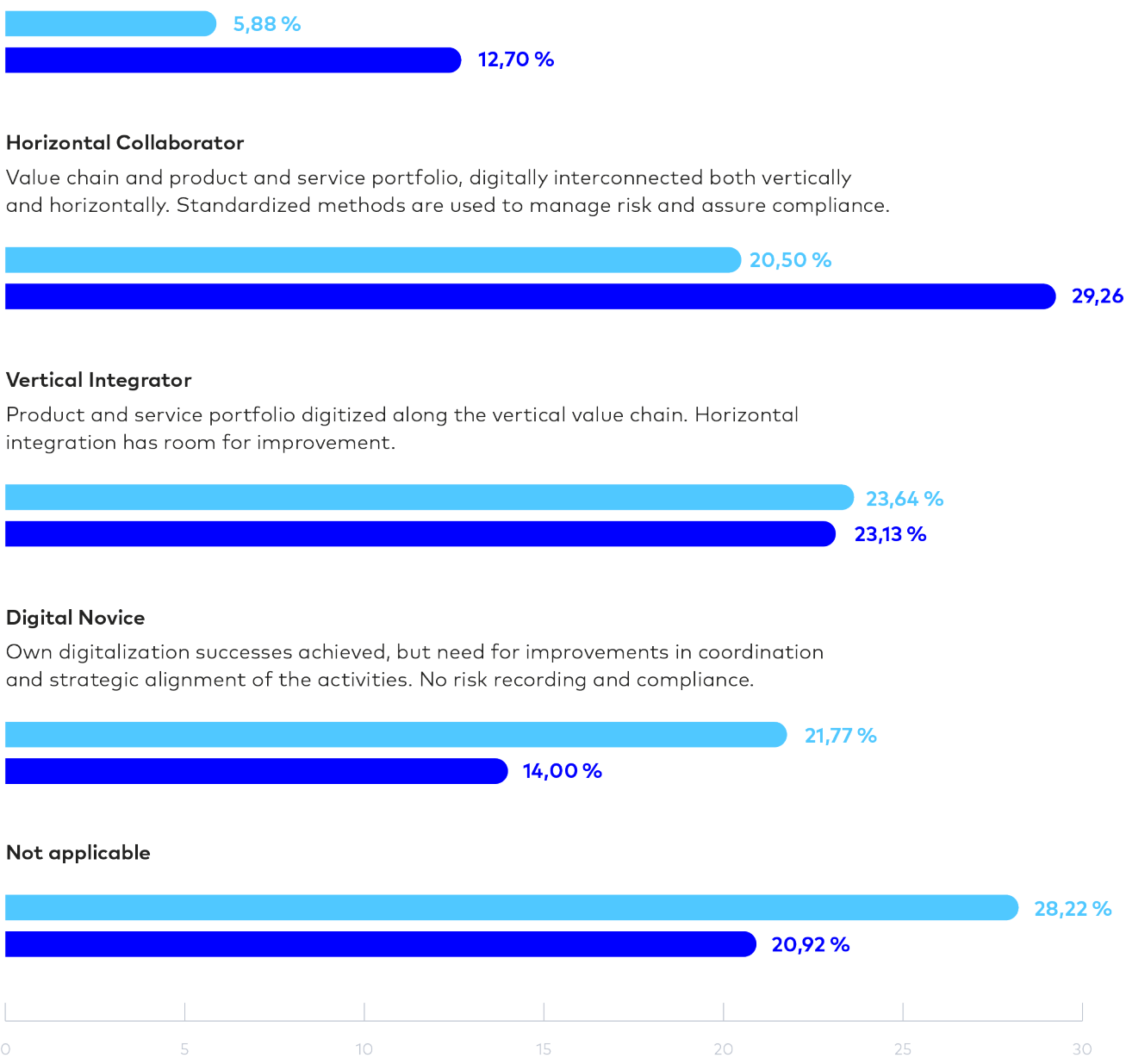
**Vertical Integrator**

Product and service portfolio digitized along the vertical value chain. Horizontal integration has room for improvement.

**Digital Novice**

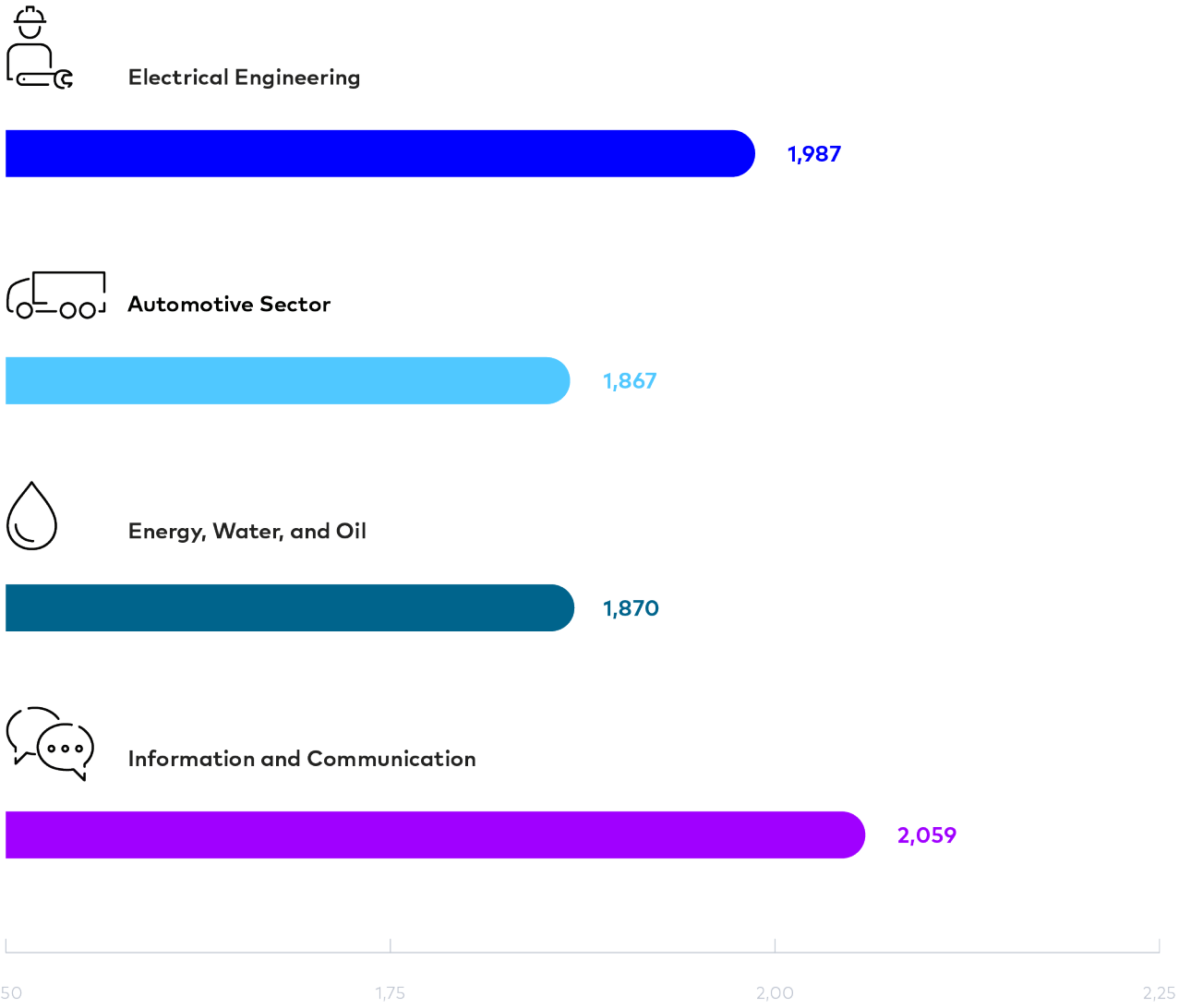
Own digitalization successes achieved, but need for improvements in coordination and strategic alignment of the activities. No risk recording and compliance.

**Not applicable**



# Industry by interoperability

**Average interoperability**
(2013-2025, net values; scale -3 - +3)



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