Technische Universität Berlin

DIN DKE

GERMAN STANDARDIZATION PANEL

Standardization Research, Policy and Promotion

Indicator Report 2025

» **SMART Standards & Standardization as a self-governance instrument of the economy**

SPONSORED BY DIN AND DKE
UNDER THE PATRONAGE OF THE FEDERAL MINISTRY FOR ECONOMIC AFFAIRS AND ENERGY

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MESSAGE OF GREETING

from **Dr. Ole Janssen**

Deputy Director-General at the Federal Ministry for Economic Affairs and Energy

for the 2025 German Standardisation Panel

It is a great pleasure for me to present to you the latest report on indicators of the German Standardisation Panel on behalf of the Federal Ministry for Economic Affairs and Energy. This report contains comprehensive findings on the relevance and assessment of standardisation activities at national and international level. This year, the focus was on the two issues of SMART standards and the role of standardisation as an instrument of self-governing and bureaucracy reduction.

In light of the major changes in our economic and political environment in the last few months, it has become more and more important for us to keep in mind and safeguard our technological leadership in Germany, also as part of Europe. The use of SMART standards to make corporate procedures more efficient plays a key role, especially for SMEs. The use of standards also offers great potential for administrations, as procedures can be simplified and automated.

One of the positive findings of the report is that companies familiar with SMART standards actively use them. This shows that while the use of SMART standards offers many advantages, awareness still needs to be raized, as only a third of the participants said that they are familiar with SMART standards. There is another positive trend: compared with the last few years, companies have increased their internal expenditure on standardisation. This fits in with the fact that companies are increasingly pointing to the significance of formal standards rather than consortium standards. European standardisation in particular continues to be regarded as an important channel of standardisation, as it is seen as decisive for trade and innovation.

The report shows that users and companies involved in the drafting of standards regard standards as more transparent, practice-related, coherent and open than laws. This offers many possibilities for cutting red tape and increasing efficiency in both the public sector and the private sector. Standards provide a clear and uniform basis so that procedures can be made more efficient and the potential for innovation can be better tapped. They strengthen competitiveness and help to streamline bureaucracy.

Finally, I want to underline that the findings of the 2025 German Standardisation Panel are an essential basis for the future strategic shaping and further development of standardisation. It is very important that we continue to invest in standardisation work and to make the advantages of standards more visible to all, especially to small and medium-sized enterprises and startups. This is the only way for us to ensure that Germany and Europe will continue to play a leading role in the global economy. Let me thank all the participants for their commitment and their valuable contributions. I wish the readers of this year's report interesting and valuable insights.

Kind Regards

Dr. Ole Janssen
Deputy Director-General at the Federal Ministry for Economic Affairs and Energy

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Panel.

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GERMAN STANDARDIZATION PANEL 2025

ANNUAL INDICATOR REPORT ON THE IMPORTANCE OF STANDARDS AND STANDARDIZATION ACTIVITIES OF GERMAN ORGANIZATIONS

EXECUTIVE SUMMARY

Innovations are largely responsible for the growth and prosperity of a society. When an idea successfully becomes a marketable solution, many factors play a role in this success. These factors include, in particular, standardization, as highlighted in the OECD's Oslo Manual[1] in 2018. The EU Standardization Strategy of February 2022 aims to strengthen the importance of standards for the EU's competitiveness and to harmonize and accelerate standardization processes, which was further advanced under the German patronage of the G7 in 2022. In 2025, the standardization agreement between the German government and DIN will celebrate its 50th anniversary - an occasion that will once again highlight the importance of standardization as a public good and strategic instrument for competitiveness. The Coalition Agreement 2025 also emphasizes the role of standards-based regulation in the context of reducing bureaucracy, digital administration and efficient legislation.

In order to strengthen research in the field of standardization, the German Standardization Panel (DNP) was launched in autumn 2011 by the German Association for the Promotion of Research on Standardization (FNS). The aim was to gain a better understanding of standardization processes and their implications through scientifically sound findings. Today, the German Standardization Panel is supported by DIN and DKE and conducted by the Department of Innovation Economics at the Technical University of Berlin. The annual surveys conducted as part of the DNP provide important data for the analysis of standardization activities and make it possible to examine the impact of standards on various economic and social areas. Since 2016, the German Federal Ministry for Economic Affairs and Energy (BMWE) has been the patron of the DNP.

A comprehensive analysis of standardization requires a reliable database. In particular, panel data is essential for researching the complex effects of standardization processes and the application of norms and standards on organizational success. This data, which is collected over a longer period of time and among the same economic actors, provides insights into changes in standardization behavior and the use of norms and standards by organizations from 2013 to 2024. The pilot study from 2012 could not be included in the panel data set due to an insufficient number of observations, but the data from thirteen waves of the DNP this year provide a unique basis for analysis.

[1] *OECD and Statistical Office of the European Communities (2018): Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data, 4th Edition. Retrieved from https://www.oecd.org/science/oslo-manual-2018-9789264304604-en.html.*

The evaluation of the current survey makes it clear that the results from previous years can be validated, but also that new insights can be gained into the development of standardization activities and their impact in and on organizations. The following key findings can be derived:

1 Formal standards as well as technical rules and specifications from official standardization organizations are the most important types of standards for almost all of the organizations surveyed. They are considered central to legal certainty and market access across all industries, especially in large, innovative and internationally active organizations. While national standards are becoming slightly less important, international and European specifications continue to gain in relevance. Consortia standards, on the other hand, are considered less strategically important, especially in larger industrial companies, while organizations with a high level of innovation and international involvement attach particularly high relevance to formal standards.

2 Internal company standards remain the third most important type of standard and are rated much more positively than consortium or de facto standards. They are particularly important in larger, highly innovative organizations - for example in the automotive and mechanical engineering sectors as well as in the energy industry. Their role lies primarily in increasing productivity and quality. In smaller organizations and networked industries, they also strengthen the negotiating position along the value chain.

3 Informal consortia and de facto standards are particularly important in technology-intensive industries, for example for interoperability and cross-system applications. However, their importance has tended to decline steadily since 2021. Their use is increasingly focused on large, internationally networked companies. They score points for their rapid implementation and early market penetration, while formal standards stand for regulatory connectivity, legitimacy and stability.

4 Sustainability and resilience were included in the survey for the first time in 2022. In 2024, formal standards and specifications are again rated as particularly effective here, followed by company standards. However, the ratings are slightly down on the previous year, particularly for consortium and de facto standards.

5 Certifications according to DIN EN ISO 9001 and 14001 continue to be widely used. There has been a slight increase in ISO/IEC 27001 (IT Security Management). Interest in future ISO 14001 certifications is also increasing, an indication of the growing importance of management system standards in areas such as sustainability and information security.

6 SMART Standards could contribute to increasing digital efficiency, but so far only around a third of organizations use them or are even aware of them, mostly in narrowly defined use cases. Technical and legal uncertainties remain. The potential reduction in bureaucracy through standards is assessed differently depending on the sector.

CREATING AN EMPIRICAL BASIS FOR THE EXPLORATION OF THE GERMAN STANDARDIZATION LANDSCAPE

Introduction

In autumn 2011, the German Standardization Panel (DNP) was initiated by the German Association for the Promotion of Research on Standardization (FNS). The aim of the FNS was to promote research on topics and issues relevant to standardization in order to be able to make scientifically sound statements on standardization policy aspects. The German Standardization Panel is now commissioned and supported by DIN and DKE. Annual surveys conducted as part of the DNP collect data that contribute to an inventory of standardization activities and make it possible to examine the impact of standards and standardization on various economic and social dimensions. In 2016, the Federal Ministry for Economic Affairs and Energy (BMWE) took over the patronage for the first time.

Inspired by the innovation survey[2] established in the early 1990s (on the initiative of the European Commission) in the member states of the European Union, the DNP created a comprehensive empirical database with a wide range of organizational information that can be used to answer key questions in standardization research.

Objectives

The data available through the DNP forms a basis for gaining new scientific insights into the standardization activities of organizations, the implementation of standards and their effects on organizational success. The results of the survey also offer the opportunity to actively derive strategies for involvement in European and international standardization and to articulate national interests to the European Commission, among others. Another aim of the DNP is to take up and evaluate current standardization policy initiatives. In the last survey waves, the effects of the Covid-19 pandemic, climate change and the importance of the United Nations Sustainable Development Goals for standardization were addressed in this regard. In addition, the DNP can be used to record the impact of economic and geopolitical events, such as the coronavirus crisis or the consequences of the Russion aggresion against Ukraine, on the standard-setting organizations.

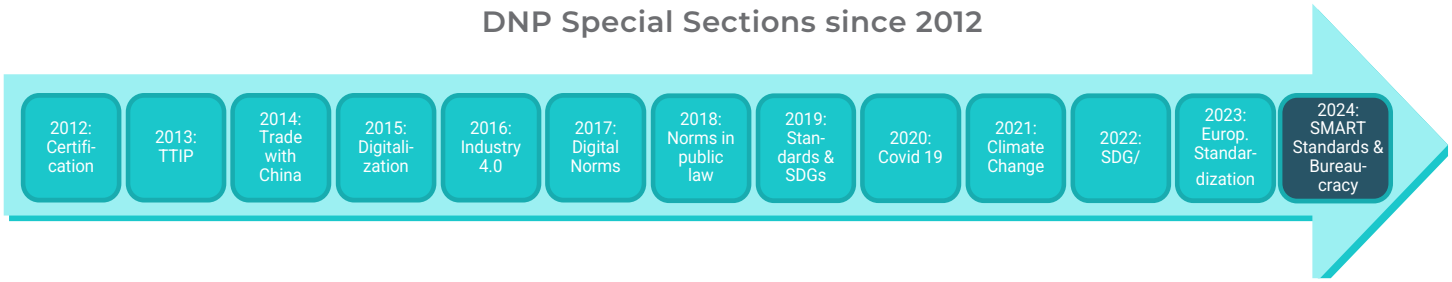
Finally, the DNP is intended to help raise the awareness of the topic and motivate organizations that have not used standards to date, or have used them little, or are not actively involved in standardization. Furthermore, target groups are addressed for whom the topic of standardization is still unfamiliar. One way of doing this is to

[2] This is the panel survey of the Community Innovation Survey (CIS), in which companies are repeatedly asked about their innovation activities, problems and successes..

disseminate the results of the surveys on a large scale, for example through reports such as this one or public events. The DNP is intended to achieve these compatible objectives with regard to standardization research, policy and promotion

Figure 1

DNP Special Sections since 2012



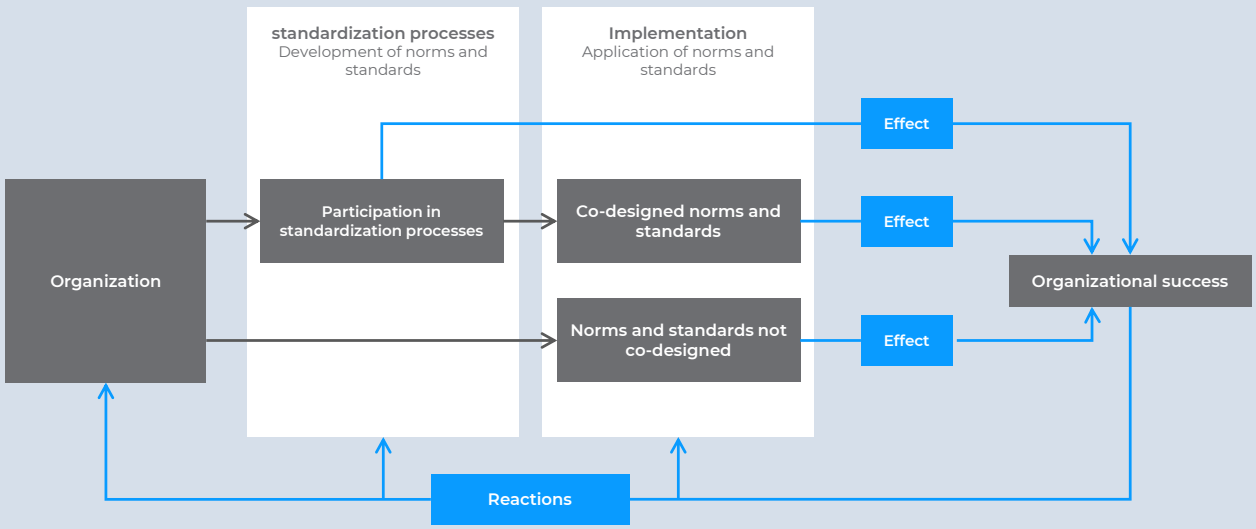
Heuristic Model

The annual survey is divided into core questions and a topic-oriented special section. Conceptually, the core survey of the DNP is based on a heuristic impact model (see Figure 2). This model is so comprehensive that the widest possible range of questions can be integrated. In particular, the model depicts the multidimensional relationships between standardization participation and standardization, the implementation of standards and organizational success.

In order to characterize standardization activities, the type and scope of standardization work are primarily recorded, such as the time and personnel required or the commitment within standardization committees. In the area of standards implementation, the various cost and benefit dimensions are recorded. In addition to

Figure 2

Heuristic structural model for the German Standardization Panel



these aspects, which focus more on the development processes and the implementation of norms and standards, the DNP also aims to record the impact of standardization and the application of norms and standards on the success of organizations.

Realization

Method

On 14 October 2024, World Standards Day, the thirteenth wave of the DNP's organizational survey was launched. The project is carried out by the Department of Innovation Economics at the Technical University of Berlin and is financed and supported by DIN and DKE. In 2024, the Federal Ministry for Economic Affairs and Energy (BMWE) once again thankfully took on the patronage of the DNP. In total, more than 31,000 experts were contacted (previous year: almost 34,000). The number of usable questionnaires was 1,217 (1,628 in the previous year), resulting in a response rate of 7%.

Panel data

This year, data from 513 organizations that have participated at least five times since the 2013 and 2014 editions was analyzed. A balanced panel data set was created on this basis, which enables a reliable analysis of longer-term developments. It is particularly noteworthy that 26 organizations participated in the survey over almost the entire period, i.e. in at least ten of the thirteen years. In order to obtain a comprehensive overview of the development of individual indicators, the responses from the respective annual samples were also compared and included. With the aim of enabling more robust comparability and a sufficient degree of representativeness, the responses of the organizations were weighted according to the size of the organization and the sector assigned to it. The target distribution was an estimate of the distribution of organization size and industry classification of the organizations active in standardization at DIN, which was created on the basis of a database with almost 10,000 organizations.[3] On the basis of this unique data set, insights into changes in standardization behavior and the application of standards by organizations over time can be gained.

Composition of the 2024 sample

In this report, the industry affiliation, the size of the organizations and their activities in the areas of research, innovation and internationalization are used as the basis for structuring the results and highlighting specific characteristics. The composition of the organizations participating in the 2024 survey is largely similar to that of previous years. This ensures that the structures of the sample as well as the experts and organizations participating in the DNP allow the results to be compared with previous surveys.

Participants

Of the 1,217 questionnaires used for the analysis, 61% represent organizations or groups of organizations. Around 39% of the responses came from experts who answered on behalf of an organization in their sector. Compared to the previous year, the ratio has changed slightly towards a higher proportion of individual experts. In smaller organizations with up to 50 employees, the questions were mainly answered by people from management, while in larger organizations, experts from research and development departments or with a specialized background in standardization participated more frequently. The proportions of the functional areas surveyed were roughly the same as in the previous year: 23% of respondents wor-

[3] *Industry affiliation according to the Classification of Economic Activities, 2008 edition (WZ 2008), Federal Statistical Office of Germany*

ked in research and development (2023: 25%), 21% in management (2023: 19%), 12% in standardization departments (2023: 11%) and 10% in quality management (2023: also 11%).

Provenance & Company size

In 2024, the survey continued to focus on organizations headquartered in Germany, which clearly made up the largest group of respondents at just under 90%. Around 9% of the responding organizations were based in other European countries and around 2% in the USA. The size distribution of the participating organizations has hardly changed compared to previous surveys. Around a quarter of participants were in each of the four size categories (< 50, 50-249, 250-999, ≥ 1,000 employees). This means that small and medium-sized organizations make up around 50% of the sample. Smaller organizations were particularly frequently represented in the service sector, while very large organizations were predominantly from industry, such as vehicle construction or the chemical and pharmaceutical sectors.

Sectors

The sector distribution also shows only minor changes compared to the previous year (Figure 3). In 2024, most participating organizations were active in the mechanical and plant engineering sector (13 %, N = 256), followed by electrical engineering (9 %, N = 175) and vehicle construction (9 %, N = 167). In addition, public administration, universities, and associations as well as the chemical and pharmaceutical industries each accounted for significant shares of around 7%. The information and communication sector was still underrepresented at around 3% (N = 53). Compared to the previous year, the proportion of participants from the mechanical and plant engineering, vehicle construction and public administration sectors decreased slightly, while organizations from the construction industry and the certification and testing sector were proportionately more frequently represented.

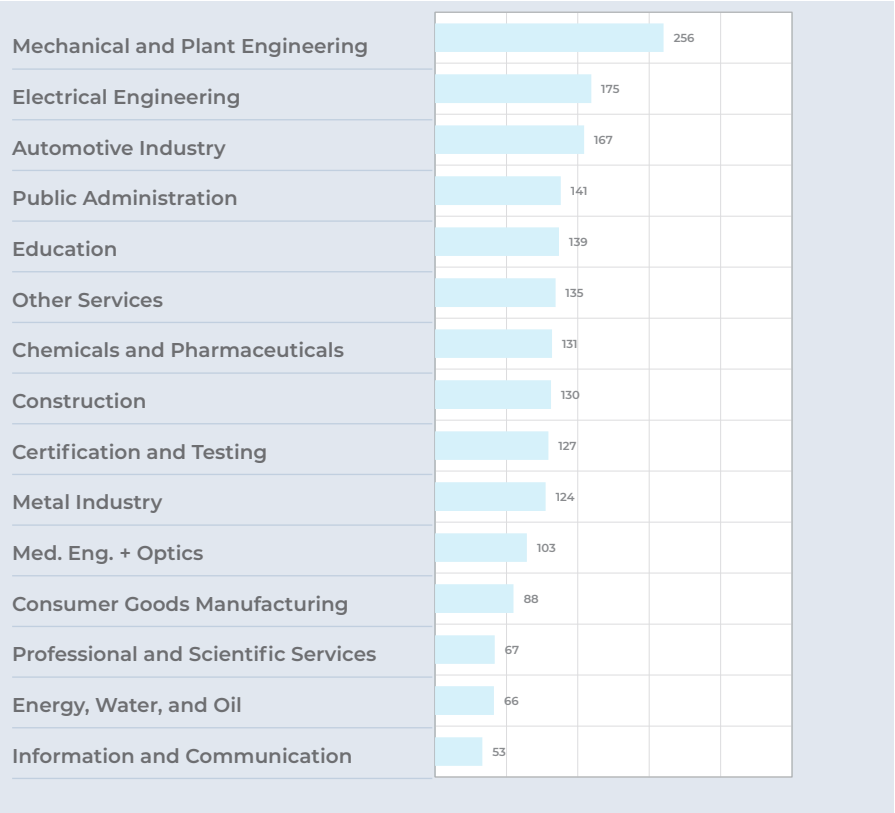
Research & Innovation

The innovation activity of the organizations surveyed remained at a high level in 2024. 64% of the responding organizations stated that they had introduced product innovations in 2023, while 51% reported process innovations. These figures are roughly in line with the previous year. Internal research activity was reported slightly more frequently than in 2023 (58%), while collaboration with external research institutions declined slightly (47%, previous year: 52%). Innovation activity increases with company size. While 70% of small and 76% of medium-sized companies consider themselves to be innovative, this figure is 87% for large organizations and 92% for very large ones.

There are clear differences in innovation intensity across sectors. Organizations from the automotive industry were particularly active in innovation in 2024, with 87% reporting product innovations (2023: 72%), closely followed by electrical engineering (86%) and the chemical and pharmaceutical industry (83%). Electrical engineering recorded the highest proportion of internal research organizations at 80%, followed by universities, associations and federations at 75% and vehicle construction at 71%. The proportion of researching organizations in the other services sector (30%) and in the construction industry (52%) was comparatively low. The highest rate of cooperation with external research institutions was reported by organizations in the energy, water, oil and chemical and pharmaceutical sectors (71%

Figure 3

Number of participants by sector
N = 1,942



each). Service organizations (34%) cooperated least frequently in the area of research and development.

Export

The export orientation of the sample was also surveyed. Of the organizations that provided information on their export activities, 37% stated that they export to the EU (2023: 52%), 22% to Asia (2023: 18%), 20% to the USA and 21% to other regions of the world (2023: 16% and 14% respectively). Here, too, there were clear differences according to size: while around 47% of small companies export at all, the proportion of very large organizations is over 80%. The strongest export sectors are mechanical and plant engineering and electrical engineering. The highest average export turnover was achieved by organizations in mechanical and plant engineering, energy supply and vehicle construction. Within the European Union, small companies and organizations from the service sector are the most active. Exports to the USA are primarily performed by the service sector and electrical engineering.

IMPORTANCE OF STANDARDS AND SPECIFICATIONS

The main part of the German Standardization Panel's annual survey focuses on the relevance of norms and standards for organizations in various sectors. Five categories of norms and standards are identified: formal norms such as DIN standards, technical rules or specifications (e.g. DIN SPEC), informal consortium standards, de facto standards and internal and external company standards. With the exception of the last category, their significance is analyzed at national, European and international level. For example, the importance of formal standards refers to DIN standards (national), the European standards EN (CEN, CENELEC or ETSI) and ISO standards (international). Further information on the different types of norms and standards can be found in the glossary.

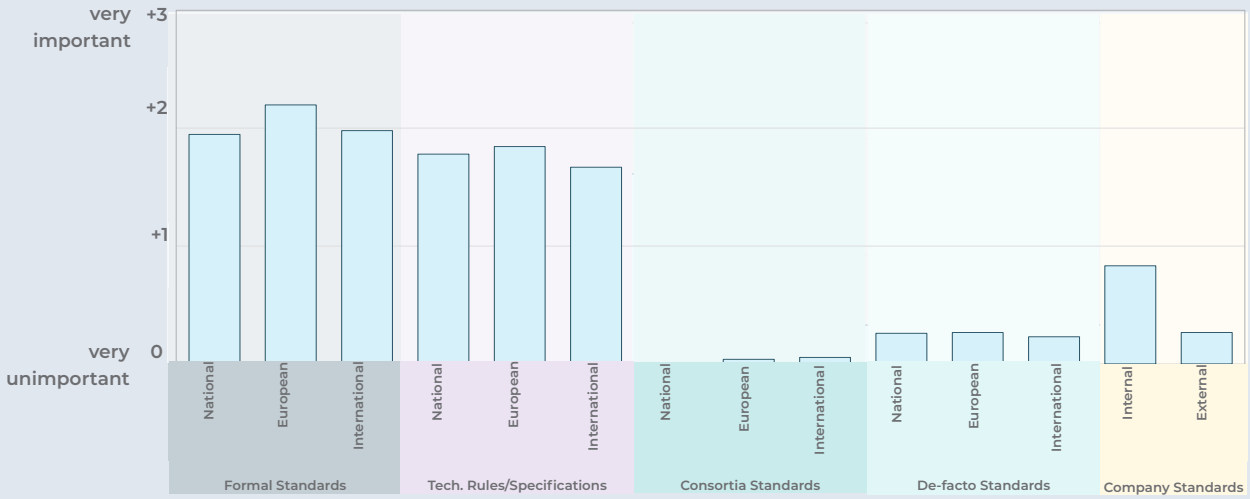
Formal standards remain the most important, Company standards and Consortia Standards continue to lose importance

As in previous years, the organizations surveyed in 2024 also attach the greatest importance to formal standards and technical specifications at European level. European standards achieve particularly high scores in the automotive, mechanical and plant engineering, chemicals and pharmaceuticals sectors. They are less relevant in the construction and service sectors.

Figure 4

Importance of standards

Average rating of the importance of standards at different regional levels.
Rating scale from -3 (very unimportant) to +3 (very important).
N = 655 to 664



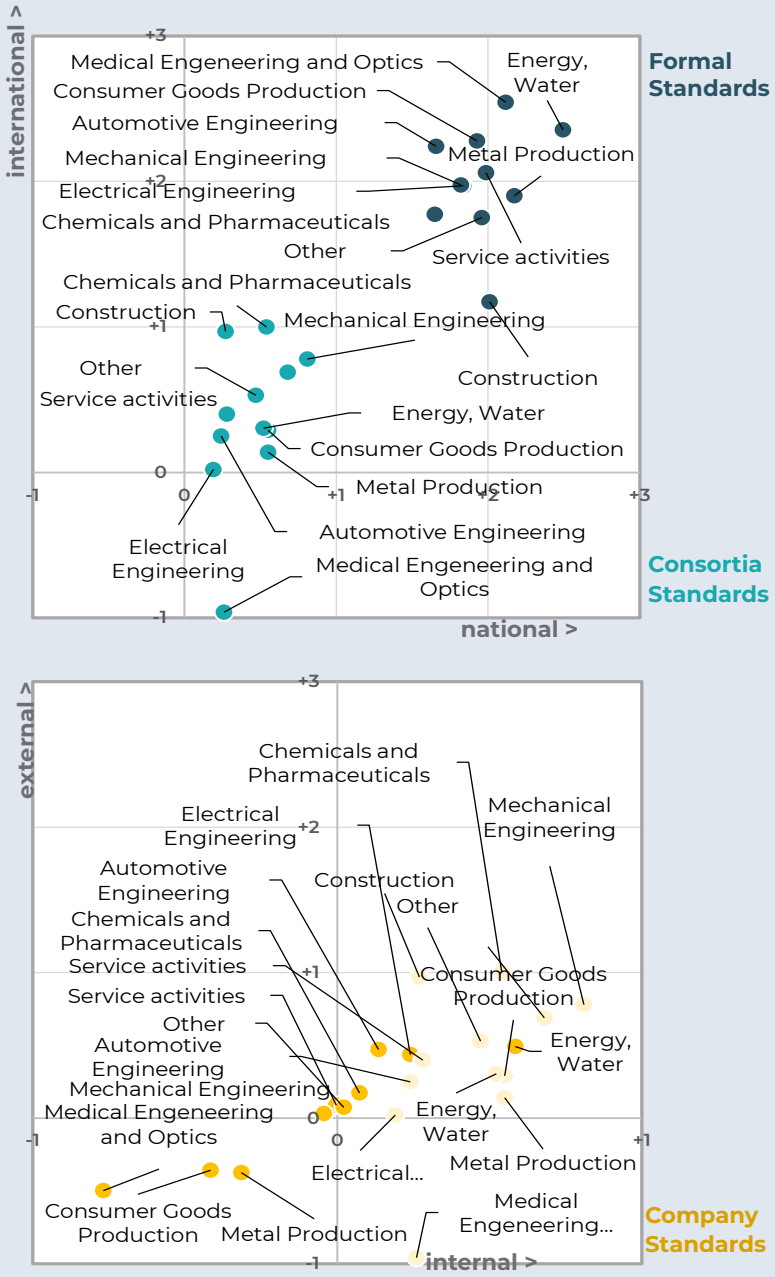
The importance of formal international standards increases significantly as company size increases. Small organizations rate national and international standards roughly equally (mean value 1.93), while for very large organizations, international standards (mean value 2.38) are clearly more important than national standards (mean value 1.93). Technical specifications, particularly at international level, are also significantly more relevant for larger companies.

Figure 5

Importance of national and international standards and consortia standards, as well as internal and external company standards by industry in 2024.

Scale from -3 (very unimportant) to +3 (very important)
N = 655 to 664

Figure 6 Importance of Standards by Industry



Export orientation also influences assessment behavior: Exporting companies focus on formal European and international standards, while non-exporting organizations rate internal standards, specifications and de facto standards as slightly more significant. Consortia standards are assessed much more critically by exporting companies.

Figure 6

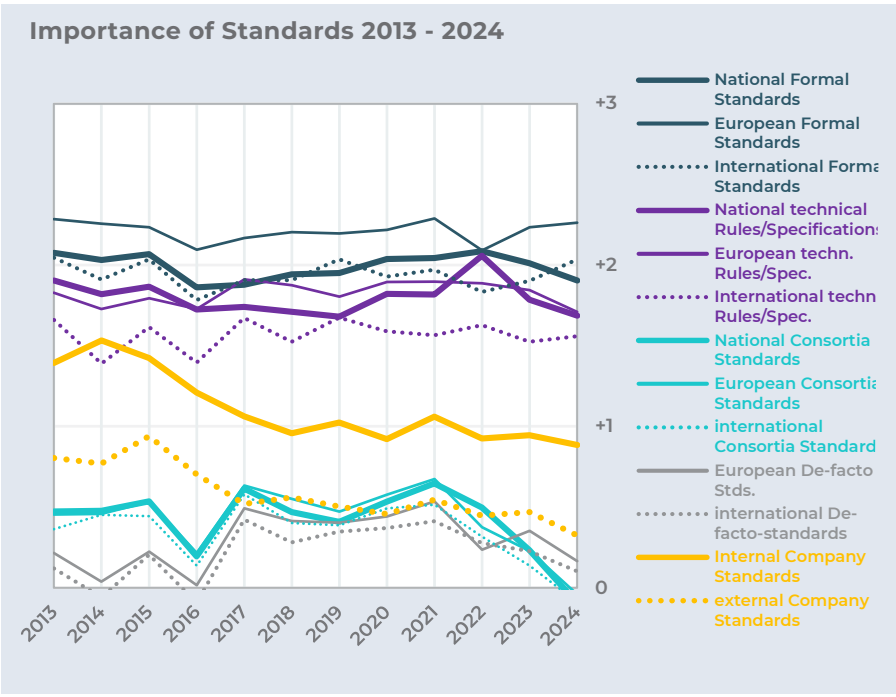
Average assessment of the impact of different types of standards on success factors.

Scale from -3 (very negative) to +3 (very positive) in the year 2024
N = 617 to 653

Figure 7

Change in the assessment of the importance of various types of standards between 2013 and 2023.

Scale -3 (very unimportant) to +3 (very important).
Weighted sample 2013 - 2024
N =7,520 - 7,980



Internal company standards remain particularly relevant for large, innovative companies, especially in vehicle construction and in energy and water supply. There, they are often used for internal quality assurance and process optimization. External company standards are also mostly used in metal production and in the chemical and pharmaceutical industries, where they are considered important for increasing quality and productivity as well as for the negotiating position.

The ratings of consortia and de facto standards decline significantly in 2024. Across all sectors, only a few companies with strong international networks (e.g. vehicle construction, medical technology) still rate them as relevant in connection with technical interoperability and quality improvement. In contrast, the construction industry, metal production, consumer goods manufacturers and medical technology (national) are increasingly rating these types of standards negatively, in some cases with mean values below zero. The mechanical engineering sector even rates international consortium standards neutrally on average, a significant decline compared to previous years.

On average, consortium standards and de facto standards are currently rated most critically across all levels. The decline in importance of these types of standards is thus continuing for the third year in a row.

Critical assessment of the influence of formal standards, technical rules and specifications on success factors

Overall, the assessment of previous surveys that formal standards have a significantly stronger influence on (organization-related) success factors than consortium or de facto standards is confirmed. After observing a return to pre-coronavirus pandemic importance for all types of norms and standards in the last two years, in particular a strong increase in the importance of technical rules and specifications (see Figure 7), there is a slight weakening of the assessments in 2024, without there being a slump. One explanation is presumably the economic stagnation, which is pushing the general importance of standards into the background. The decline is particularly strong for de facto standards, consortium standards and external company standards.

Organizations continue to see a particularly high benefit in aspects relating to cost savings through use of standards and market access. Formal standards, technical rules and specifications are said to have a significantly greater influence on legal certainty, the fulfillment of formal and informal market access conditions, technical interoperability and the negotiating position vis-à-vis suppliers and customers than other types of standards. Here too, however, a decline or stagnation can be seen, with a particularly marked decline in technical interoperability (see Figure 8). By contrast, the loss of importance in terms of market access and negotiating position is more moderate.

In terms of success factors aimed at improving internal processes, particularly productivity and quality improvements, internal company standards play a similarly important role as formal standards and technical specifications. It should be particularly emphasized that internal company standards in the area of productivity improvement received a higher approval rating than formal standards for many years.

Since 2021, however, this ratio has reversed: in 2024, technical specifications are clearly in the lead (see Figure 8). However, a loss of importance can be observed for all three types of standards. A similar trend can also be observed for quality improvement, although the decline in the importance of internal company standards

Figure 8

Change in assessments of the impact of standards on success factors 2013 - 2024

Average assessment of the impact of different types of standards on success factors. -3 (very negative) to +3 (very positive). Weighted Samples 2013 - 2024, N = 5.,977 - 7,726

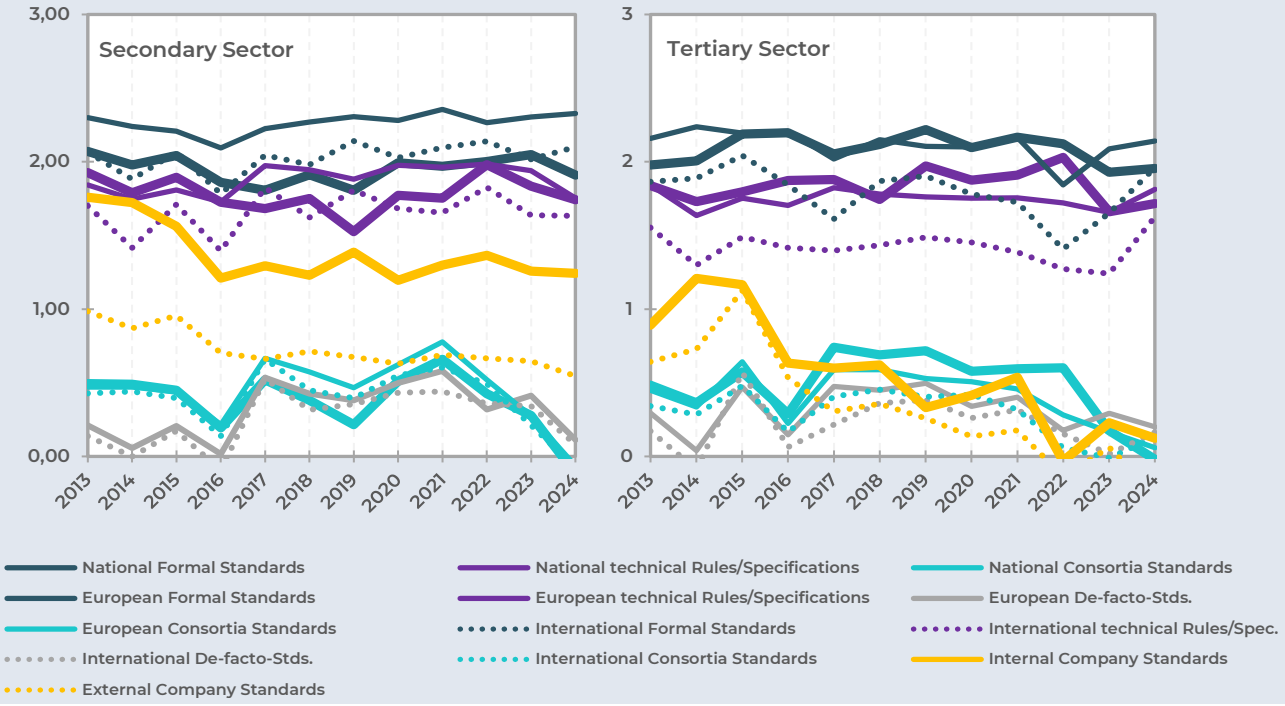
began before the pandemic. Since 2016, they have been consistently rated as less relevant in this area than formal standards and technical specifications. De facto and consortium standards have achieved higher approval ratings for these two factors in the past than in other areas, but this has been greatly relativized in the current year.

A similar picture emerges with regard to R&D and innovation activities and competitiveness: Internal company standards are rated higher here than consortium and de facto standards, even though their relevance has been declining for the past four years. The ratings for technical rules and specifications in R&D and innovation 2024 are again slightly higher than those for formal standards, this trend is continuing (see Figure 8).

Figure 9

Change in assessments of the importance of different types of standards between 2013 - 2024

Scale: -3 (very negative) to +3 (very positive).
Weighted samples 2013 - 2024
N = 5,839 - 6,213 (secondary sector), N = 1,624 - 1,706 (tertiary sector)



This differentiation is in line with the results of previous studies on the macroeconomic benefits of standardization[4]: Internal company standards are particularly relevant for internal organizational processes, while formal standards are primarily decisive for successful market activity. The latest surveys also show a convergence: formal standards and technical rules are increasingly taking on both functions (see Figure 8).

[4] *DIN German Institute for Standardization (2000): "Macroeconomic Benefits of Standardization: Summary of Results. Scientific Final Report with Practical Examples," Berlin, Vienna, Zurich: Beuth Verlag.*

Importance of standards for 'sustainability' and 'resilience'

The assessment of the two factors, sustainability and resilience, shows a similar pattern to other aspects of corporate success: formal standards and technical rules and specifications are consistently rated as the most influential types of standards by the organizations surveyed. Internal company standards follow in the assessment and appear to play a role primarily for internal company implementation processes. Especially in the area of sustainability, certifications in accordance with ISO 14001 (environmental management) or ISO 50001 (energy management) are particularly important. In contrast, consortium standards, de facto standards and external company standards are rated as significantly less relevant for both success factors. This also corresponds to the pattern for other success dimensions and presumably reflects their lower institutional commitment and strategic anchoring in companies.

Figure 10

Average assessment of the impact of different types of standards. -3 (very negative) to +3 (very positive).

One clear trend is particularly noticeable: since the first survey in 2022, there has been a continuous decline in the average rating for all types of standards, both in terms of sustainability and resilience. The values for 2024 are below those of previous years. The decline is particularly sharp for internal company standards and formal standards, while the values for technical specifications also fall significantly. This result may point to a shift in the perception of the strategic relevance of different standard types in the context of sustainability and resilience.

Compared to other success factors, a notable pattern emerges: The perceived impact of standards on sustainability and resilience is significantly lower than for classic market-oriented success factors such as competitiveness, market access, or negotiating position. Instead, the ratings are on a similar level to those for productivity gains and research and innovation activities. This suggests that while sustainability and resilience are recognized as relevant objectives within companies, they are, in many cases, still less firmly embedded in standardization strategies compared to traditional efficiency goals.

STANDARDIZATION ACTIVITIES

Participation in standardization committees remains stable – focus lies on the national level

A central component of the DNP survey is the assessment of organizations' external standardization activities. In 2024, more than 1,000 company representatives provided information about their involvement in committees of various standardization bodies. National standardization remains the main focus: 85% of respondents are involved with DIN, and 27% with DKE. This means that the level of participation remained stable compared to the previous year.

Participation in standardization committees in 2024

Participation in European organizations such as CEN (56%), CENELEC (30%), or ETSI (13%) is significantly lower than in the previous year. The same holds true for international organizations like ISO (54%), IEC, or ITU (11%), partly because national committees often represent their interests in supranational bodies through delegates. Consortia-based activities are also relevant: 56% of respondents participate in national consortia, while participation in EU-level (42%) and international consortia (37%) is somewhat lower.

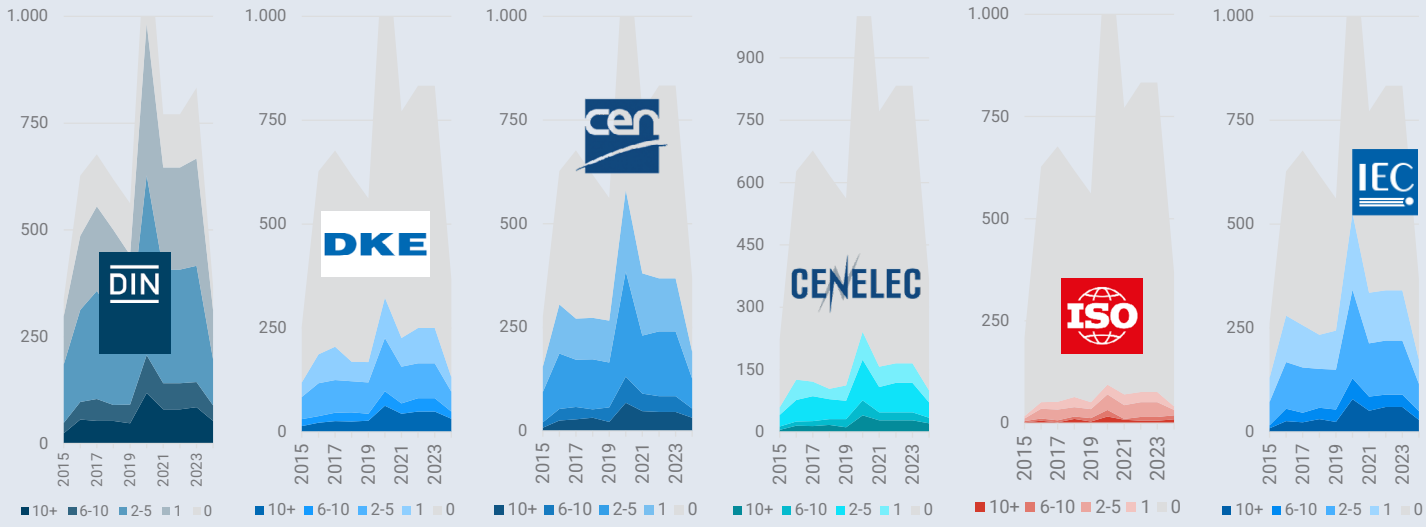
Very large companies (more than 1,000 employees) are particularly active, accounting for around one third of all participations. Small companies (fewer than 50 employees) make up about 27%, with DIN showing a balanced level of participation across all company sizes. In technology-oriented international organizations such as ETSI or ITU, large firms are especially dominant, in some cases representing over 70% of participants.

The services sector is most strongly represented (e.g., 23% at DIN), followed by mechanical and plant engineering, electrical engineering, medical technology, and metal processing. In international committees, traditional industrial sectors such as mechanical engineering, metal production, and chemicals/pharmaceuticals are

Figure 11

Balanced panel: committee seats in standardization organizations

Balanced panel (organizations that provided at least 7 responses between 2013 and 2024)
N = 1,313 - 1,604



more dominant. On the European level (CEN, CENELEC), there is a more balanced distribution between industry and services.

Development of participation in standardization committees

The analysis of committee participation at DIN shows a significant decline in the participation of highly active organizations compared to 2020: While there were still 118 organizations with more than ten committee participations in 2020, this figure was 91 in 2024. A similar decline can be observed at DKE, where the number of frequent participants (>10 committees) fell from 64 (2020) to 48 (2024).

At the same time, total participation at DIN in 2024 was similar to previous years at 664 organizations. The majority of participants are involved in one or a few committees: Over 50% of organizations are currently active in only one or in 2-5 committees at DIN.

At European level, CEN and CENELEC show an overall stable to slightly positive trend over the period from 2015 to 2024. A continuous increase in participation can also be observed at ETSI over this period. In the case of international organizations such as ISO and IEC, participation has stabilized at a medium level following previous declines, even if the pre-crisis level of 2020 has not yet been reached again.

Participation in consortia shows a differentiated picture: the number of participations in national consortia has remained constant at a high level in recent years (2024: 56%), while European and international consortia have also recovered slightly after temporary declines.

Overall, there are signs of consolidation in standardization activities: While the number of strongly committed organizations is declining, broad participation at national level remains intact. European and international standardization is once again attracting increasing attention. The willingness to participate in standardization is high, especially at national level. Most organizations participate in at least one committee - this underlines the broad anchoring of standardization in day-to-day business. At the same time, however, it is clear that intensive participation (more than five committees) is on the decline.

Standardization departments remain concentrated in large companies and technology oriented sectors

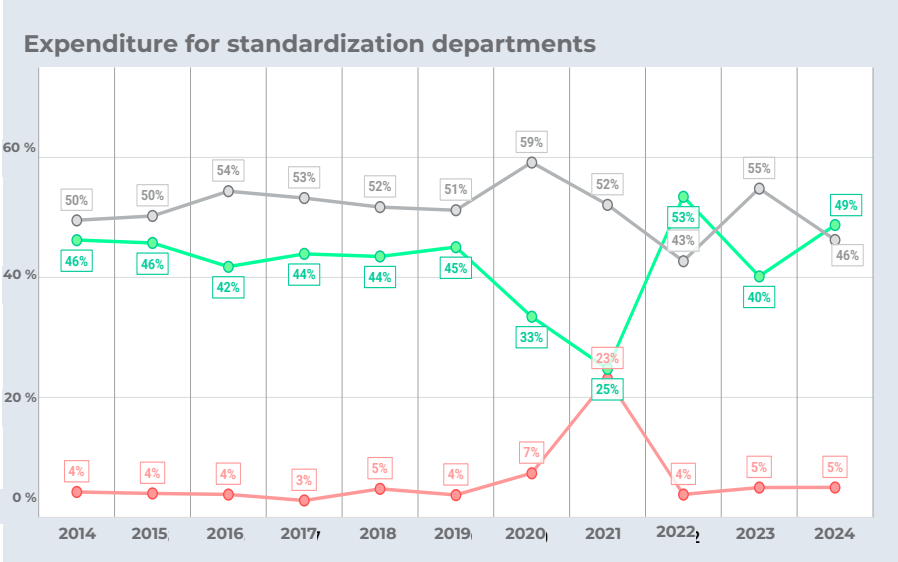
In 2024, around 34% of the organizations surveyed had their own standardization department. The establishment of such structures is still clearly dependent on size: While more than half (52.5%) of very large companies (1,000 employees or more) have their own department, the proportion of small and medium-sized companies (under 250 employees) is only around 24% in each case.

There are also clear differences between sectors: standardization departments are particularly common in vehicle construction (63.6%), electrical engineering (42.5%) and mechanical and plant engineering (38.2%). In other sectors, such as the construction industry, consumer goods manufacturing or the chemical and pharmaceutical industry, the proportion is significantly lower. This means that although standardization is actively pursued in many sectors, it is only structurally anchored in certain areas.

Figure 12

Change in expenditure on standardization departments between 2013 and 2024

N = 5,020



There was a pleasing development in expenditure on standardization departments (Figure 12): Compared to the previous year, 49% of organizations stated that they had increased their expenditure, the highest figure since the survey began. A further 46% left their expenditure at the second level. Only 5% reported cuts. These results indicate that the strategic relevance of standardization-related activities is increasing again in many companies.

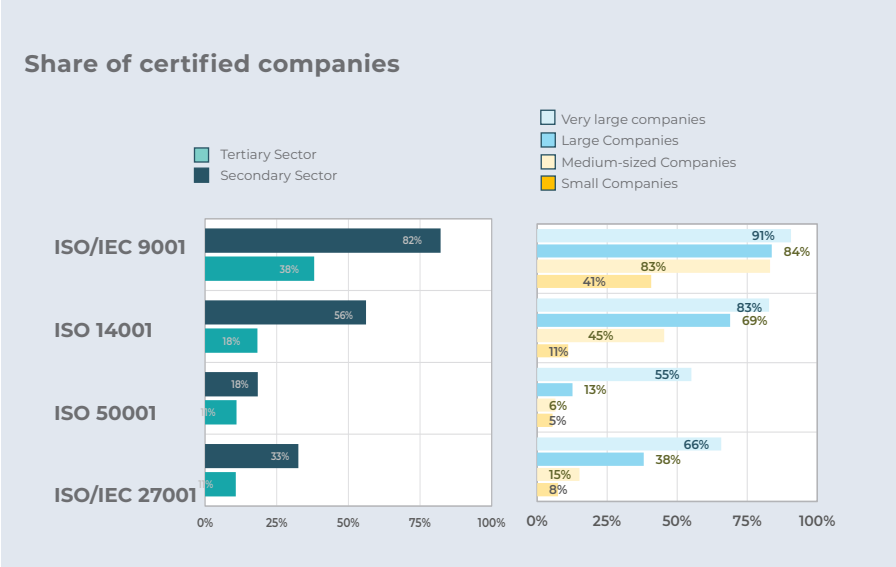
CERTIFICATION OF MANAGEMENT SYSTEMS

More ISO 14001 and ISO/IEC 27001 certifications planned

Another aspect on which participants provided information in the survey was whether they received certification according to certain formal standards in the previous year of the survey (2023). If this was the case, they were also asked to indicate in which year the initial certification took place.

Figure 13

Proportion in 2024 of companies certified according to various standards
N = 301 to 748



As in the previous surveys, the majority of organizations (65.6%) stated that they had been certified to at least one of the major quality, environmental, energy or IT security management system standards in 2023. The results of the individual certifications show a slight decline overall compared to the previous year, with differences according to standard and organization type.

With 70.3% of organizations certified, ISO 9001 (quality management) was again by far the most widespread standard among the companies that reported being certified in 2023. This is followed by ISO 14001 (environmental management), which is used by 45.9% of organizations. ISO 50001 (energy management) was used by 26.6% of the participating organizations. The IT security standard ISO/IEC 27001 was implemented by 16.3% - a decrease compared to the previous year.

Certifications more widespread among large and innovative organizations

As expected, the prevalence of certifications varies significantly according to company size. In small and medium-sized organizations, the certification rate for ISO 9001 is 58%, for ISO 14001 27%, for ISO/IEC 27001 6% and for ISO 50001 12%. These figures are significantly higher in large and very large organizations: 88% are certified to ISO 9001, 77% to ISO 14001, 36% to ISO/IEC 27001 and 54% to ISO 50001.

Innovation behavior also correlates with the likelihood of certification. Organizations that have introduced product or process innovations or conducted research activities are significantly more likely to be certified. The certification rate for innovative organizations is 76% for ISO 9001, 52% for ISO 14001, 20% for ISO/IEC 27001 and 32% for ISO 50001 - significantly above the level of non-innovative organizations.

There are also clear differences between sectors. Certification rates are particularly high in electrical engineering (ISO 9001: 98%), vehicle construction (ISO 14001: 80%, ISO 27001: 51%) and in the chemical and pharmaceutical industry (ISO 14001: 79%, ISO 50001: 57%). The figures are lower in the service sector, for example.

Increase in planned certifications: Focus on the environment, information security and new topics

The trend towards the certification of energy management systems identified in the previous year is not reflected in the initial certifications surveyed this year. Compared to ISO 9001 and ISO 50001, there was a slightly stronger increase in initial certifications in accordance with ISO/IEC 27001 and ISO 14001. A slight trend towards more initial certifications compared to the previous year was identified, with the environmental management standard ISO 14001 in particular leading with 20%.

The 2024 survey also recorded which certifications organizations are planning for the coming years. There was a particularly high level of interest in ISO 14001 (16.6%), ISO/IEC 27001 (13.9%) and ISO 50001 (12.8%). ISO 9001 is also targeted by 7.4% of organizations that are not yet certified.

ISO/IEC 42001 and ISO 56001

This year, respondents were also asked about the application of two current management standards ISO 56001 on innovation management and ISO/IEC 42001 on the management of trustworthy artificial intelligence. Both standards address current challenges in dealing with technological developments and uncertainties in the digital transformation. Although the current certification levels for these standards are still very low, with only 84 and 56 certifications in total (Figure 14), 6.5% of organizations are planning to certify to ISO 56001 and 9.6% to ISO 42001, particularly in technology-intensive sectors such as mechanical engineering, electrical engineering, and vehicle manufacturing.

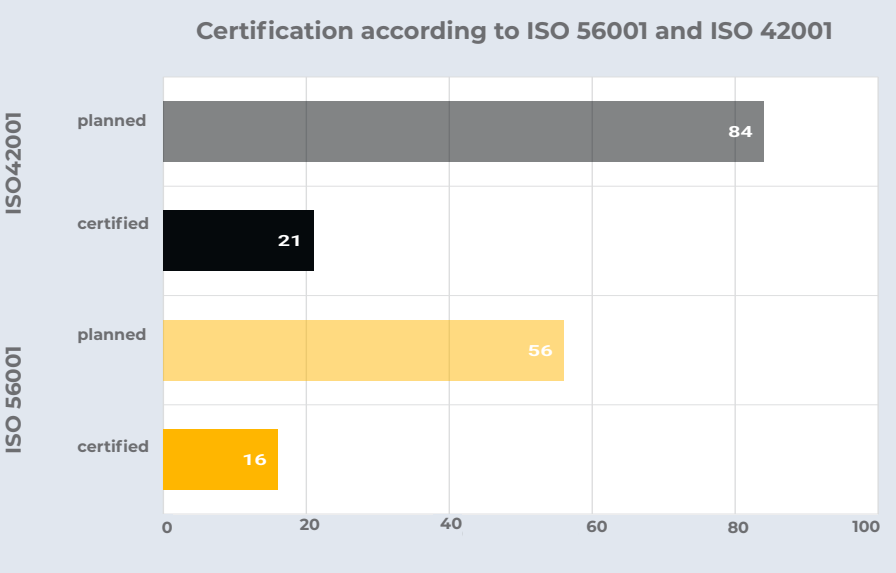
ISO 56001 is part of the ISO 56000 family and is intended to support organizations in the systematic planning, implementation, evaluation and continuous improvement of innovation management systems. The standard specifies requirements for a culture that promotes innovation, strategic orientation, risk assessment and processes for idea generation, validation and implementation. It aims to establish innovation capability not as a sporadic event, but as a structural component of organizational development for products and processes as well as for business models.

ISO/IEC 42001 is the first internationally uniform standard that specifically addresses the handling of artificial intelligence as part of a management system. It is aimed at organizations that develop, deploy or operate AI systems and offers a structured approach to ensuring trustworthiness, transparency and accountability. The standard addresses aspects such as data quality, explainability, security requirements and ethical guidelines and is intended to help meet regulatory requirements and strengthen social trust in AI-based systems.

The results of the 2024 survey show a slight decline in the level of existing certifications in 2023, particularly for IT and energy management systems. At the same time, an increased interest in sustainability (ISO 14001), information security (ISO/IEC 27001) and new normative topics such as AI trust (ISO 42001) and innovation management (ISO 56001) can be observed for the future. The relevance of management system standards therefore remains high - especially for larger, innovation-oriented and highly regulated organizations.

Figure 14

Number of organizations certified according to ISO 56001 (Innovation Management) or ISO 42001 (AI Trustworthiness) in 2024



SPECIAL SECTION SMART STANDARDS AND STANDARDIZATION AS A TOOL FOR SELF-MANAGEMENT

Structure of the special section

This year's special section of the German Standardization Panel is dedicated to two central future topics of standardization: digital change in the form of machine-readable SMART standards and the role of standardization as a tool for self-governance. Both topics are exemplary of current regulatory challenges to standardization in the context of increasing digitalization, regulatory complexity and growing expectations of transparency, efficiency and innovation.

The aim of the special section was to record the assessments and experiences of organizations active in standardization with regard to these developments, to analyze existing usage patterns and to identify the need for action - both in terms of technical implementation options and with regard to institutional, legal and procedural framework conditions.

Part A examines the dissemination, use and assessment of SMART standards. Among other things, the degree of digitization of the organizations, the use of digital standard formats (e.g. PDF, XML, database, interfaces/API), the level of awareness of the SMART concept, specific purposes of use (e.g. further processing in systems) and the willingness to participate in follow-up activities were recorded. The results show a differentiated picture: While PDF formats still dominate, interest in structured and machine-readable formats is increasing noticeably, especially among digitally advanced organizations. However, the awareness of SMART standards has so far been limited and strongly dependent on size, industry and digital maturity level. It is also clear that organizations that are familiar with SMART standards use them more frequently and see more potential in digital access to standards. The findings demonstrate the need for targeted information offerings, technical support and industry-specific application examples.

Part B sheds light on the role of standardization as an instrument of self-administration and places it in relation to legislation. The respondents rated standardization and legislative procedures according to key characteristics such as transparency, effectiveness, coherence and efficiency. Standardization continues to be rated more positively overall, particularly with regard to fact-orientedness, factual orientation and efficiency. However, the assessment has shifted slightly compared to 2018: Assessments of standardization have become more critical, primarily in terms of transparency and efficiency, while the image of legislation has barely improved. There is also an ambivalent picture regarding the contribution of standardization to reducing bureaucracy: the mean value is slightly negative, with larger and digitally affine organizations tending to see a relieving function, while smaller companies do not see standardization as relieving bureaucracy.

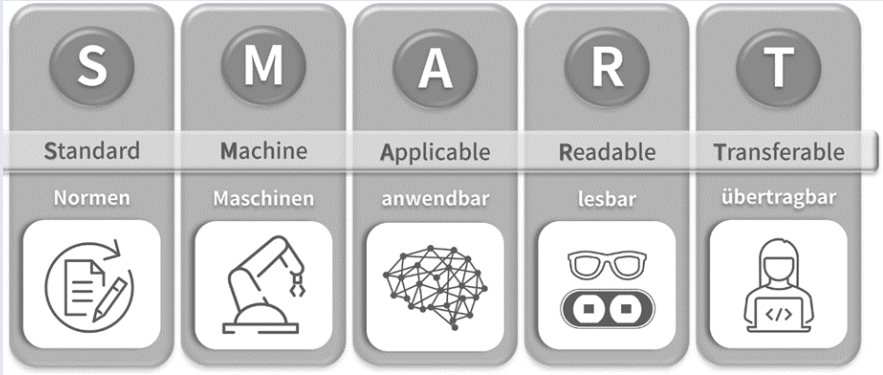
SPECIAL SECTION A: SMART STANDARDS

Special Part A of the German Standardization Panel 2024 focused on the use and assessment of SMART standards. First, the degree of digitalization of the participating organizations was surveyed using an established maturity model in order to reveal correlations with the use of digital standard formats. Next, the level of awareness of the SMART Standards concept was surveyed in order to assess the degree of dissemination and level of information in various industries and company sizes. Another focus was on the current and planned use of digital standard formats such as PDF, XML, databases and APIs. In addition, the concrete plans for the use of SMART standards within the organizations as well as the most important application purposes (e.g. targeted search or further processing of standards content) were recorded.

SMART standards - the future of standardization?

Figure 15

What are SMART Standards?
(Source: https://www.dke.de/idis/smart-standards)



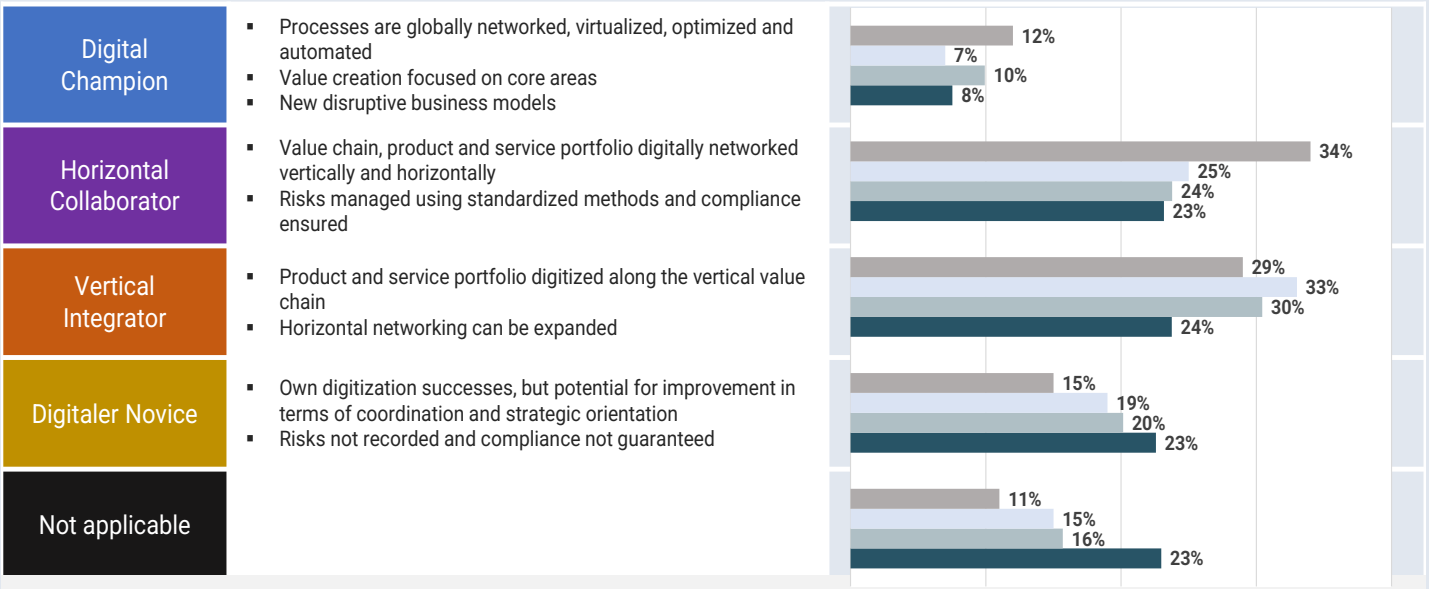
SMART standards are digital standards that are prepared in such a way that they can be read, applied and transferred by both humans and machines. They are intended to provide relevant information in an optimal form anytime and anywhere, thereby enabling efficiency gains and avoiding misinterpretation. Developed as part of the Digital Standards Initiative (IDiS), SMART standards play a central role in digital transformation and Industry 4.0. Their aim is also to harmonize standards between different organizations and improve interoperability.

Assessment of the digital maturity level

In the first question of the module on digitalization, participants were asked to assess their organization's level of digitalization and networking based on a maturity model developed by PwC. This model distinguishes between five levels: from the "Digital Novice", which has achieved initial digitalization successes but still has considerable deficits in coordination and compliance, to the "Digital Champion", where processes are globally networked, automated and geared towards value-added business models. In between are the categories "Vertical Integrator" and "Horizontal Collaborator". There was also the option of ticking "Not applicable". The classification is based on characteristics such as vertical and horizontal integration, dealing with risks and standardization as well as the ability to develop new digital business models.

Figure 16

Degree of digitalization
Self-assessment by experts



1. Categories according to PwC (2014): 'Industry 4.0 – Opportunities and Challenges of the Fourth Industrial Revolution', 2015: N=799, 2017: N=1.033 2020: N= 1.682, 2024: N = 1.023

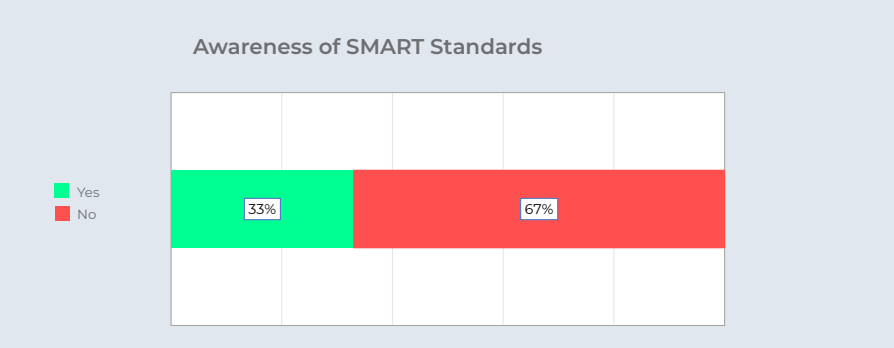
The question has already been asked three times as part of the German Standardization Panel survey, in 2015, 2017 and most recently in 2020. The time series on the self-assessment of the degree of digitalization shows a remarkable development: despite technological progress and the increasing relevance of digital processes, the proportion of organizations that classify themselves as "digital champions" is falling. While 12% of participants still stated that they had reached this highest level of maturity in 2020, only 8% did so in 2024. At the same time, the proportion of those who classify themselves as "digital novices" is stagnating (2020: 19%, 2024: 20%) and the proportion of those who do not consider any of the categories to apply is increasing (2020: 16%, 2024: 23%). This shift suggests that organizations today assess their digital competence more critically than in previous years. The increased demand for digital maturity, for example in terms of automation, data integration or regulatory requirements, could mean that previous progress is no longer considered sufficient. It can also be observed that the majority of organizations now place themselves in the middle of the field: The proportion of "horizontal collaborators" rose to 34%, while the group of "vertical integrators" also remains strongly represented at 33%. Overall, there is a trend towards more realistic or more cautious self-assessments - which indicates an increasing sensitivity to the challenges and demands of digital transformation.

Awareness of SMART standards

The awareness of the concept of SMART standards is still relatively low in the sample surveyed. Only 33% of the participating organizations stated that they were familiar with the term. Accordingly, 67% have not yet come into contact with this new form of digital, machine-readable and interoperable standards, which are expected

Figure 17

Awareness of SMART Standards
N = 1.003



to play a central role in automated and networked industrial processes in the future. The analysis also shows clear differences between different company sizes. The awareness is particularly high among very large companies, 42% of which stated that they were familiar with SMART standards. Large companies (31%) and small organizations (30%) also achieve similar values, while medium-sized companies have the lowest proportion of mentions at 25%.

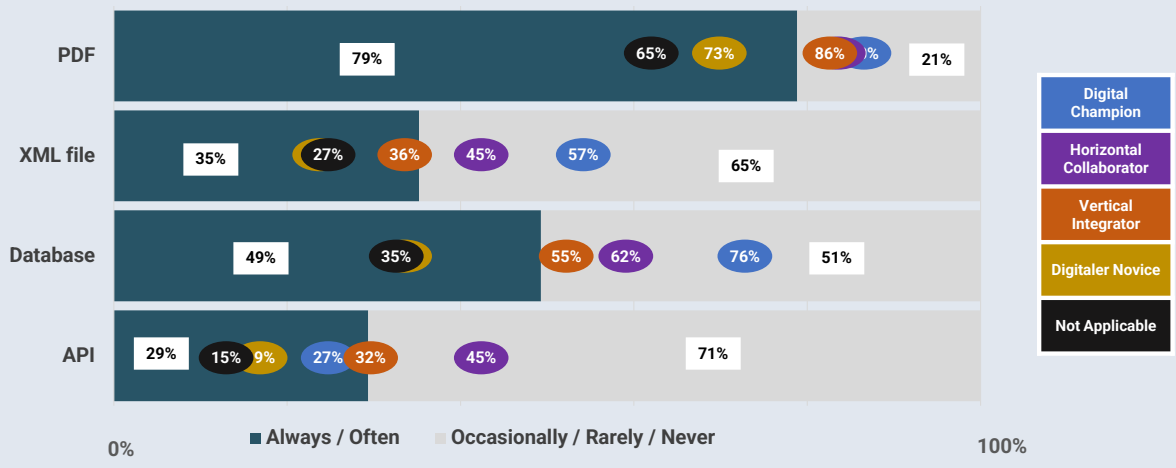
There are clear differences when comparing sectors. The highest level of awareness was found in vehicle construction, where 49% of the organizations surveyed were familiar with the concept. It is also more widespread than average in electrical engineering (37%) and in freelance and scientific services (32%). In the energy and water supply and chemical and pharmaceutical sectors, the proportion is around 32% in each case. By contrast, the awareness is well below average in consumer goods manufacturing (9%), metal production (25%) and construction (25%).

The concept is also not very widespread in the area of certification services. In addition, it can be seen that so-called digital champions and organizations with a strong horizontal focus on digital collaboration in particular report an above-average level of familiarity with SMART standards. This indicates that digital-savvy players in particular are able to recognize and classify the potential of this new form of standard at an early stage.

PDF formats continue to dominate - structured formats are gaining in importance

Figure 18

Use of Digital Formats
N = 1.025



Question: How frequently are standards (patents) used in digital form in your company/group/industry to enable electronic further processing of their content?
1. [Rarely, Occasionally, Often, Always]
2. Self-assessment regarding one's own company / industry. Categories based on PwC (2014): 'Industry 4.0 – Opportunities and Challenges of the Fourth Industrial Revolution'

The use of digital standards formats is currently still predominantly via classic PDF documents. 79% of the organizations surveyed stated that they often or always use standards as PDFs. The mean value of 3.1 (on a scale from 0 = never to 4 = always) is also significantly higher than all other formats. XML files achieved an average score of 1.7, databases 2.2 and APIs 1.5, meaning that PDF remains the central format for provision and archiving - a finding that has hardly changed since the first survey in 2017. Even then, PDF usage was 78%, showing that structural changes are only taking effect very slowly.

However, a look at the planned use shows the first shifts: 31% of respondents plan to use databases more frequently in the future, while this figure is 27% for APIs and 24% for XML files. At the same time, 7% of organizations expect a reduced use of PDF, while 22% expect a more intensive use - the change is therefore proceeding hesitantly and PDF remains the dominant format. The use of structured formats is particularly pronounced in organizations with a high degree of digitization. Digital champions have a mean score of 2.9 for databases, 2.4 for XML files and 2.3 for APIs - well above the average for the overall sample. Horizontal collaborators are also above the average: they use APIs with a MW of 2.0, compared to just 1.2 for digital novices.

There are also differences in the industry comparison. The highest combined use of structured formats is found in the automotive industry (overall mean: 11.3), the energy and water industry (10.1), the ICT industry (11.1) and the construction industry (9.0). The latter is also planning to make greater use of XML files - presumably in connection with building information modeling (BIM). In many of these sectors, there is a clear trend towards greater automated processing of standard data. For example, the planned increase in the use of APIs in vehicle construction is +43% and +38% for databases.

This shows a differentiated picture compared to 2017: While structured formats such as XML, APIs and databases are gaining relevance in certain industries and among digitally advanced organizations, PDF remains the universal and most widely used format.

Targeted search for standard content as the most important application purpose

The organizations surveyed were also asked in which application scenarios they thought SMART standards could be most useful. The targeted search for specific standard content, such as certain regulations or requirements, was mentioned most frequently. 28% of participants see this as the main application purpose. The search for specific content for use in subsequent processes, such as for further processing in digital systems, followed in second place with 19%. In contrast, only 11% consider the general search for standards to be the most helpful purpose. 17% are unsure in their assessment and 25% did not specify.

A look at the size of the company shows that very large organizations most frequently rate the targeted search for specific content (36%) and subsequent use in processes (19%) as particularly relevant. Smaller companies are often undecided in their assessment (16% "not sure") or do not specify (29%). Medium-sized organizations rely more heavily on process integration (23%), while large companies primarily emphasize access to specific standard content (30%).

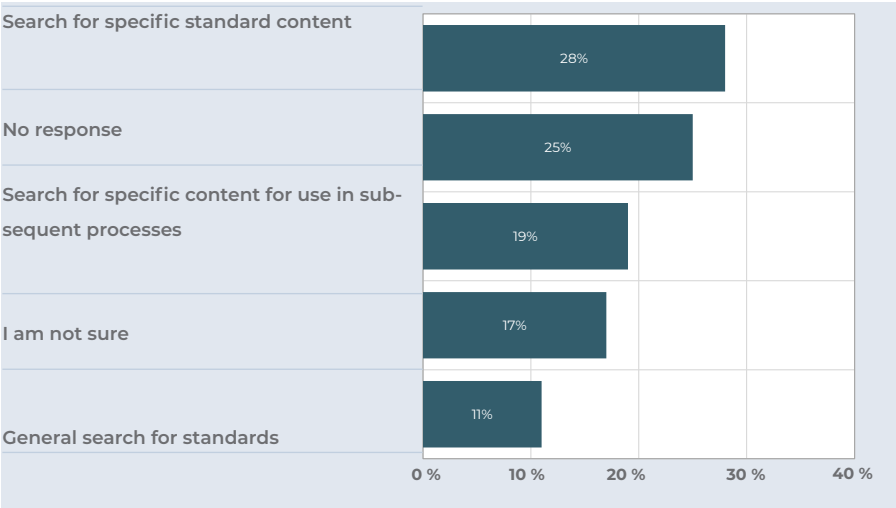
There are also clear differences when differentiated according to the degree of digitalization: Horizontal collaborators (32%) and vertical integrators (31%) clicked on the search for standards content particularly often. For digital novices, this proportion is significantly lower at 24%, while uncertainty (24%) is comparatively high here. Digital champions are characterized by a particularly pronounced focus on specific content: 30% of them emphasize the need for specific standards content, 12% see further use in processes as the main purpose.

In terms of sectors, the application purpose "search for specific standard content" is particularly important in mechanical and plant engineering (40%), electrical engineering (36%) and construction (34%). Further use in processes, on the other hand, plays a particularly significant role in the chemical and pharmaceutical industry (37%), in vehicle construction (28%) and in electrical engineering (22%). The high proportion of uncertain answers in the service industries is also striking.

Use and planned use of SMART standards

Figure 19

Use of SMART standards
N = 939



The use of SMART standards is still low, but there are signs of growing interest (Figure 20). 11% of the organizations surveyed state that they are already actively working with SMART standards, while a further 17% are planning to introduce them. This means that a total of 28% of participants are specifically working on the topic - a considerable proportion given the still early stage of development. It is striking that organizations that are already familiar with SMART standards use them or plan to use them with above-average frequency. This underlines the importance of information and awareness-raising for practical implementation.

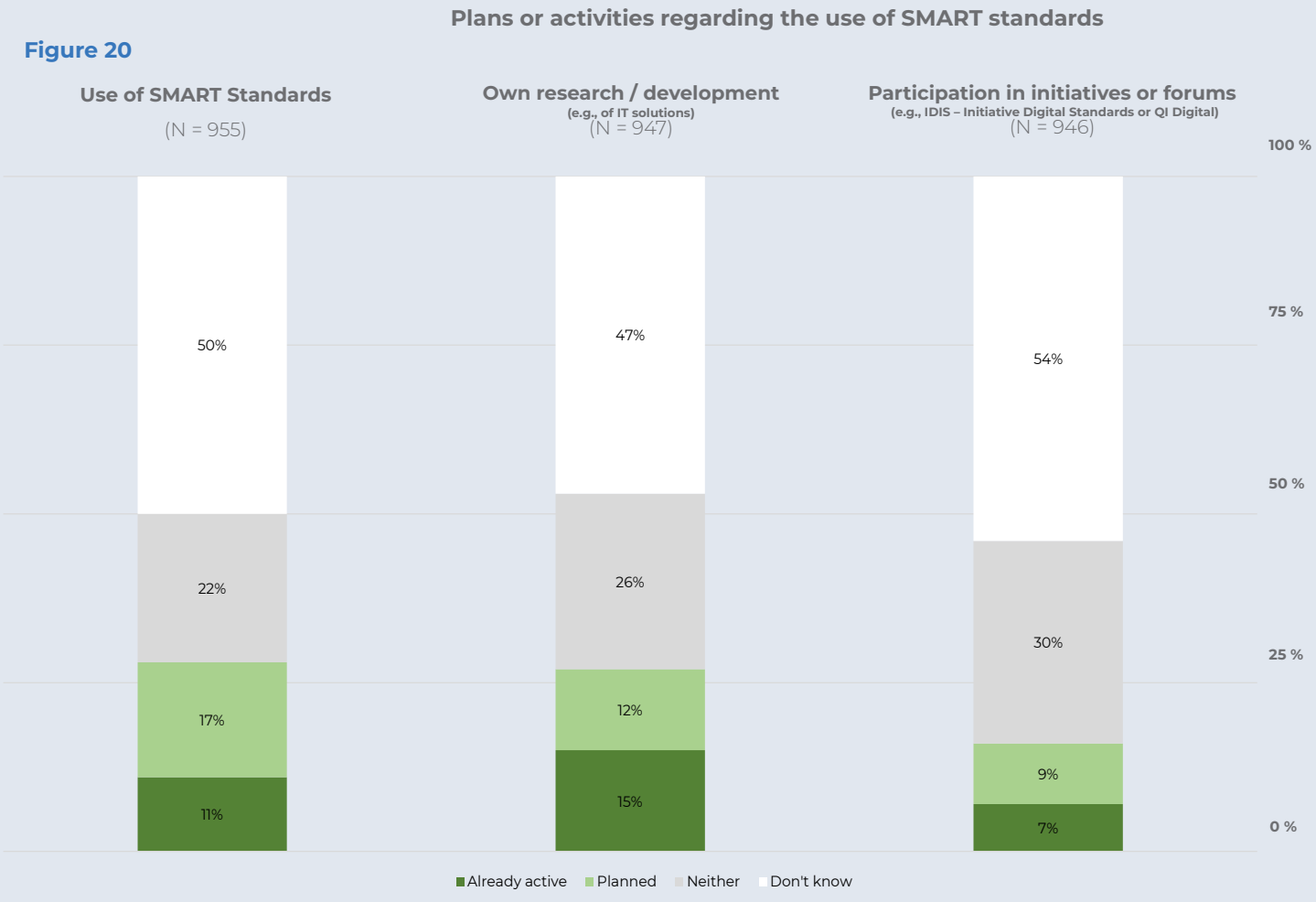
Very large companies (19% active, 18% planned) and organizations with a high degree of digitalization are particularly active. Among digital champions, 25% are already active, and 19% among horizontal collaborators. In contrast, the proportion of active users among digital novices is only 4%, accompanied by a high level of uncertainty (55% "don't know"). There is also a great deal of uncertainty among small and medium-sized companies: more than 40% each state that they do not know whether their company uses SMART standards.

In terms of sectors, mechanical and plant engineering, electrical engineering and vehicle construction are particularly active. In these sectors, the proportion of active users is around 20%. In less digitized areas such as public administration, the metal industry or consumer goods production, on the other hand, usage is well below average. Organizations that develop their own solutions are an important target group: 15% of respondents are already active in research or development in the context of SMART standards, while 12% are planning corresponding activities. The proportion is particularly high among digital champions (33%) and in very large companies (20%). These groups develop their own IT applications - often without standardized interfaces. SMART standards could help here to integrate standard data efficiently.

Activities and involvement in initiatives

Overall, it is clear that initial experience with SMART standards is available, particularly in digitally-oriented and technology-oriented organizations. However, the vast majority are unsure or not yet active - a clear signal of the need for further information and support.

Figure 20



SPECIAL SECTION B: STANDARDIZATION AS A SELF-GOVERNANCE INSTRUMENT OF THE ECONOMY

In the special section of the German Standardization Panel on "Bureaucracy and standardization", participants were asked to compare standardization and legislation with regard to various aspects. They were asked to assess transparency, effectiveness, accessibility, relevance, coherence and efficiency. The aim was to highlight the differences and similarities between the two coordinating instruments from the perspective of those involved.

In addition, the role of standardization as an instrument of economic self-administration was discussed. The focus was on the extent to which standardization can contribute to relieving the burden on state structures and reducing bureaucracy. In addition, open questions were asked in order to record qualitative assessments. Respondents were able to indicate why standardization may not be perceived as effective or efficient, in which areas it is considered particularly helpful and where or how it could be used even better in the future in the interests of regulation.

Perception of transparency in standardization and legislation

The first question in this section examined how participants rate national and European standardization and legislation in various dimensions. Six characteristics were surveyed: transparency, openness, fact-orientedness, effectiveness, coherence and efficiency, each on a scale from -2 (very negative) to +2 (very positive). The assessments from 2024 were compared with the results from the 2018 survey.

National standardization is rated as consistently positive overall in 2024. Approval is particularly high in relation to fact-orientedness (mean value 2024: 0.94), which represents a significant increase compared to 2018 (0.37). The overall picture is also positive in the categories of transparency, effectiveness and coherence, albeit with slightly lower values compared to 2018. Efficiency, on the other hand, is consistently rated the weakest (2024: 0.21), with a decrease compared to 2018 (0.35). European standardization also performs best in terms of impartiality (2024: 0.72 compared to 0.25 in 2018). The ratings for transparency and openness are positive, although there is a clear decline in openness (2024: 0.21; 2018: 0.44). The perception of efficiency is particularly low (2024: 0.01), which indicates clear criticism of European standardization work in this aspect.

In comparison, national legislation is rated much more critically. Although the values improve slightly in individual areas (e.g. transparency from -0.45 to -0.07 and impartiality from -0.19 to 0.14), the ratings in the areas of openness (2024: -0.20) and especially efficiency (2024: -0.33) remain negative. European legislation is rated most critically overall. The mean values are negative in almost all categories, particularly in the areas of transparency (2024: -0.33) and efficiency (2024: -0.47). Compared to 2018, the ratings in almost all areas have deteriorated or remain at a low level, which indicates an overall low level of trust in European legislation.

In summary, it can be seen that both national and European standardization are perceived much more positively than legislation, particularly in terms of impartiality, transparency and effectiveness. However, the greatest weaknesses of standardization continue to lie in efficiency - particularly at the European level.

Standardization and bureaucracy reduction: perception between relief and additional effort

In a further question, participants were asked to assess whether standardization, understood as a self-governing task of industry to reduce bureaucracy, contributes to relieving the administrative burden and reducing bureaucracy. The assessment was made on a 7-point scale from -3 (strongly disagree) to +3 (strongly agree). The results show an ambivalent picture: While 31% of respondents answered neutrally, only 7% strongly agreed with the statement, with 15% scoring +2. At the same time, around 10% clearly disagreed with the statement (-3), with a further 10% scoring -2. The mean value for the overall sample is slightly negative at -0.10.

A differentiated look at company size shows clear differences in perception. Small companies rate the potential contribution of standardization to reducing bureaucracy as the most negative, with a mean value of -0.34. Medium-sized companies also tend to see no positive bureaucracy reduction effect (mean value -0.28). Large (+0.08) and especially very large companies (+0.13), on the other hand, tend to recognize a relieving function of standardization. These differences can be explained by the fact that smaller organizations feel the standardization-related effort, for example for implementation, documentation or certification, more clearly, while larger companies benefit more from legal clarity and standardized processes due to their existing capacities.

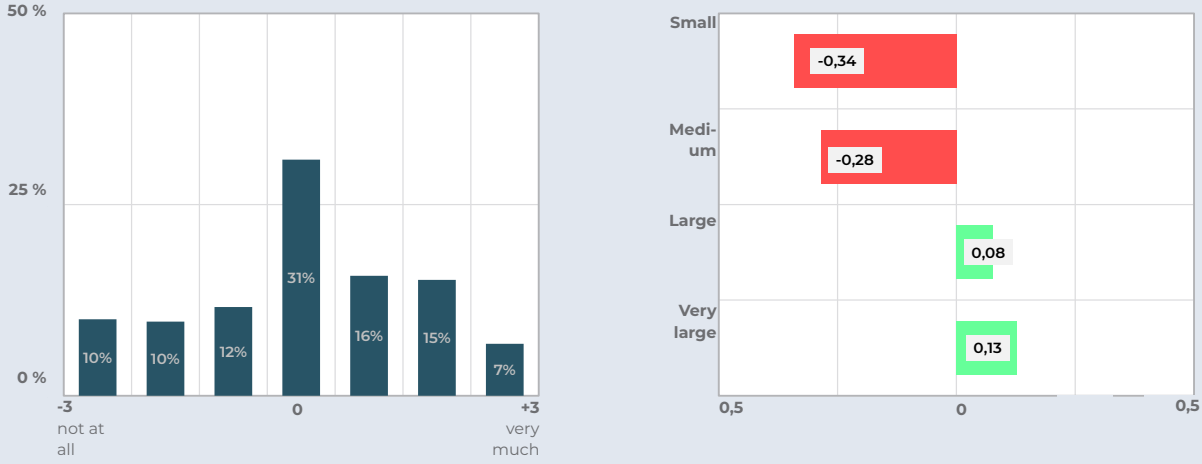
The comparison by degree of digitalization also shows a differentiated picture: digital champions are the most positive overall (mean value +0.33), followed by horizontal collaborators (+0.17) and vertical integrators (+0.16). In contrast, digital novices rate the question clearly negatively with a mean value of -0.28. It is particularly striking that digital champions agree with the statement more often than average (+3: 11%), while rejection and uncertainty dominate among novices and the "none applicable" group. This suggests that digitally advanced organizations are more likely to recognize how standardization can contribute to relieving administrative burden and bureaucracy

Knowledge of SMART standards also has an impact on perception: People who are aware of SMART standards rate the contribution of standardization significantly more positively (+0.49) than those who are not aware (mean -0.27). Agreement with the reduction in bureaucracy is almost twice as high in this group (strong

Figure 21

Relevance of standardization as an instrument of self-governance

Scale from -3 (not at all) to +3 (very much)
Left: Overall response distribution (% of respondents), N = 930
Right: Group means by company size, N = 559



agreement: 10% vs. 5%). This shows that informed organizations tend to see standards as part of efficient and modern management, especially in conjunction with digital processing options.

In terms of sectors, standardization is perceived as relieving the regulatory burden, particularly in regulation-intensive sectors such as the energy and water industry (+0.68), vehicle construction (+0.42) or the ICT sector (+0.23). Here, standards apparently offers real simplification in dealing with legal requirements. By contrast, players from the metal industry (-0.26), the construction industry (-0.27) or freelance scientific services (-0.22) are more critical. These sectors tend to see standardization as an additional level of regulation without any noticeable reduction in bureaucracy.

The perception of standardization as a contribution to reducing bureaucracy is strongly influenced by operational requirements. While larger and digitally advanced organizations tend to see a reduction in bureaucracy, smaller companies and less regulated sectors see standards as an additional burden. The level of information and digital connection, particularly through SMART standards, have a clearly positive effect on the assessment.

Where does standardization already help?

In the open questions, respondents were asked in which areas standardization already provides support and how it could be used even more effectively for self-administration in the future.

The contribution of standardization in the area of safety and consumer protection is mentioned most frequently (39 mentions), followed by quality assurance and comparability (31) as well as economic benefits and market access (30). Legal certainty and contracts (27) as well as technical compatibility and interoperability (19) are also perceived as key areas of impact. The results show that standards are considered particularly helpful where they enable clarity, transparency and smooth processes - both legally and technically.

Potential for improvement and recommendations for action

With regard to possible improvements, the main demand is for more uniformity and consistency (26 mentions), particularly with regard to interfaces and regulations. The binding nature and verifiability of standards (11) and the cost and access barriers (10) are also critically reflected upon. Other topics include the reduction of bureaucracy, the political independence of standardization as well as more flexibility and the promotion of innovation. The feedback indicates that many potentials have already been recognized, but that there is a lack of implementation structures - especially for smaller players. Recommendations, therefore, relate not only to further technical development, but also to more transparent procedures and low-threshold participation formats.

CONCLUSION

Key findings from the thirteenth survey of the German Standardization Panel

Economic stagnation, geopolitical uncertainties and the break-up of the government as well as the discussion about the future role of the German economy in Europe and worldwide characterized the survey period of the DNP between autumn 2024 and early 2025. The current survey of the German Standardization Panel shows that only around one third of the more than 1,200 participating organizations perceive standards as helpful in reducing bureaucracy. Small companies in particular see little relief in this. Nevertheless, standards perform slightly better than legislation in aspects such as transparency and efficiency - even if the overall assessment remains cautious. The concept of SMART standards was also examined. Around a third of companies are familiar with these digital standard formats.

The analysis of the results makes it clear that formal standards and technical specifications continue to be seen as extremely relevant for competitiveness, technical interoperability, legal certainty and market access. In contrast, external company standards and consortium standards are less important. The importance of internal company standards generally remains high, but their relevance for productivity increases is declining. Work in standardization committees remains stable and expenditure on standardization departments in organizations shows a slight upward trend.

The results of the DNP 2025 show that fewer and fewer companies consider themselves to be digitally advanced, possibly due to increased requirements or changed assessment criteria. While sectors such as ICT, mechanical engineering and electrical engineering are still considered digital pioneers, public administration and the construction industry remain cautious. Standards are still predominantly used as PDFs. A third of companies are familiar with and use SMART standards or are planning to use them, particularly in technology-intensive sectors. At the same time, there are uncertainties about specific application possibilities. The advantage of digital standards therefore often remains unused.

With regard to reducing bureaucracy, it is clear that standardization is perceived more positively overall than legislation, particularly in terms of transparency and coherence. However, the assessment of its effectiveness is declining. Large com-

panies see greater potential to use standardization to relieve the burden on state structures, while SMEs and regulated sectors such as construction are much more skeptical.

SMART standards can help to simplify and speed up administrative processes. In order to better utilize their potential as an instrument for reducing bureaucracy, more information, concrete application examples and targeted support are needed, especially for smaller companies.

SURVEY DETAILS

The German Standardization Panel is conducted by the Department of Innovation Economics at the Technical University of Berlin (TU Berlin) and is financed and supported by DIN and DKE. To present representative results for the companies involved in standardization, the survey results are being compared to DIN's data on companies active in standardization. Furthermore, in the medium term, data from the innovation surveys commissioned by the German Federal Ministry of Education and Research since the 1990s and from the study on the research and development of economic statistics by the "Stifterverband für die Deutsche Wirtschaft" are being used to complete the picture. For the subsequent surveys, it will be essential to motivate previous participants to participate in the following survey waves to establish a helpful panel structure. Finally, other businesses will need to be encouraged to participate in further surveys to gain a broader, more representative database.

Catalogue of questions

The goal of the German Standardization Panel is to measure not only the expenses and effort of companies investing in standardization, i.e., the activities in standardization organizations but also their utilization of the results of this work, that is, the application and implementation of standards and specifications. The questionnaire was divided into four sections:

1. Importance of formal and informal standards and specifications
2. SMART Standards
3. Standardization as an instrument of self-governance by industry
4. Formal and informal standardization activities
5. General information

The complete questionnaires of all surveys since 2012 can be found on the DNP website: normungspanel.de.

GLOSSARY

Formal Standardization

In Germany, 'formal' national standardization (also called 'full consensus standardization') is defined as the 'systematic unification of material and immaterial subjects carried out by all stakeholders working in consensus for the benefit of society as a whole' (see DIN 820-1:2014-06 Standardization – Part 1: Principles, definition from DIN 820-3:2014-06). Provisions are laid down with full consensus and are adopted by recognized formal standards institutes (such as DIN German Institute for Standardization and DKE German Commission for Electrical, Electronic & Information Technologies of DIN and VDE). Formal standardization has a high level of legitimation due to its well-established processes.

In addition, the international and European standards organizations form a network of national standards institutes. DIN's staff administers international and European standardization activities carried out in Germany, ensuring that all rules of procedures and guidelines are complied with. They prepare, carry out and follow-up meetings of international and European bodies and of the corresponding German 'mirror' committees (see www.din.de).

Informal Standardization

In Germany, a differentiation is made between 'Normung' ('formal', full consensus-standardization) and 'Standardisierung' ('informal' standardization that is not based on full consensus). The latter process results in specifications, such as the 'DIN SPEC', or Consortia Standards, for example. Usually, these are developed by a temporary body or standardization Consortia. Full consensus and the involvement of all stakeholders are not required.

Standardization

Standardization refers to the development of specifications or consortium standards by a temporarily assembled committee, for example at DIN or within bodies of standardization consortia. In contrast to formal standardization (norming), consensus among all participants and the involvement of all interested parties are not strictly required.

National Standardization Organizations

DIN, the German Institute for Standardization, is a privately organized provider of services related to standardization and the development of specifications. By agreement with the German Federal Government, DIN is the acknowledged national standards body representing German interests at all levels, including the European and international standardization organizations. DIN's purpose is to encourage, organize, steer, and moderate standardization and specification activities in systematic and transparent procedures for the benefit of society while safeguarding the public interest. DIN publishes its work results and encourages their implementation. Some 30,000 experts contribute their skills and experience to the standardization process, which is coordinated by 400 DIN employees (for further information see www.din.de).

The **DKE German Comission for Electrical, Electronic & Information Technologies of DIN and VDE** is a modern, non-profit service organization that ensures that electricity is generated, distributed, and used in a safe and rational manner, thereby serving the good of the community at large. DKE is the German national

organization responsible for developing standards and safety specifications in electrical engineering, electronics, and information technology. Its work results form an integral part of the collection of German standards. VDE specifications also form the VDE Specifications Code of safety standards (see www.dke.de).

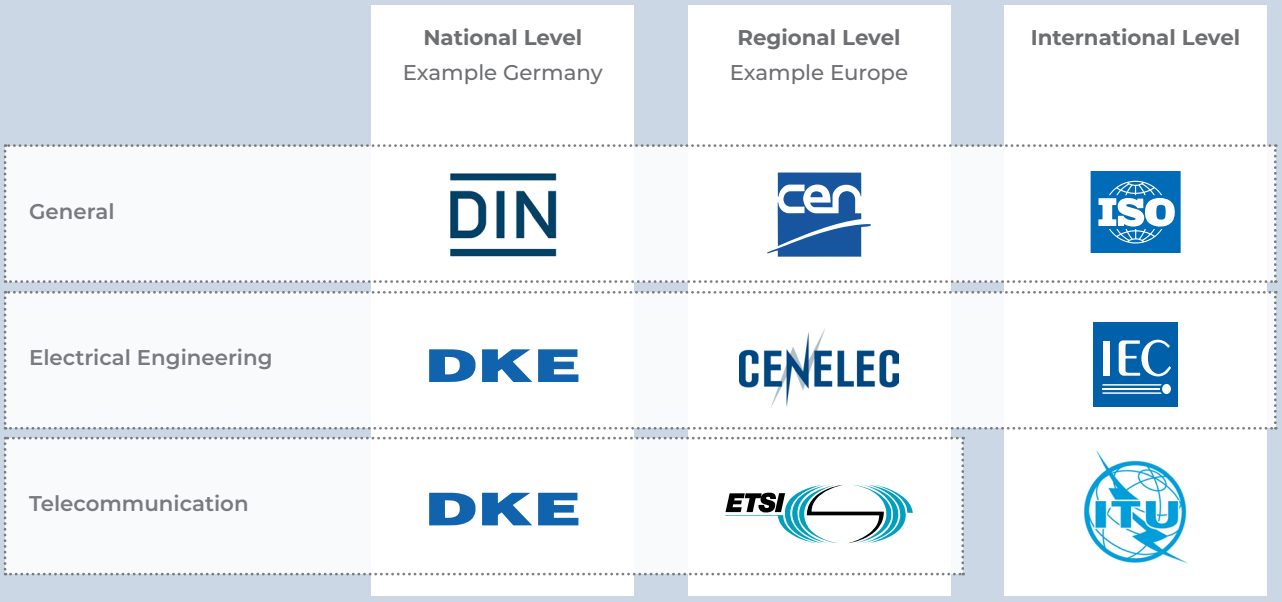
European Standardization Organizations

In Europe, standards are drawn up by the three officially acknowledged European standardization organizations: the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC), and the European Telecommunications Standardization organization (ETSI). The national standards bodies of CEN and CENELEC's 33 members work together to draw up European standards, which are adopted by the members at the national level (see http://www.cencenelec.eu/aboutus/Pages/default.aspx).

Each country is represented within CEN and CENELEC by one member body. German interests are represented by DIN within CEN and by the DKE at CENELEC. Each DIN standards committee decides on active participation at the European level. This work is supported by a working committee designated as the 'mirror committee' to the relevant European body. This committee determines the German position on a particular subject and sends delegates to the European committees to represent this position and participate in the consensus-building process.

ETSI is responsible for drawing up globally applied standards for the information and communications technology (ICT) industry. This includes television and radio technologies as well as the internet and telecommunications. The European Union has officially recognized ETSI as a European standardization organization (see www. etsi.org/about).

Figure A.1 **Structure of international standardization** (Source: www.din.de)



International Standardization Organisations

IISO International Organization for Standardization and IEC International Electrotechnical Commission are private organizations whose members are the national standardization organizations. The secretariats of ISO and IEC technical committees are held by these member organizations, who come from all over the world. DIN's standards committees decide on active participation at the internati-

onal level and on the adoption of an international standard as a national standard. The main bodies of ISO and IEC are the respective general assemblies; other bodies include policy-making bodies such as the council and technical executive committees, such as the Technical Management Board. Standards work is carried out by national delegations and their experts acting in technical committees, sub-committees, and working groups. Another international body that sets rules is the ITU International Telecommunication Union. The ITU is a subsidiary organization of the United Nations and is based in Geneva, Switzerland. Recommendations of the ITU are developed by government representatives of the 191 member countries and representatives of companies and regional and national organizations. They serve as guidelines for legislators and companies in the member countries.

Formal Standards

In Germany, formal standards are developed by the standards committees in DIN and DKE with the full consensus of all stakeholders and are largely recommendatory in nature. However, if they are cited in a law or contract, their use may become mandatory. They 'provide, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at achieving the optimum degree of order in a given context' (definition as in DIN EN 45020:2006 Standardization and related activities – General vocabulary (ISO/IEC Guide 2:2004)). Standards define the state of the art at the time of their publication, and contain recommended properties, test methods, safety requirements or dimensions, for example (see www.din.de).

The most import and designations for standards:

– **DIN** – National German Standard.

– **DIN VDE** – National electrotechnical German Standards containing safety-relevant or EMV-specific provisions

– **DIN ISO, DIN IEC, DIN ISO/IEC** – German translation of an International Standard published by ISO and/or IEC and adopted, unchanged (but sometimes with national elements such as National foreword or National footnote), as a German standard

– **DIN EN** – Official German version of a European standard. All Europeans standards are to be adopted, unchanged, by the members of the European standardization organizations CEN/CENELEC/ETSI

– **DIN EN ISO** – Official German version of a European standard which is the unchanged adoption of an International Standard

Specifications

In Germany, a 'specification' such as the 'DIN SPEC' is the result of an 'informal' standardization process, and describes products, systems, or services by defining characteristics and laying down requirements. Like standards, such specifications are developed by experts in formal standardization organizations such as DIN. However, they differ from formal standards in that full consensus and the involvement of all stakeholders are not required. Like specifications, Consortia Standards are drawn up in an 'informal' standardization process. They are developed based on a majority decision by a selected group of companies and organizations taking the form of a 'Consortia'.

Informal Consortia Standard

An informal consortium standard is also a result of a standardization process. It is developed by a selected group of organizations—such as within the framework of standardization consortia—and is based on a majority decision of that group.

De-facto-Standard

De-facto Standards are not developed by specific consortia but are a consequence of market demand. De-facto Standards are also known as 'industry standards' and are developed in what is called an 'informal' standardization process. All standards drawn up by industrial interest groups are De-facto Standards.

Technical Rules

Technical associations actively participate in DIN's standards committees to represent the interests of their members at the national, European, and international levels. Some of these associations also draw up their own technical rules (see www.din.de), which contain recommendations on how to comply with legislation, a regulation, or an established technical procedure. Although they are not legal documents in themselves, they can become legally binding or were cited in a law or regulation, for example in building regulations. Technical rules published by organizations such as VDI, VDMA, and VDE are not drawn up with a full consensus.

Company Standards

Company standards are developed and adopted by companies themselves and or by cooperating businesses (e.g., suppliers). For example, their use can be mandatory for a company's suppliers.

Panel Survey

A panel survey is a survey carried out among the same economic players (persons or companies) on the same topic and over time.

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