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# Enhancing Indo-German SME Innovation & Technology Collaboration

# Imprint

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# Contents

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All figures have been adapted to fit the format and requirements of this document. The source data remains unchanged.

CHAPTER 01

# Background and objective

Small and Medium-sized Enterprises (SMEs) are considered the backbone of national economies and the engines of economic growth. Agile and driven by entrepreneurship and innovation, as well as by their ability to successfully navigate turbulent times, SMEs have demonstrated resilience and contributed significantly to national economies.

However, in international technology collaborations, they often face structural deficits, such as limited personnel capacity and restricted access to innovation and research networks abroad. If these challenges are addressed, SMEs can globalise and move up the value chain. In the Indo-German context, various support mechanisms are already in place, focusing on short-term measures; however, there is a need for sustained platforms and long-term initiatives to enhance SME-to-SME and SME-to-academia collaborations internationally.

In 2022, the Deutsches Wissenschafts- und Innovationshaus – DWIH New Delhi (German Centre for Research and Innovation) and the Fraunhofer Office India conducted an exploratory project to understand the challenges hindering Indo-German SME collaborations in technology development and research. The goal was to assess the status quo and develop recommendations for a long-term programme fostering technology collaborations and strategic alliances.

The envisioned programme aims to support:

- SMEs in Germany engaged in research and development (R&D) and seeking international cooperation in the field of R&D.
- SMEs in India engaged in R&D and seeking international cooperation in the field of R&D.
- Indian research institutions offering R&D capacities in applied research.

To develop a robust framework for cooperation, the DWIH New Delhi and the Fraunhofer Office India facilitated discussions with experts from Germany and India. The findings were consolidated and validated in a stakeholder dialogue held simultaneously in Berlin and New Delhi in June 2022. Based on these insights, this paper was jointly developed by the DWIH New Delhi and the Fraunhofer Office India, with the support of the Bundesverband mittelständische Wirtschaft – Mittelstand BVMW (German Association for Small and Medium-sized Businesses).

The objective of this paper is to provide an overview of the innovation and research ecosystems in both countries, emphasising the role of SMEs. It also outlines funding mechanisms for technology transfer and industry–academia collaboration and presents key recommendations from the stakeholder dialogue to help shape a framework for Indo-German technology cooperation.

CHAPTER 02

# SME definitions in Germany and India

According to the World Bank, SMEs represent about 90% of businesses worldwide and account for more than 50% of employment. Even without considering the informal sector, SMEs generate up to 40% of national income (Gross Domestic Product, GDP) in emerging economies, creating seven out of ten jobs.[1] However, there is no universal definition of an SME, as classification parameters vary from country to country.

## 2.1 Germany

The German term for SMEs is kleine und mittelständische Unternehmen (KMU). Germany generally follows the European Commission's SME definition,[2] which categorises enterprises based on employee count and annual turnover:

The German term *Mittelstand* is often used synonymously with SMEs in German-speaking countries, but it has a distinct meaning. *Mittelstand* companies are qualitatively defined by their ownership and leadership structure: the majority of company shares must be owned by up to two natural persons and their family members, who must also be part of the management of the company.[4] Many, but not all, SMEs fit this model.

| Enterprise type | Number of employees | Annual sales turnover |
|---|---|---|
| **Micro** | Up to 9 | Up to EUR 2 million (USD 2.26 million/INR 191.07 million) |
| **Small** | Up to 49 | Up to EUR 10 million (USD 11.30 million/INR 955.37 million) |
| **Medium** | Up to 250 | Up to EUR 50 million (USD 56.52 million/INR 4.78 billion) |

*Table 1: Definition of SMEs in the European Union (EU)*

One of Germany's leading SME research institutes, Institut für Mittelstandsforschung Bonn, extends the definition of medium-sized enterprises to include those with up to 500 employees, as this better aligns with Germany's economic landscape.[3]

1. The World Bank. "Small and Medium Enterprises (SMEs) Finance". Web resource. 2019. https://www.worldbank.org/en/topic/smefinance (accessed on August 15, 2024).
2. European Commission. "SME Definition". Web resource. 2021 https://single-market-economy.ec.europa.eu/smes/sme-fundamentals/sme-definition_en (accessed on August 15, 2024).
3. Institut für Mittelstandsforschung (IfM). "SME Definition of the IfM Bonn". Web resource. 2024. https://www.ifm-bonn.org/definitionen-/kmu-definition-des-ifm-bonn (accessed on August 15, 2024).
4. Institut für Mittelstandsforschung (IfM). "Mittelstand Definition of the IfM Bonn". Web resource. 2024. https://www.ifm-bonn.org/definitionen/mittelstandsdefinition-des-ifm-bonn (accessed on August 15, 2024).

## Key facts about SMEs in Germany:[5]

- **Total number of SMEs:** 3.41 million, representing 99.2% of all enterprises
- **Employment:** 19.1 million employees, accounting for 53.6% of Germany's workforce
- **Main sectors by employment:** Automobile industry, manufacturing, and healthcare[6]
- **GDP contribution:** 27.3% of total revenue in the private sector
- **SME output:** 55.7% of total net value added
- **Exports:** More than EUR 220 billion (USD 248.67 billion/INR 21.02 trillion) annually, representing approximately 16% of total exports
- **Fixed assets:** EUR 194 billion (USD 219.28 billion/INR 18.53 trillion)
- **Growth rate:** 30% increase in revenue from 2018 to 2022[7]

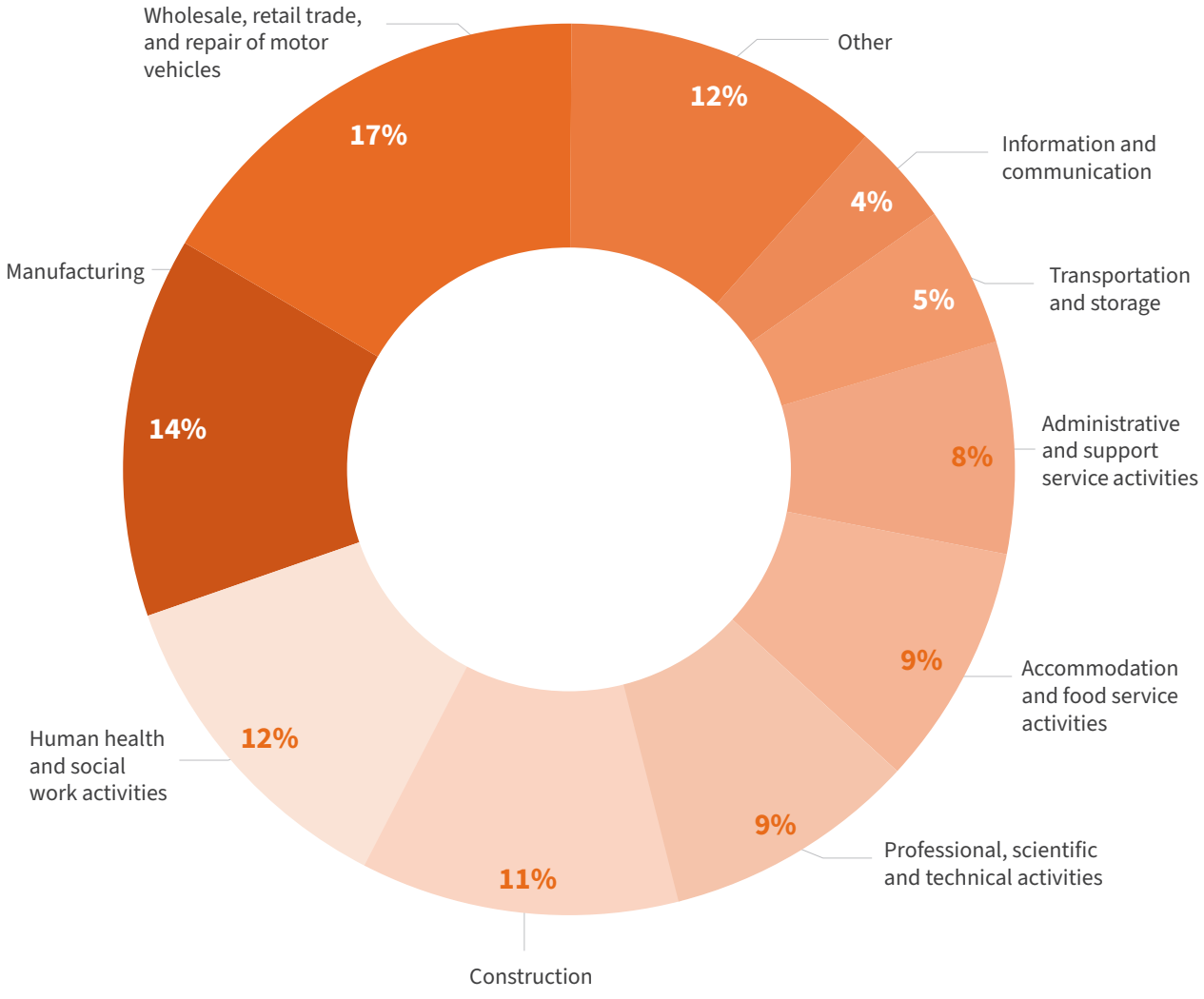



*Figure 1: Size of SMEs in Germany by number of employees per sector (2022)[8]*

5. For all key facts, unless otherwise stated, see: https://www.ifm-bonn.org/statistiken/mittelstand-im-einzelnen/ (accessed on August 15,2024). Numbers are calculated according to the SME definition of the EU.
6. Federal Statistical Office of Germany. "Statistics on Small and Medium-sized Enterprises". Web resource. 2024. https://www-genesis.destatis.de/genesis/online?language=en&sequenz=statistikTabellen&selectionname=48121 (accessed on August 15, 2024).
7. Ibid.
8. Ibid.

## 2.2 India

In India, SMEs are defined under multiple frameworks. These include Small-scale Industrial (SSI) units and Medium-scale Industrial (MSI) units, each classified based on investment thresholds.

- **SSI units:** Investment in fixed, leased, or hire-purchase assets of up to INR 10 million (USD 113,030/EUR 104,708)
- **MSI units:** Investment of up to INR 100 million (USD 1.13 million/EUR 1.05 million)

Additionally, SSI units must operate independently and cannot be subsidiaries of or controlled by larger industrial entities.

A second classification follows the criteria defined by the Ministry of Micro, Small & Medium Enterprises (MoMSME) for Micro, Small and Medium Enterprises (MSMEs), which defines enterprises based on investment and annual turnover.

| Enterprise type | Number of employees | Annual sales turnover |
|---|---|---|
| **Micro** | Up to INR 10 million (USD 113,030/ EUR 104,708) | Does not exceed INR 50 million (USD 565,150/ EUR 523,540) |
| **Small** | Up to INR 100 million (USD 1.13 million/EUR 1.05 million) | Does not exceed INR 500 million (USD 5.65 million/ EUR 5.24 million) |
| **Medium** | Up to INR 500 million (USD 5.65 million/EUR 5.23 million) | Does not exceed INR 2,500 million (USD 28.26 million/ EUR 26.17 million) |

*Table 2: Revised classification of SMEs in India (applicable from July 1, 2020)*[9]

The MSME sector in India is the second largest in the world and consists mainly of micro-enterprises. According to the data from the MoMSME (2024), the number of registered MSMEs has reached 40,042,875, with continual growth observed. Among these:

- 97.7% (39,318,355) are classified as micro-enterprises
- 1.5% (609,935) as small enterprises
- 0.8% (55,488) as medium-sized enterprises

In addition to registered MSMEs, a large number of enterprises operate in the informal sector.

The SME sector in India is a key driver of industrial production, manufacturing a diverse range of products, including food and beverages, textiles, wood and paper products, machinery, and electrical equipment. In addition to manufacturing, SMEs play a crucial role in the service industry.

The MSME sector is a key pillar of India's economy, contributing 30% to GDP. With global MSME contributions ranging from 25% to 60%, India's MSME sector holds significant untapped potential, with projections indicating an increase in its share to 45% by 2030.

However, several challenges hinder the growth of SMEs. Many enterprises still rely on traditional, inefficient business practices, reducing their competitiveness in an evolving market. Additionally, many MSMEs remain unregistered, restricting access to credit, government incentives, and formal support structures.

For sustainable growth, integrating MSMEs into India's industrial ecosystem is essential. Encouraging formalisation through incentives, digital adoption, and stronger linkages with large enterprises will enhance their impact. MSMEs can also generate employment at lower capital costs, particularly in rural and remote areas, while supporting larger industries as ancillary units, thereby driving economic expansion.

9. Ministry of Micro, Small & Medium Enterprises (Government of India). "Revised Classification of SME". Web resource. 2025. https://www.msme.gov.in/goisearch?search_key=revised+classification+of+SME (accessed on January 15, 2025).

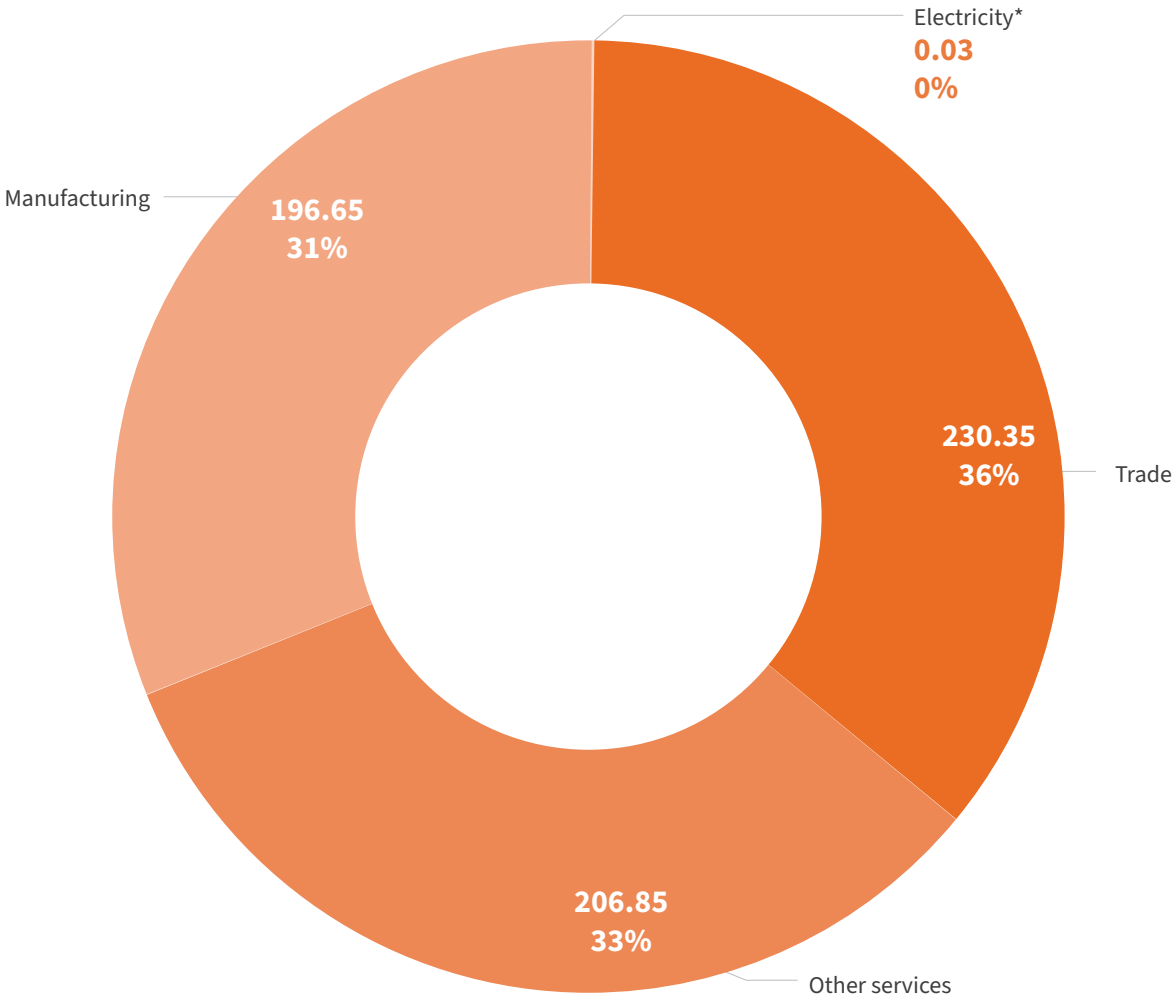



*Figure 2: Distribution of estimated MSMEs by nature of activity*[10]

## Key facts about SMEs in India:[11]

- **Total number of SMEs:** 40,042,875
- **Employment:** 40% of India's workforce, second only to the agricultural sector
- **Main sectors by employment:** Trade, other services, and manufacturing
- **GDP contribution:** 30%
- **SME output:** One-third of India's total manufacturing output
- **Exports:** 50% of India's total exports
- **Fixed assets:** INR 14.72 trillion (USD 166.83 billion/EUR 147.22 billion)
- **Growth rate:** Average annual growth of over 10%

10. Ministry of Micro, Small & Medium Enterprises (Government of India). "Annual Report 2022-23". Web resource. 2023, p. 32. https://msme.gov.in/sites/default/files/MSMEANNUALREPORT2022-23ENGLISH.pdf (accessed on January 15, 2025).
11. Ministry of Micro, Small & Medium Enterprises (Government of India). "Homepage". Web resource. 2025. https://www.msme.gov.in/ (accessed on January 15, 2025).

CHAPTER 03

# SME technology transfer and cooperation (national level)

Both India and Germany offer publicly funded initiatives to support technology transfer and industrial innovation, particularly for SMEs. This chapter explores national support programmes focused on SMEs, promoting R&D, collaboration, and knowledge exchange.

Governments in both countries prioritise collaboration over competition, engaging universities, public research institutions, and industries in joint innovation efforts.

Key support measures include:

- Financial incentives, such as tax benefits and loan programmes
- Public–private partnerships, including research clusters
- R&D support instruments
- Knowledge-sharing platforms and best practices that help facilitate access to critical information, thereby driving industrial growth and innovation[12]

## 3.1 SME technology transfer and cooperation in India

SMEs in India can play a significantly greater role in the country's economic development, contributing notably to employment generation, investment, and exports. As India continues to experience rapid GDP growth—projected at 6.5% for the fiscal year 2024–25 by the International Monetary Fund (IMF) and the Department of Commerce—they are poised to be key drivers of this expansion.

Given their potential to reduce regional disparities and promote industrialisation at both urban and rural levels, SMEs are integral to India's goal of achieving a USD 7 trillion (EUR 6.20 trillion/INR 592.78 trillion) economy by 2030.

Globally, SMEs account for nearly 90% of enterprises and 70% of employment, underscoring their

12. Hutschenreiter et al. "Innovation Support in the Enterprise Sector: Industry and SMEs". In: *OECD Science, Technology and Industry Policy Papers* 82 (2019), pp. 10-15. https://www.oecd.org/content/dam/oecd/en/publications/reports/2019/10/innovation-support-in-the-enterprise-sector_108998f5/4ffb2cbc-en.pdf (accessed on January 15, 2025).

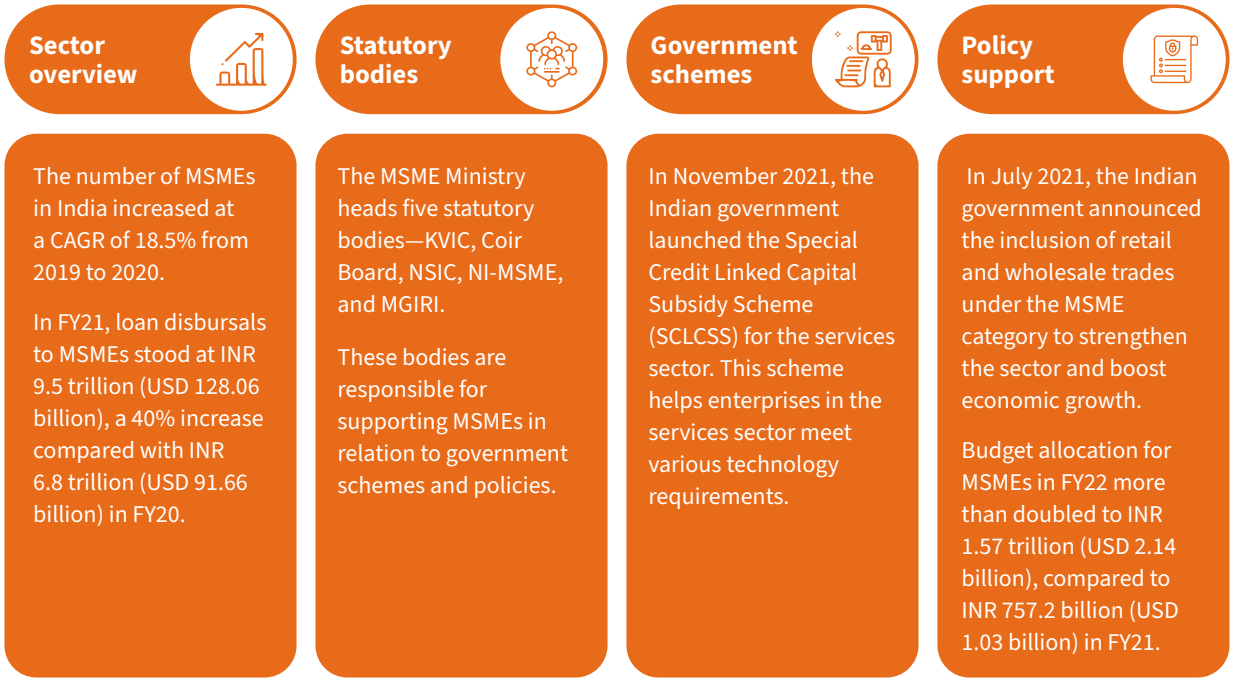



*Figure 3: Overview of the SME sector in India*[13] *Source: Ministry of MSME, Government of India, National Portal*

*Note: The values in this figure reflect the original source data and have not been converted at the time of publication of this document.*

importance in fostering innovation and economic stability. In India, their role is equally significant, particularly in manufacturing and services, where they enhance domestic supply chains and contribute to exports.

To remain competitive, SMEs in India must accelerate technology adoption, a key differentiator for enhancing productivity and resilience. Additionally, the global focus on supply chain resilience presents an opportunity for targeted technology transfer initiatives, enabling SMEs to optimise production and distribution.

Ensuring that SMEs capitalise on India's economic momentum is essential for inclusive and sustained growth.

### Technology cooperation as a catalyst for growth

Technology is increasingly recognised as a crucial enabler for enhancing efficiency, standardisation, and competitiveness in India's MSME sector. To thrive in the global market, MSMEs must prioritise the adoption of new technologies, develop indigenous solutions, and foster collaborations with international partners. A strong technological foundation allows MSMEs to compete with larger enterprises and imported products, levelling the playing field in an increasingly competitive landscape.

To accelerate technological advancement, industry stakeholders, academic institutions, government agencies, and large enterprises must collaborate to support MSMEs in key sectors such as IT, electronics, manufacturing, pharmaceuticals, and biotechnology. Establishing sector-specific incubation cells can provide MSMEs with guidance on technology adoption, scaling, and commercialisation. Additionally, research partnerships between academia and industry can drive innovation and automation, ensuring that MSMEs move up the value chain and contribute to India's technological self-reliance. However, SMEs in India face challenges in cooperating with universities and R&D institutes, and there is low awareness of R&D infrastructure (Singh et al., 2014).[14]

13. Drishti. "Self-reliance in Energy Sector". Web resource. September 20, 2022. https://www.drishtiias.com/daily-updates/daily-news-analysis/self-reliance-in-energy-sector/print_manually (accessed on January 15, 2025).
14. Singh, Davinder. "Problems related to the Financing of Small Firms in India". In: *Journal of Innovative Research & Development* 3 (2014), pp. 317-321. https://www.researchgate.net/profile/Davinder-Singh-8/publication/307977875_Problems_Related_to_the_Financing_of_Small_Firms_in_India (accessed on January 15, 2025).

Fostering entrepreneurship and leveraging technology are vital for SMEs to establish a competitive position in the global marketplace. While the government and industry associations are making significant efforts to bridge information gaps and provide strategic support, the challenges remain substantial due to the prevalence of small companies operating in the informal sector.

To overcome these challenges, SMEs must proactively seize opportunities to enhance their competitiveness. This includes:

- Leveraging social capital
- Connecting with multinational corporations
- Promoting innovation
- Engaging in networking
- Adopting new information technologies
- Implementing digital solutions and productivity-enhancing technologies to scale operations and streamline processes

Moreover, the availability of a technologically skilled workforce and the identification of opportunities for new technologies are essential for SMEs to successfully adapt and grow. Technology-driven enterprises are particularly appealing to policymakers due to their potential to create jobs, generate wealth, and experience lower failure rates compared to non-tech-focused businesses.

In highly competitive markets, SMEs often face the challenge of competing with larger firms. To survive, they must overcome the disadvantages of their smaller size. Some key strategies include:

- Forming alliances with similar firms to increase market penetration and share financial risks
- Utilising technology to mitigate diseconomies of scale, allowing them to develop innovations that differentiate them from larger competitors

Given the limited resources of SMEs and their inability to bear the costs and risks associated with in-house technology development, many SMEs turn to technology transfer as a solution. Through technology transfer, they can access innovations developed elsewhere, enabling them to adopt advanced technologies without incurring the full costs of R&D. This enables the leapfrogging of technology adoption for the technology-recipient SME and provides market access to the technology-providing SME.

For SMEs to contribute meaningfully to India's economic growth, it is crucial to identify and address the primary barriers they face in adopting and developing new technologies. Policymakers must create supportive tools and frameworks that help SMEs overcome challenges related to technology acquisition, resource constraints, and integration into innovation networks. By doing so, India can unlock the full potential of its SME sector, ensuring its long-term survival and success in a rapidly evolving global economy.

## 3.1.1 Technology innovation and demand for SMEs

SMEs in India are well positioned to generate innovative ideas but face challenges in implementing these innovations effectively, especially when compared to larger companies. Understanding the factors influencing technology adoption in SMEs reveals that awareness of available technological solutions is a key determinant. Government policies, institutional support from R&D bodies, fiscal incentives, and tailored design assistance programmes play a crucial role in helping SMEs adopt new technologies.

However, despite numerous government initiatives to promote technology development and upgradation, SMEs in India often struggle to embrace technological advancements. Many small enterprises tend to be overly cautious about adopting new technologies, compounded by the complacency that comes with access to a large domestic market. Additionally, smaller firms face significant limitations in terms of manpower and financial resources, making it difficult for them to integrate into the existing innovation networks. SMEs also struggle to transition from manual to digital systems due to outdated legacy machinery and low awareness of digital solutions.[15]

The SME ecosystem differs from that of larger firms. The dynamic global business environment, marked

15. See: Iyer, Anandi. "Moving from Industry 2.0 to Industry 4.0: A Case Study from India on Leapfrogging in Smart Manufacturing". 15th Global Conference on Sustainable Manufacturing (GCSM). In: *Procedia Manufacturing* 21 (2018), pp. 663–670.

by stiff competition, evolving customer profiles, and rapid technological advancements, necessitates that SMEs remain adaptable and take proactive measures to sustain growth. To prepare for new challenges and markets, SMEs need to reflect and realign their business strategies with technology-based solutions. In some cases, this may require a complete transformation of business operations within the new ecosystem.

Factors influencing technology adoption by SMEs include:

- Changing business environment
- Customer demand and labour availability
- Perception of global competition and growth opportunities
- Supply chain inefficiencies, which can be addressed through digital solutions
- Policy environment
- Access to capital and R&D potential

When adopted efficiently, technology helps SMEs become more competitive by improving productivity, reducing costs, and streamlining business processes. It enables SMEs to manage their operations more effectively and gain a competitive advantage in the market.

According to a report by the United Nations Industrial Development Organization (UNIDO), in collaboration with the Department of Science & Technology (DST), Government of India, firm-level investment in innovation and technology adoption among SMEs remains low compared to large enterprises. The National Manufacturing Innovation Survey 2021–22 highlights that:

- Large and medium-sized firms are more actively involved in innovation and technology investment than their smaller counterparts.
- Only 24.97% of small firms and 4.20% of micro firms engage in innovation activities, compared to 49.46% of large firms and 34.91% of medium firms.

This is a decisive indicator of the capability and activity of SMEs in innovation-related areas, highlighting the urgent need for SMEs in India to increase investment in innovation and accelerate technology adoption.

As SMEs continue to lag behind larger firms in technology adoption, there are significant benefits to be gained by closing this gap. Efficiently implemented technologies can significantly enhance SME operations, providing the following key advantages:

- Increased efficiency
- Wider use of digital tools
- Improved product quality
- Better financial control
- Enhanced business tracking
- Better decision-making and customer acquisition
- Increased professionalism and communication
- Improved Human Resources (HR) management
- Increased export potential
- Financial growth
- Enhanced customer service
- Improved transparency

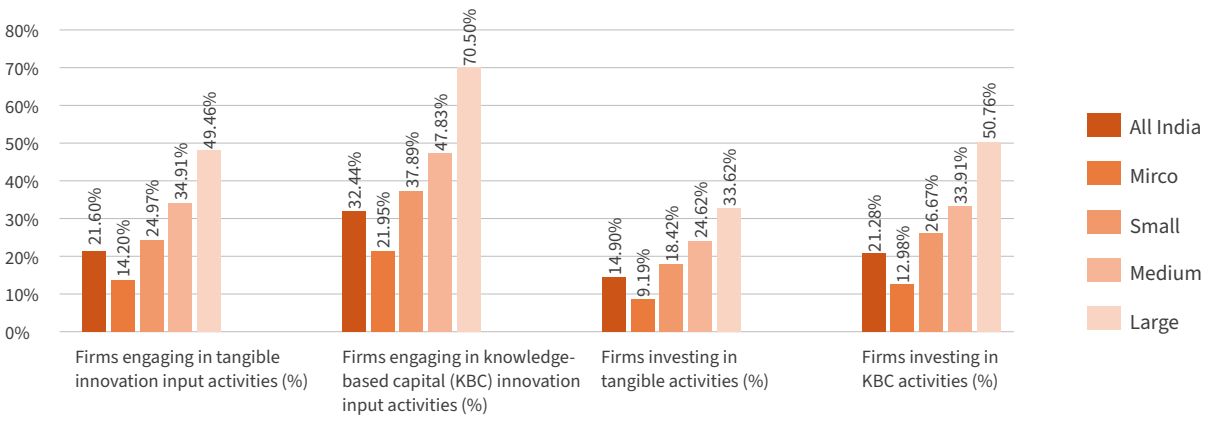



*Figure 4: Assessment of firm-level innovation in Indian manufacturing*[16]

16. United Nations Industrial Development Organization (UNIDO) and Department of Science & Technology (Government of India). "Assessment of Firm-level Innovation in Indian Manufacturing: National Manufacturing Innovation Survey 2021-22". Government Report. March 2023, p. 116. https://dst.gov.in/sites/default/files/Assessment%20of%20Firm-Level%20Innovation%20in%20Indian%20Manufacturing_0.pdf (accessed on January 15, 2025).

## 3.1.2 Technology adoption and digital transformation

India has witnessed a significant shift in technology adoption among SMEs, particularly after the pandemic. Digital transformation has been a key driver of growth, with 50% of SMEs incorporating digital tools into their business operations, compared to only 29% before the pandemic.

SMEs are expected to contribute between EUR 3.6 trillion (USD 4.07 trillion/INR 343.93 trillion) and EUR 4.8 trillion (USD 5.43 trillion/INR 458.58 trillion) to India's GDP by 2030 through digitalised business operations. With over 75 million SMEs in India, these businesses have undergone a major behavioural shift, increasingly adopting technology in communication, marketing, payments, hiring, and other essential operations.

The digital landscape for SMEs has evolved dramatically, driven by innovations such as cloud services, blockchain technology, and the integration of artificial intelligence (AI) and machine learning (ML). These technologies provide long-term solutions for stakeholder engagement, marketing, supply chain management, and product development.

A key example of this shift is the widespread adoption of digital payment systems, including Unified Payments Interface (UPI), mobile wallets, and card payments. These methods have reduced reliance on physical banking infrastructure, making transactions more accessible and convenient for SMEs.

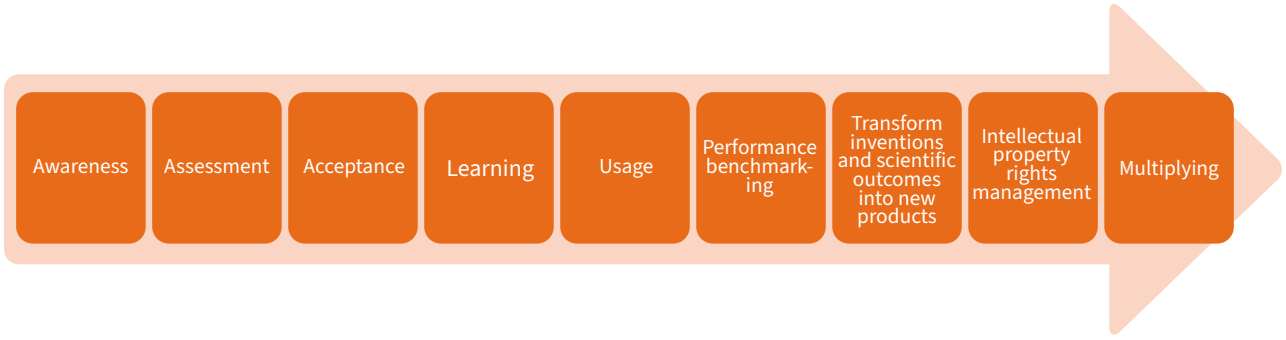



*Figure 5: Stages of technology adoption and innovation*

The pandemic further accelerated this transformation, with businesses increasingly adopting digital solutions for bill payments, account management, and customer engagement. The rise of mobile applications in sectors such as food delivery has enabled businesses to reach more customers, track orders, and streamline operations. This shift to online platforms demonstrates that technology adoption by SMEs has been a strategic decision rather than merely a necessity.

To further enhance technology adoption and cooperation among SMEs in India, several key approaches should be considered:

- Strengthening policies, focusing on the role of government and dedicated credit lines
- Establishing an organised institutional setup, including governance and performance evaluators
- Developing the digital ecosystem
- Identifying high-potential entrepreneurs
- Enhancing market linkages, such as e-commerce and social media
- Improving operational efficiency
- Expanding capacity building efforts
- Introducing distributed ledger technologies like blockchain
- Leveraging cloud technologies
- Enhancing cybersecurity and data privacy measures

## 3.1.3 National support schemes for SMEs, technology transfer, and digital transformation

The Government of India has launched various initiatives to enhance the capabilities of MSMEs. These schemes focus on technology adoption, innovation, financial support, and market access to help MSMEs remain competitive and contribute to the country's economic development.

### National registration platform

- **Udyam Registration Portal:** The Udyam Registration Portal simplifies the MSME registration process by providing a free, paperless, and self-declaration-based system. This initiative enables MSMEs to easily access government benefits and integrates informal micro-enterprises into the formal economy, making them eligible for Priority Sector Lending (PSL). As of now, over 4.91 million MSMEs are registered, generating substantial employment across the country.

### Technology adoption and innovation support

- **Export Promotion of Capital Goods (EPCG):** Allows MSMEs to import capital goods at zero duty, subject to meeting export obligations.
- **Lean Manufacturing Competitiveness Scheme (LMCS) under the National Manufacturing Competitiveness Programme (NMCP):** Encourages the use of lean manufacturing techniques to improve operational efficiency and reduce costs.
- **Technology Centre Systems Programme (TCSP):** Facilitates collaboration between MSMEs and academic institutions through dedicated technology centres. These centres provide MSMEs with access to cutting-edge research, technical expertise, and industry-specific innovations to support technology adoption and improve competitiveness.
- **Scheme for Research and Innovation in MSMEs (RISE Scheme):** Encourages MSMEs to partner with academic and research institutions for joint research projects. Provides financial support for product development, process improvement, and addressing industry-specific challenges through collaborative innovation.
- **National Research Development Corporation (NRDC):** Helps MSMEs commercialise academic research and innovations by facilitating technology transfer. Offers consultancy services for patenting, licensing, and bringing academic advancements to market, supporting MSMEs in leveraging new technologies.
- **Intellectual Property Rights (IPR) Assistance:** Aids MSMEs in securing patents, trademarks, and copyrights for their innovations in collaboration with academic institutions. This protects technological advancements and facilitates the transfer of academic research into commercial applications.
- **MSME Technology Development Centres (TDCs):** Partner with academic institutions to provide MSMEs with access to advanced technologies, research, and training. These centres support MSMEs in adopting new technologies and improving manufacturing processes, helping them stay competitive.
- **Entrepreneurship and Skill Development Programme (ESDP):** Promotes collaboration between MSMEs and academic institutions to foster entrepreneurship and innovation. Focuses on skills development, helping MSMEs adopt new technologies and remain competitive in a rapidly evolving market.

### Digital platforms and market access

- **MSME Databank and My MSME App:** Digital platforms that streamline access to government benefits and provide MSMEs with tools to manage registrations and applications efficiently.
- **MSME SAMPARK:** A job portal that connects MSMEs with jobseekers, fostering employment opportunities and mutual benefit.
- **Digital Payments:** Payment systems that encourage MSMEs to adopt digital payment systems, such as UPI, Bharat Interface for Money (BHIM), and Bharat QR, to enhance financial inclusion and simplify business transactions.

### Financial support for MSMEs

- **Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE):** Provides collateral-free loans up to INR 10 million (USD 113,030/ EUR 104,708) to help Micro and Small Enterprises (MSEs) access financing.
- **Credit Linked Capital Subsidy Scheme (CLCSS):** Facilitates technology upgrades by offering credit for the purchase of machinery and technological improvements.
- **Prime Minister's Employment Generation Programme (PMEGP):** Provides subsidies to establish micro-enterprises, creating employment in the non-farm sector.
- **Self-Reliant India (SRI) Fund:** Aims to support MSMEs with funding for growth and sustainability through an INR 500 billion (USD 5.65 billion/EUR 5.23 billion) equity infusion.
- **Financial Support for Zero Defect Zero Effect (ZED) Certification:** Promotes ZED manufacturing practices, encouraging MSMEs to improve product quality, adopt energy-efficient processes, and enhance competitiveness.

### Policy and procurement initiatives

- **Public Procurement Policy for MSEs:** Ensures that 25% of annual procurement by government bodies is sourced from MSMEs, with specific reservations for Scheduled Castes (SC), Scheduled Tribes (ST), and women-owned enterprises.
- **Raising and Accelerating MSME Performance (RAMP) Programme:** Aims to enhance MSME performance through capacity building and skill development under an INR 60 billion (USD 678.21 million/EUR 627.42 million) initiative.
- **Vivad se Vishwas I:** Provides MSMEs with relief by refunding 95% of deducted performance security and resolving contract defaults.

### Cluster development and capacity building

- **Scheme of Fund for Regeneration of Traditional Industries (SFURTI):** Supports traditional industries by organising artisans into clusters, enhancing their competitiveness, and helping them access new technologies and markets.
- **MSE Cluster Development Programme (MSECDP):** Focuses on cluster development to increase productivity, enhance competitiveness, and provide capacity building support for MSMEs.
- **Pradhan Mantri Vishwakarma Scheme (Prime Minister Vishwakarma Scheme):** Aims to enhance the quality and marketability of products created by artisans and craftspeople, integrating them into domestic and global value chains.
- **A Scheme for Promotion of Innovation, Rural Industry and Entrepreneurship (ASPIRE):** Encourages innovation and job creation by promoting entrepreneurship in the rural SME sector.

## 3.1.4 Case study: CHAMPIONS

The CHAMPIONS portal, which stands for Creation and Harmonious Application of Modern Processes for Increasing the Output and National Strength, is a platform launched by the Government of India to support and empower the MSME sector. By integrating cutting-edge technologies such as AI, ML, and data analytics, alongside traditional information and communication technology (ICT) tools like telephone, internet, and video conferencing, the portal provides a one-stop solution to address and resolve grievances faced by MSMEs. It is also fully integrated with the Government of India's main grievance portal, ensuring seamless communication and support.

The portal was introduced as part of India's ambitious INR 20 trillion (USD 226.06 billion/ EUR 209.42 billion) economic package, aimed at boosting economic growth. This package focuses on key sectors such as land, labour, liquidity, and laws, with particular attention to MSMEs, cottage industries, and labourers. The CHAMPIONS portal is designed to assist MSMEs in overcoming challenges related to finance, raw materials, labour, regulatory permissions, and other critical issues, particularly in the wake of the COVID-19 pandemic.

One of the key features of the portal is its user-friendly interface, which provides a fully integrated dashboard where MSMEs can track their grievances and monitor the status of their complaints. The system generates unique complaint IDs for each issue, categorised into types such as association, SME unit, and entrepreneur. The portal also follows

a hub-and-spoke model, with 66 state-level control rooms facilitating efficient support across India.

The CHAMPIONS portal has three key objectives:

- **Grievance redressal:** Resolving challenges faced by MSMEs, including issues related to finance, raw materials, labour, and regulatory permissions, particularly during the COVID-19 period.
- **Helping MSMEs capture new opportunities:** Enabling MSMEs to pivot towards new opportunities, such as manufacturing medical supplies like PPE kits and masks, and expanding their presence in national and international markets.
- **Identifying potential MSMEs for growth:** Recognising MSMEs with the potential to thrive despite challenges and supporting them in becoming national and international champions.

The CHAMPIONS portal serves as a critical tool for addressing the immediate concerns of MSMEs, while also fostering long-term growth and self-reliance, contributing to the broader Atmanirbhar Bharat (SRI) initiative.

# 3.2 SME technology transfer and cooperation in Germany

## 3.2.1 The German research and innovation system

In general, German companies and the Federal Government of Germany prioritise R&D, with more than 3.1% of GDP spent on it annually. In 2023, Germany reached an all-time high in R&D expenditure of EUR 129.7 billion (USD 146.61 billion/ INR 12.39 trillion).[17]

At the national level, research and industrial innovation in Germany are driven by central policies such as the High-Tech Strategy 2025 and the Future Research and Innovation Strategy (Zukunftsstrategie Forschung und Innovation), where technology transfer plays a pivotal role.

Research in Germany operates under two key pillars:

- Public research, including universities, departmental research, and research organisations
- Industrial research, conducted within research associations and enterprises

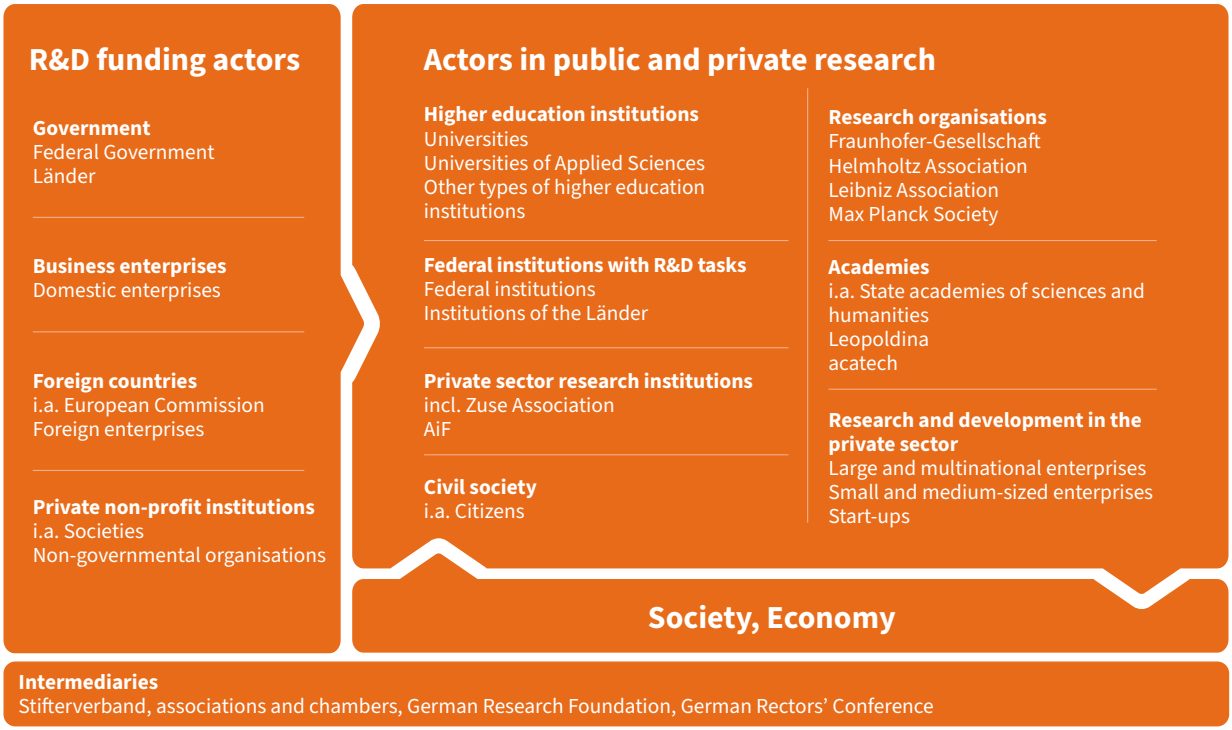



*Figure 6: Overview of actors in the German research and innovation system*[18]

17. Federal Statistical Office of Germany. "Bildung, Forschung und Kultur: Forschung und Entwicklung". Web resource. 2025. https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bildung-Forschung-Kultur/Forschung-Entwicklung/_inhalt.html#234658 (accessed on April 1, 2025).
18. Federal Ministry of Education and Research (BMBF). "Federal Report on Research and Innovation". Web resource. 2024. https://www.bundesbericht-forschung-innovation.de/en/Actors-of-the-German-research-and-innovation-system-2134.html (accessed on August 17, 2024).

The research expenditure in Germany is distributed as follows:

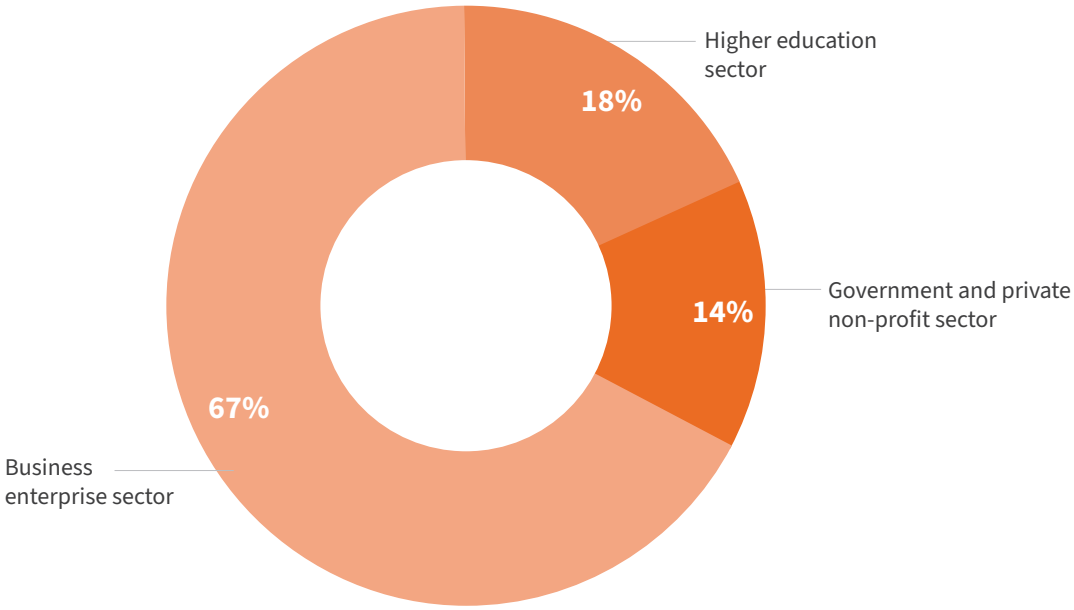



*Figure 7: Gross domestic expenditure of R&D in Germany by performing sectors (2022)*[19]

While privately funded entities engaging in research naturally prioritise applied research, the more than 1,000 publicly funded institutions have varied goals. Their different roles can be summarised as follows:

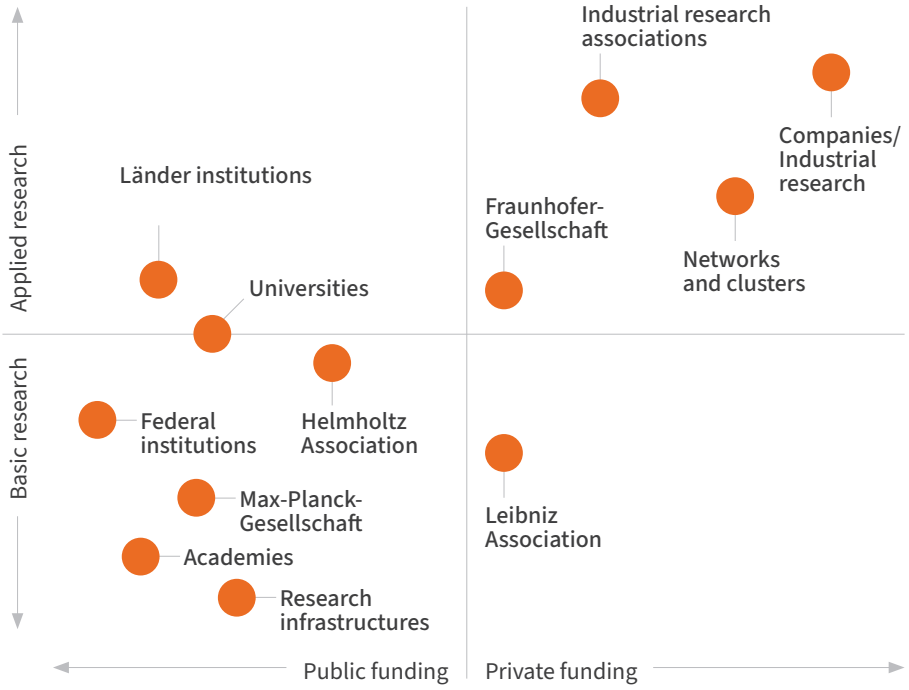



*Figure 8: Funding vs. research*[20]

19. Federal Ministry of Education and Research (BMBF). "Gross Domestic Expenditure on R&D (GERD) of the Federal Republic of Germany, by Performing Sectors". Web resource. 2024. https://www.datenportal.bmbf.de/portal/en/Table-1.1.1.html (accessed on August 15, 2024).
20. Akil, Ayman, Nicolas Teeny and Iulian Herciu. "Workshop 3: Research Funding". Web resource. January 28, 2021, p. 18. https://tg.tanta.edu.eg/admin-cp/uploads/srdu/20210128%20Research%20Funding%20Tanta%20U.pdf (accessed on January 15, 2025).

## 3.2.2 Industrial research and SMEs

Industrial research accounts for 67% of all R&D funding in Germany, making German companies among the most innovative in Europe. Approximately 33,700 companies in Germany are continuously active in R&D, while more than 181,400 companies regularly bring new products and services to the market.[21]

The most innovative sectors in Germany, based on R&D expenditure across industries, are as follows:

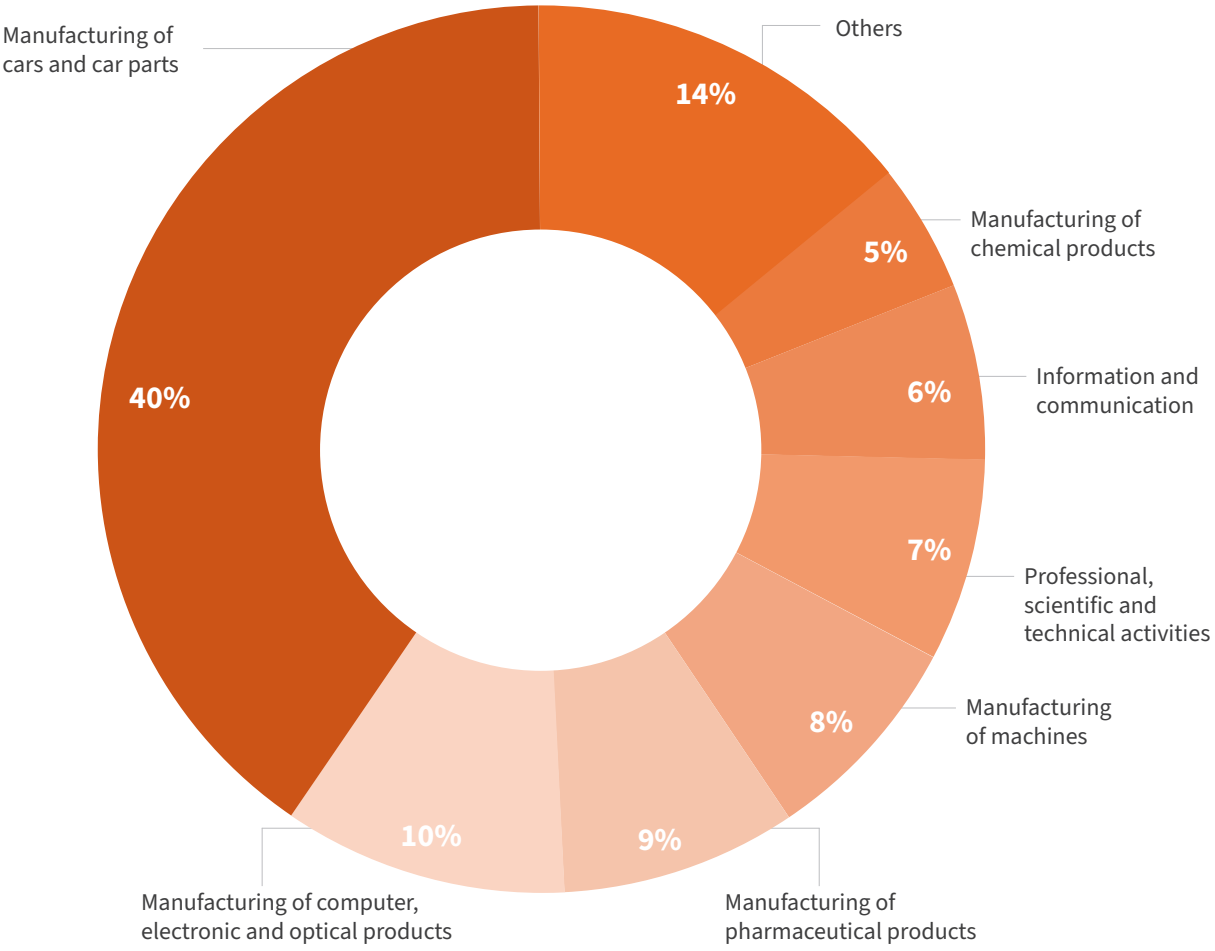



*Figure 9: Percentage of total R&D spending in Germany by setcor (2022)[22]*

21. Federal Ministry of Economic Affairs and Climate Action (BMWK). "Innovation Policy". Web resource. 2024. https://www.bmwk.de/Redaktion/EN/Dossier/innovation-policy.html (accessed on August 17, 2024).
22. Stifterverband für die Deutsche Wissenschaft e.V. "Forschung und Entwicklung in der Wirtschaft 2022". Web resource. 2019. https://www.stifterverband.org/fue-facts-2022 (accessed on August 15, 2024).

Overall, private sector R&D expenditure is increasing, with medium-sized companies disproportionately increasing their R&D spending. However, SMEs account for only 8.9% of total R&D expenditure in the private sector.[23]

In Germany:

- 35.2% of SMEs operate in high-technology industries (1%), medium-technology industries (12.1%), and knowledge-intensive services (22.1%).
- This share is higher than the EU average, making Germany one of the leading countries for innovative SMEs.[24]

One notable feature of the German industrial sector, as mentioned in Chapter 2.1, is the outsized importance and success of the *Mittelstand* abroad. Globally, there are 2,734 companies with an annual turnover of less than USD 5 billion (EUR 4.42 billion/ INR 424.35 billion) that are market leaders in their product segments. Among these 'hidden champions', 1,307—or roughly half—are German companies,[25] and 23.9% of those are SMEs.[26]

The success of these companies is based on two key factors:

- A stronger emphasis on innovation than their competitors, allowing them to provide tailor-made solutions for customers
- Investment in recruitment and staff training, leading to higher in-house innovation potential[27]

### Industrial research associations

While SMEs in Germany play a central role in innovation, their smaller or insufficient research capacities make it essential for them to pool R&D resources. SMEs and affiliated research institutions are organised into industrial research associations, which support and initiate applied R&D for SMEs.

Two of the main associations are:

- **German Federation of Industrial Research Associations (Arbeitsgemeinschaft industrieller Forschungsvereinigungen – AiF):**[28] The AiF is an umbrella organisation comprising 101 industrial research associations across various industrial and technological sectors, representing approximately 50,000 SMEs. The AiF focuses on strengthening SME competitiveness by promoting R&D in several ways:
  - Organising joint industrial research for the benefit of entire sectors
  - Administering governmental R&D support programmes
  - Promoting R&D through open innovation processes
  - Facilitating networking within and between industrial sectors and policymakers
- **German Industrial Research Association Konrad Zuse (Deutsche Industrieforschungsgemeinschaft Konrad Zuse – Zuse Association):**[29] The Zuse Association represents the interests of non-profit, privately organised research institutions. The association, which is open to technology and industry, currently has 80 members nationwide. Its institutes focus on practice-oriented research tailored to medium-sized companies.

SMEs constitute a key pillar of the German economy, both in terms of employment and net value added, making their technological progress essential for Germany's competitiveness and prosperity. Since SMEs account for only around 9% of total private sector R&D spending, tapping into their full innovation potential is an economic necessity.

SME-driven innovation also plays a decisive role in transforming the economy towards greater climate protection and sustainability. The Federal

23. Federal Ministry of Education and Research (BMBF). "Daten und Fakten zum deutschen Forschungs- und Innovationssystem: Bundesbericht Forschung und Innovation 2024". Government report. 2024, p. 25. https://www.bundesbericht-forschung-innovation.de/files/BMBF_BuFI-2024_Datenband.pdf (accessed on August 15, 2024).
24. European Commission. "Annual Report on European SMEs". Report. 2024, p. 78. https://single-market-economy.ec.europa.eu/document/download/2bef0eda-2f75-497d-982e-c0d1cea57c0e_en?filename=Annual%20Report%20on%20European%20SMEs%202024.pdf (accessed on August 15, 2024).
25. Rainer Zitelman. "The Leadership Secrets of The Hidden Champions". 2019. https://www.forbes.com/sites/rainerzitelmann/2019/07/15/the-leadership-secrets-of-the-hidden-champions/ (accessed on August 15, 2024).
26. Der Informationsdienst des Instituts der deutschen Wirtschaft (iwd). "Hidden Champions: Die Starken aus der zweiten Reihe". 2022. https://www.iwd.de/artikel/hidden-champions-die-starken-aus-der-zweiten-reihe-424550 (accessed on August 15, 2024).
27. Christian Rammer; Alfred Spielkamp. "The Distinct Features of Hidden Champions in Germany: A Dynamic Capabilities View". Centre for European Economic Research (ZEW), *Discussion Paper* 19-012 (2019), p. 5f. https://ftp.zew.de/pub/zew-docs/dp/dp19012.pdf (accessed on August 15, 2024)
28. Forschungsnetzwerk Mittelstand. https://www.aif.de/index.html (accessed on August 15, 2024).
29. Deutsche Industrieforschungsgemeinschaft Konrad Zuse. https://www.zuse-gemeinschaft.de/ (accessed on August 15, 2024).

Government of Germany therefore aims to increase SME participation in innovation. According to the definition of the Federal Statistical Office, SMEs—defined as enterprises with up to 249 employees and an annual turnover of up to EUR 50 million (USD 56.52 million/INR 4.78 billion)—are the target group for these initiatives.

Various programmes are therefore implemented to promote R&D activities and support the digital transformation of the *Mittelstand*. To address the recent slight decline in SME participation in innovation and encourage greater involvement, the Federal Government of Germany plans to introduce targeted innovation incentives for SMEs and improve the framework conditions for innovation.

## 3.2.3 National support schemes for innovation and technology transfer

Given the importance of SMEs in the German innovation system, the SME policy of the Federal Government of Germany considers increasing innovation and digitalisation essential for SMEs.[30] Reflecting this economic necessity, 52% of public funding for industrial research was allocated to SMEs in 2021.[31] In the same year, the government streamlined its funding programmes for SMEs under the From the Idea to Market Success initiative. The included schemes target the entire innovation chain, from creative ideas to the development and market readiness of new products and processes.[32]

### 3.2.3.1 Industry–academia collaboration

Industry, universities, and research organisations collaborate in many areas. Numerous joint programmes and research projects involve companies as well as research organisations. Various cooperation models exist, including:[33]

- Contract research for industry carried out by universities and non-university research institutions
- Joint staffing and funding of research projects
- Industry-funded research groups and professorships
- Donations, sponsorships, and joint funding for specific R&D institutes
- Cooperation in networks, clusters, or public–private partnerships (research campuses)

Of these, regional or industry-specific clusters and networks have proven to be the most effective for SMEs in creating value chains, gaining access to knowledge and research capacities, and improving their competitiveness. These clusters are either initiated and supported by public funding or operate as public–private partnerships. Some of the major current initiatives include:

- **Clusterplattform Germany:**[34] The platform offers a comprehensive database of clusters in Germany, as well as information on the cluster policies of the central government, the federal states, and the EU.
- **Go-cluster Programme:**[35] Through the Go-cluster programme, the Federal Ministry for Economic Affairs and Climate Action (Bundesministerium für Wirtschaft und Klimaschutz – BMWK) supports outstanding innovation clusters in their development. The programme focuses on:
    - Networking and exchange with national and international clusters

30. Federal Ministry for Economic Affairs and Climate Action (BMWK). “The German Mittelstand as a Model for Success”. Web resource. 2024. https://www.bmwk.de/Redaktion/EN/Dossier/sme-policy.html (accessed on August 15, 2024).
31. Federal Ministry of Education and Research Germany (BMBF). “Daten und Fakten zum deutschen Forschungs- und Innovationssystem: Bundesbericht Forschung und Innovation 2024”. Government report. 2024, p. 28. https://www.bundesbericht-forschung-innovation.de/files/BMBF_BuFI-2024_Datenband.pdf (accessed on August 15, 2024).
32. Federal Ministry for Economic Affairs and Climate Action (BMWK). “Von der Idee zum Markterfolg: Programme für einen innovativen Mittelstand”. Web resource. 2021. https://www.bmwk.de/Redaktion/DE/Publikationen/Technologie/von-der-idee-zum-markterfolg-programme-fuer-einen-innovativen-mittelstand.html (accessed on August 15, 2024).
33. Federal Ministry of Education and Research (BMBF). “Research in Germany: Why are Collaboration and Interaction Important for Business R&D?”. Web resource. 2024. https://www.research-in-germany.org/en/research-landscape/r-d-companies-business-germany/Why-is-collaboration-important.html (accessed on August 15, 2024).
34. Federal Ministry of Education and Research (BMBF). “Clusterplattform Germany”. Web resource. 2024. https://www.clusterplattform.de/CLUSTER/Navigation/EN/Home/home.html (accessed on August 18, 2024).
35. Federal Ministry of Education and Research (BMBF). “Programme Go-Cluster”. Web resource. 2024. https://www.clusterplattform.de/CLUSTER/Navigation/DE/Clusterpolitik/Bund/go-cluster/go-cluster.html (accessed on August 18, 2024).

- Individual consulting services and participation in a seminar and event programme
- Public relations activities to increase visibility, including the cluster platform, national cluster week, publications, trade fairs, and conferences

Currently, 77 clusters are members of this initiative.

- **Cluster4Future:**[36] With the Zukunftscluster-Initiative, the Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung – BMBF) supports regions across Germany in leveraging their research strengths by fostering the development of innovation networks. The 14 existing clusters focus on transforming cutting-edge research into practical applications in areas such as:
  - Neuromorphic hardware for autonomous systems
  - Personalised cell and gene therapy processes
  - Sustainable marine research
  - Quantum technology
  - Hydrogen
  - New approaches to drug development

In these clusters, universities, research institutions, companies, SMEs, and other relevant stakeholders in the regions pool their expertise.

#### 3.2.3.2 Focus on SME innovation

Support for SMEs and their research and innovation activities is anchored in various ministries and institutions in Germany. In addition to supporting SMEs in R&D through national schemes funded by the central government and federal states, Germany also fosters international cooperation through dedicated programmes.

The main sponsors of SME innovation activities are the BMWK and the BMBF. The BMWK offers funding schemes at different stages, covering start-ups, capacity development, research projects, and market-ready products.

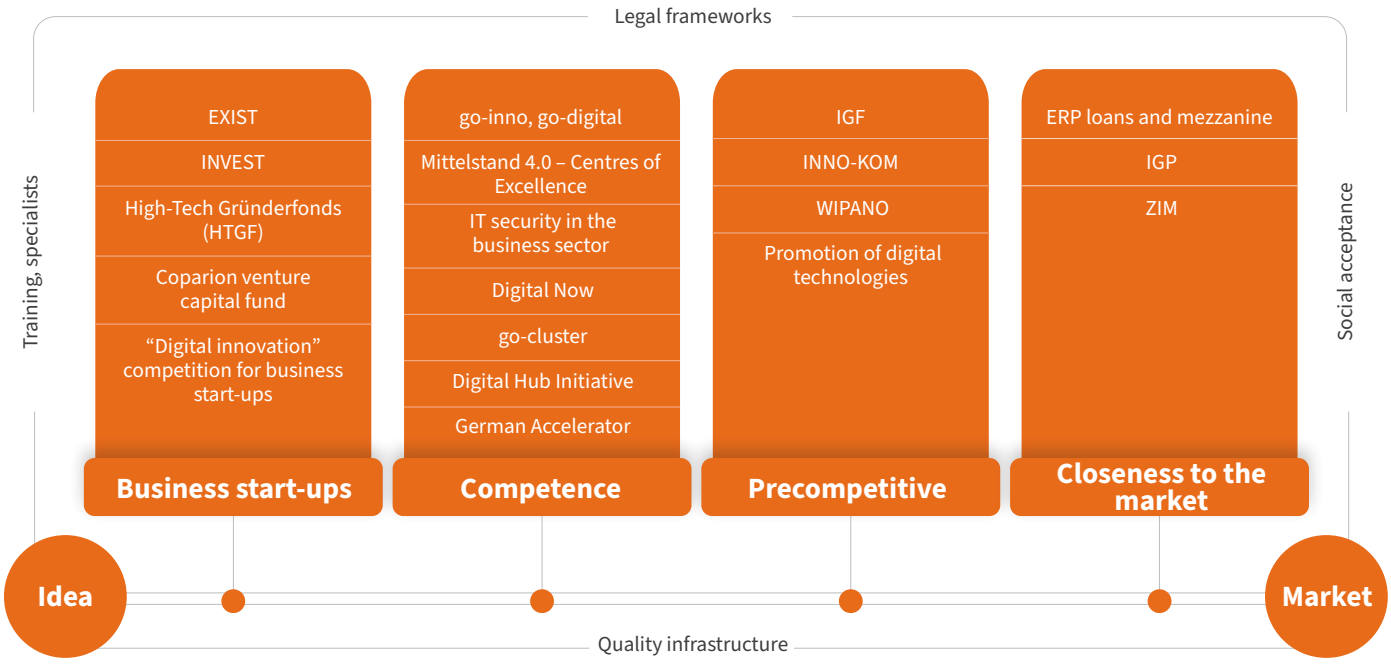



*Figure 10: Overview of funding programmes for SMEs focusing on R&D*[37]

36. Federal Ministry of Education and Research (BMBF). "Clusters4Future". Web resource. 2024. https://www.clusters4future.de (accessed on August 18, 2024).
37. Federal Ministry for Economic Affairs and Climate Action (BMWK). "Von der Idee zum Markterfolg: Programme für einen innovativen Mittelstand". Web resource. 2021, p. 4.https://www.bmwk.de/Redaktion/DE/Publikationen/Technologie/von-der-idee-zum-markterfolg-programme-fuer-einen-innovativen-mittelstand.html (accessed on August 15, 2024).

Some of the major programmes and initiatives are as follows:

- **go-inno (BMWK):**[38] go-inno supports external management and consulting services for the preparation and implementation of product and process innovations. Services are provided by authorised consulting companies and cover, among others:
    - Strengths and weaknesses profile of the company in relation to the innovation project
    - Preliminary examination of marketability
    - Development of a financing plan
    - Technology evaluation based on market assessments and market analyses
    - Identification of a suitable external technology provider
- **Pre-competitive Industrial Collective Research (Industrielle Gemeinschaftsforschung – IGF) (BMWK):**[39] Collective research is a mechanism enabling businesses to solve problems through shared projects and the development of technological platforms for entire industries or for cross-industry use. Research projects are proposed and managed exclusively by industrial associations, and each project must clearly demonstrate the economic added value of the research work for enterprises in the defined sector. Research is conducted by research institutes or universities. Through IGF, long-term research cooperation in industry-wide and/or cross-industry networks is supported, giving SMEs access to practice-oriented research results.
- **Central Innovation Programme for SMEs (Zentrales Innovationsprogramm Mittelstand – ZIM) (BMWK):**[40] ZIM is the core funding programme for market-oriented technologies in Germany. It provides funding for SMEs to finance R&D projects, with no restrictions on specific topics or technologies. The programme supports the development of new products, technical services, and advanced production processes, fostering cooperation between companies as well as between industry and academia.
  Funding is available for:
    - Individual projects by companies
    - Cooperation projects (between two companies or one company and one research institute)
    - ZIM cooperation networks
- **KMU-innovativ (BMBF):**[41] The KMU-innovativ funding initiative supports cutting-edge research in SMEs in Germany. In general, funding is available for individual companies or consortia involving several SMEs and/or research institutions. Research is supported in various technology fields, including bioeconomy, biomedicine, electronics and autonomous driving, supercomputing, civil security, medical technology, ICT, materials research, photonics and quantum technologies, as well as resource efficiency and climate protection.
- **Federal Funding Advisory Service on Research and Innovation:**[42] This is the central point of contact for any questions concerning research and innovation funding. It provides advice on the federal research structure, funding programmes, contact persons, and current funding priorities and initiatives. Additionally, it offers a special service for SMEs engaged in research, known as the Corporate Guidance Service.
- **Central Funding Database of the Federal Government of Germany:**[43] This database provides detailed information on approximately 2,400 funding programmes offered by the Federal Government of Germany, federal states, and the EU. It allows searching for different funding areas, such as research and innovation, energy efficiency and renewable energies, and corporate financing.

38. Federal Ministry for Economic Affairs and Climate Action (BMWK). "Innovationsgutscheine go-inno". Web resource. 2021. https://www.bmwk.de/Redaktion/DE/Publikationen/Technologie/bmwk-innovationsgutscheine-go-inno-flyer.pdf?__blob=publicationFile&v=7 (accessed on August 18, 2024).
39. Federal Ministry for Economic Affairs and Climate Action (BMWK). "Das Portal der Industriellen Gemeinschaftsforschung für Antragstellende und Gutachtende". Web resource. 2025. https://portal.industrielle-gemeinschaftsforschung.de/ (accessed on January 15, 2025).
40. Federal Ministry for Economic Affairs and Climate Action (BMWK). "Central Innovation Programme for Small and Medium-sized Enterprises (SMEs)". Web resource. 2024. https://www.zim.de/ZIM/Navigation/DE/Meta/Englisch/englisch.html (accessed on August 18, 2024).
41. Federal Ministry of Education and Research (BMBF). "KMU-innovativ". Web resource. 2023. https://www.bmbf.de/bmbf/de/forschung/innovativer-mittelstand/kmu-innovativ/kmu-innovativ_node.html (accessed on August 18, 2024).
42. Föderberatung des Bundes - Forschung und Innovation. "Lotsendienst für Unternehmen". Web resource. 2018. https://www.bmbf.de/SharedDocs/Publikationen/de/bmbf/5/30821_Lotsendienst_fuer_Unternehmen.pdf?__blob=publicationFile&v=3 (accessed on August 15, 2024).
43. Federal Ministry for Economic Affairs and Climate Action (BMWK). "Förderdatenbank Bund, Länder, EU". Web resource. 2024. https://www.foerderdatenbank.de/FDB/DE/Home/home.html (accessed on August 15, 2024).

- **Transfer Initiative (BMWK):**[44] This initiative helps enterprises translate ideas into marketable products, processes, and services. Together with innovation stakeholders, it assesses necessary improvements to facilitate the transfer of ideas to the market and identifies required adjustments. To achieve this, existing instruments are reviewed, and new ones are developed through expert dialogues, surveys, and stakeholder consultations.
- **Patent Registration Service:**[45] In 2024, a total of 153,654 patents were in force, according to the German Patent and Trademark Office (Deutsches Patent- und Markenamt – DPMA). The publicly accessible DPMA databases serve as a repository of technological developments, allowing research in German and English on all German innovations, as well as 80 million patent publications from all over the world. The DPMA focuses on SMEs in Germany, guiding them on intellectual property (IP) topics, including how to protect and enforce their rights.

Apart from these support schemes at the central government level, the federal states of Germany also offer funding schemes for SMEs focused on research. One such scheme is the State Offensive for the Development of Scientific and Economic Excellence (Landes-Offensive zur Entwicklung Wissenschaftlich-ökonomischer Exzellenz – LOEWE),[46] initiated by the federal state of Hesse. Under this programme, collaborative research projects between SMEs and research institutions and/or universities receive funding. These projects aim to jointly develop new and marketable products, processes, and services.

44. Federal Ministry for Economic Affairs and Climate Action (BMWK). "Transfer Initiative: More Ideas – More Successes". Web resource. 2020. https://www.bmwk.de/Redaktion/EN/Dossier/transfer-initiative.html (accessed on August 15, 2024).
45. German Patent and Trademark Office (DPMA). "DPMAregister". Web resource. 2024. https://www.dpma.de/english/search/dpmaregister/index.html (accessed on August 15, 2024).
46. Ministry for Science and Research, Art and Culture of Hesse. "Landesprogramm LOEWE". Web resource. 2024. https://wissenschaft.hessen.de/Forschen/Landesprogramm-LOEWE (accessed on August 15, 2024).

CHAPTER 04

# International SME and technology cooperation

Internationalisation in industry is of paramount importance for the future of the economy, influencing growth, competitiveness, and adaptability. Generally, large companies have easier access to international markets and possess the capacity and capital to establish manufacturing and research units abroad.

It should be noted that while SMEs make up a large share of businesses, relatively few operate on an international scale. Additionally, only a minority of SMEs in India and Germany are engaged in research and technology development. As a result, the number of SMEs involved in international technology transfer is even smaller. Developing workable models for SMEs to enhance the internationalisation of technology transfer is therefore key to ensuring economic growth.

There are various pathways for international technology cooperation involving SMEs, which are explored in the following chapters.

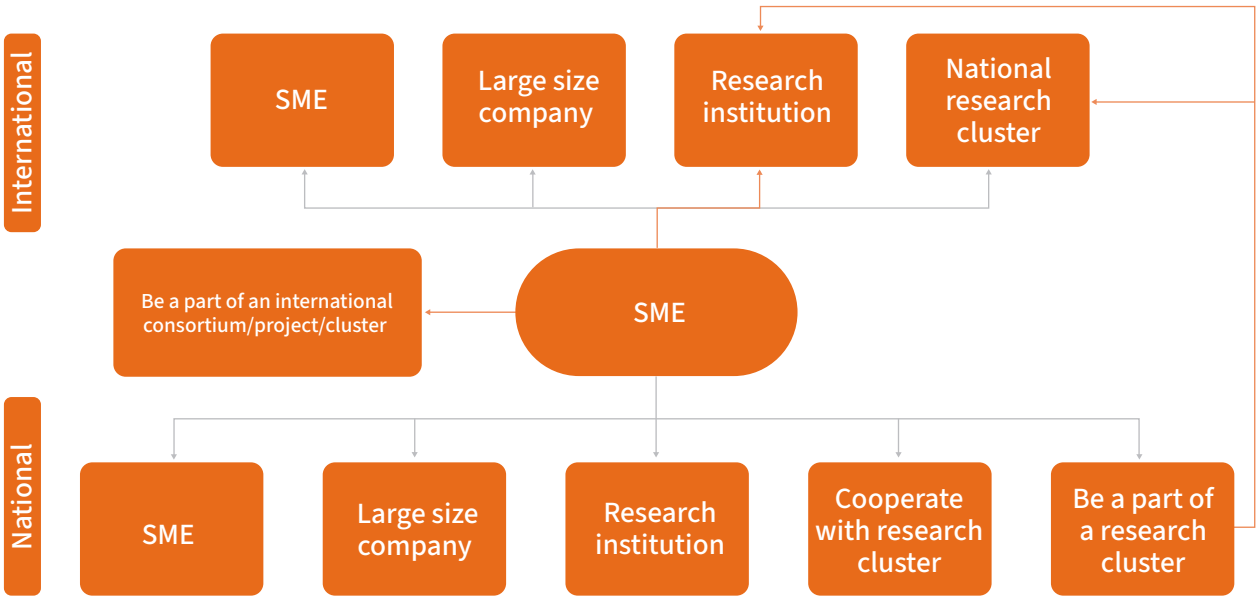



*Figure 11: Pathways of institutional technology cooperation (own illustration; orange lines indicate common pathways)*

## 4.1 Instruments

SMEs employ a variety of established practices for cooperation with research institutions in technology development, including:[47]

- Joint publications
- Temporary exchange of personnel
- Self-funded research projects
- Contractual research projects
- Publicly-funded research projects
- Research internships and PhDs
- Licensing of technology transfer agreements/ shared patents
- Use of research facilities and infrastructure
- Participation in a cluster/network
- Participation in conferences, seminars, and events

Other measures, activities, and forms of cooperation for SMEs to engage in international technology transfer include:

- Establishing joint ventures with international companies
- Participation in international trade fairs and exhibitions
- Export of technology-based products
- Participation in government programmes designed to help SMEs navigate international collaboration, including legal assistance

Governments worldwide offer such initiatives and programmes to boost SME internationalisation within their jurisdictions.

## 4.2 Support schemes in India

The Government of India promotes the internationalisation of research and innovation through various programmes. However, dedicated initiatives specifically for SME internationalisation in technology cooperation remain limited. Existing programmes primarily focus on market access and technology export, rather than fostering deeper international collaborations in research and innovation.

- **International Technology Transfer Programme (ITTP):** This programme promotes global technology transfer and trade, with an emphasis on exporting Indian technologies, projects, and services. It aims to enhance the global reach of SMEs in India by facilitating technology exports and supporting the adoption of foreign technologies in India. Key measures include:
    - Providing information on export-ready innovations
    - Raising international awareness of Indian technologies
    - Assisting SMEs in developing competitive technologies
    - Fostering high-tech cooperation and supporting policy research
    - Establishing institutional frameworks to strengthen international technology exchange
- **Market Development Assistance (MDA) Scheme:** The Indian Ministry of Commerce and Industry administers this scheme for export-oriented companies. To be eligible, a company's annual export value must not exceed INR 150 million (USD 1.70 million/EUR 1.57 million), making the initiative squarely aimed at Indian MSMEs. Individual companies can participate in Export Promotion Councils (EPCs), which organise trade delegations to attend trade fairs. Under certain conditions, international airfare can be reimbursed for foreign importers meeting with potential suppliers in India. Target regions include Latin America, Africa, the Commonwealth of Independent States (CIS), i.e., former Soviet Union members, and the Association of Southeast Asian Nations (ASEAN) countries.[48]

47. Antonino Ardilio; Carolina Wienand. "KMU & internationaler Forschungsaustausch: Potenziale und Herausforderungen". Web resource. 2019. https://www.researchgate.net/publication/356563711_KMU-Studie_2_Research_in_Germany (accessed on August 15, 2024).
48. Ministry of Commerce and Industry. "Market Development Assistance (MDA) Scheme". Web resource. 2024. https://www.commerce.gov.in/international-trade/trade-promotion-programmes-and-schemes/trade-promotion-programme-focus-cis/market-development-assistance-mda-scheme/ (accessed on January 15, 2025).

## 4.3 Support schemes in Germany

The Federal Government of Germany funds internationalisation of research on a large scale, with several research schemes also open to SME participation.[49] A few programmes are specifically targeted at SMEs for the internationalisation of technology cooperation:

- **Collective Research Networking (CORNET):**[50] CORNET is an international network based on Germany's IGF programme. It enables ministries and funding agencies to combine their existing funding schemes to enhance the competitiveness of SMEs. Twice a year, CORNET issues calls for proposals for international collective research projects. A typical CORNET project lasts 24 months and includes partners from at least two countries. An international project consortium consists of an SME association, a research organisation, and several SMEs (the number varies by national rules) in each participating country. Currently, the network has 15 members, but India is not a CORNET partner.
- **International Research Activities by SMEs (IraSME):**[51] IraSME is a network of R&D funding programmes from different countries and regions, supporting SMEs in their innovation efforts. Its goal is to lower the threshold for international cooperation by making local funding schemes available to international projects and partners. The network coordination is financed by the Federal Government of Germany.
- **Eureka Association:**[52] With a presence in 47 countries, Eureka is the world's largest public network for international cooperation in research, development, and innovation. Its national coordinators provide guidance and application support to help SMEs access funding schemes across all member countries. Germany is a member of Eureka, while India is an official partner country.
    - **Eurostars:**[53] The largest international funding programme for SMEs collaborating on R&D projects that create innovative products, processes, or services for commercialisation. It is co-funded by the EU and open to all technology areas and sectors, provided the projects do not involve dual-use technologies. Project consortia must include at least two independent partners from different Eurostars countries, led by an innovative SME. In Germany, Eurostars is managed by the BMBF and coordinated by the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt – DLR). SMEs in Germany can receive up to EUR 500,000 (USD 565,150/INR 47.77 million), covering 50% of eligible R&D costs. Public research institutions may receive 100% funding when partnered with an SME in Germany. International SMEs can participate as partners when their activities are aligned with SMEs in Germany and supported by their respective national funding bodies.
    - **Innowwide:**[54] Under the Eureka Association, five funding schemes are available in Germany. Innowwide is the only programme dedicated to international market access. It provides SMEs with a EUR 60,000 (USD 67,818/INR 5.73 million) grant to assess the viability of research or commercialisation in international target markets outside the EU, including Asia. Applicants must collaborate with a local partner in the target country.
- **ZIM – International Innovation Networks (BMWK):**[55] The programme supports networks to foster collaboration between SMEs in Germany and international partners. The aim is to jointly develop and commercialise innovative products, processes, or technical services with strong

49. A database of funding schemes for SMEs in Germany including participation in research projects is available on the following website: https://www.foerderdatenbank.de/SiteGlobals/FDB/Forms/Suche/Servicesuche_Formular.html?resourceId=75957770-36ec-4a46-a24b-63087e1d6e7c&input_=285abce9-4339-43b9-9e4d-b1cac15665f4&pageLocale=de&templateQueryString=&submit=Suchen (accessed on August 18, 2024).
50. Federal Office for Economic Affairs and Export Control (BAFA). "CORNET. Collective Research Networking". Web resource. 2022. https://cornet.online/EN/About/About_node.html (accessed on August 15, 2024).
51. IraSME Coordination Office. "IraSME – International Research Activities by Small and Medium-sized Enterprises". Web resource. 2024. https://www.ira-sme.net (accessed on August 15, 2024).
52. Eureka Association. "Innovation Beyond Borders". Web resource. 2024. https://eurekanetwork.org/ (accessed on August 15, 2024).
53. Federal Ministry for Education and Research (BMBF). "Eurostars". Web resource. 2025. https://www.bmbf.de/EN/Research/InternationalAffairs/Europe/Eurostars/eurostars.html (accessed on August 15, 2024).
54. Eureka Association. "Innowwide". Web resource. 2024. https://eurekanetwork.org/programmes/innowwide/ (accessed on August 15, 2024).
55. Federal Ministry for Economic Affairs and Climate Action (BMWK). "Hinweise zur Förderung internationaler ZIM-Innovationsnetzwerke". Web resource. 2024. https://www.zim.de/ZIM/Redaktion/DE/Artikel/hinweise-zur-foerderung-internationaler-zim-Kooperationsnetzwerke.html (accessed on August 18, 2024).

market potential. The collaboration must be based on a common innovative idea and can be either technologically or regionally focused, or span a value chain. There are no restrictions on specific technologies, sectors, or countries. An international ZIM network must consist of at least four German companies (of which two must be SMEs), two international SMEs, and one international supporting institution that acts as a coordinator and partner to the German network management organisation. Additional partners—such as research institutions, universities, large companies, or associations—may also participate. ZIM funding is available exclusively to partners in Germany. International participants are expected to finance their contributions independently. The maximum funding is EUR 600,000 (USD 678,180/ INR 57.32 million), with a funding rate of up to 95% for eligible costs. For networks involving non-European partners, an additional EUR 10,000 (USD 11,303/INR 955,370) can be granted in each phase.

Compared to national funding schemes that foster SME technological innovation and collaboration, there are fewer programmes dedicated to supporting international technology cooperation. Most of these programmes only fund SMEs in Germany in their internationalisation efforts. SMEs in India can participate in programmes such as the ZIM – International Innovation Networks or Eurostars if they are partnered with SMEs in Germany and are able to cover their costs, e.g., through Indian national funding schemes.

CHAPTER 05

# Indo-German collaboration for innovation and R&D – focus on SMEs

India and Germany have a long-standing partnership in technology and scientific cooperation, formalised by an agreement signed in 1974.[56] Over the course of the past seven Indo-German Intergovernmental Consultations, science and technology have consistently been recognised as key areas of collaboration.

Deepening research cooperation between the two countries is viewed as a mutually beneficial approach, and strengthening academia–industry collaboration will be crucial in catalysing Indo-German strategic research, development, and innovation partnerships.[57] Recognising this, several initiatives and projects by the Government of India and the Federal Government of Germany have been—and continue to be—implemented in this field.

## 5.1 Initiatives and projects

### 5.1.1 Indo-German initiatives and projects

**Intech Project (2002–2007)**

The Intech initiative, funded by the German Federal Ministry for Economic Affairs and Energy (Bundesministerium für Wirtschaft und Energie – BMWi) from 2002 to 2007, aimed to strengthen international partnerships for SMEs in Germany in the fields of innovation and technology. Focusing on key markets such as India and China, the programme facilitated collaborations between SMEs in Germany and their counterparts by providing structured matchmaking and targeted support.

56. Bundesgesetzblatt Jahrgang 1974, Teil II, pp. 998-1003. https://www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger_BGBl&jumpTo=bgbl274s0998.pdf#__bgbl__%2F%2F*%5B%40attr_id%3D%27bgbl274s0998.pdf%27%5D__1723977720343 (accessed on August 15, 2024).
57. Ministry of External Affairs (MEA), Government of India. "Joint Statement: 6th India-Germany Inter-Governmental Consultations". Web resource. 2022. https://www.mea.gov.in/bilateral-documents.htm?dtl/35251/Joint_Statement_6th_IndiaGermany_InterGovernmental_Consultations (accessed on August 18, 2024).

Implemented by the AiF, the Association of the German Chambers of Industry and Commerce (Deutscher Industrie- und Handelskammertag – DIHK), and the Fraunhofer-Gesellschaft, the initiative established networks of vetted companies and research institutions in each target country. These networks enabled SMEs in Germany to engage with potential partners based on industry sectors and partnership models, whether for joint research or industrial applications.

The initiative provided comprehensive support, including:

- Partner selection, validation, and contact facilitation at no cost to SMEs in Germany
- Sponsorship of business travel, networking events, and on-site visits to foster direct engagement and trust-building
- Assistance with IPR, financing instruments, and collaboration agreements, accelerating successful partnerships

Over five years, SMEs in Germany benefited from a structured engagement platform, leading to increased cross-border cooperation and market access. As a direct outcome of the initiative in India, more than 35 Indo-German collaborations were forged, significantly increasing understanding and interest in partnerships.

The following key insights were gained from the Intech initiative:

- **SME definition gap:** SMEs in Germany often equate to mid-sized Indian companies, requiring careful alignment in partnerships based on size and investment capacity.
- **Technology and market leadership:** German *Mittelstand* companies, though small, lead global markets with proprietary high-tech solutions and command premium prices due to innovation-driven exports. SMEs in India, in contrast, leverage cost advantages, focusing on high margins and low labour costs. Except in sectors like automotive and pharmaceuticals, they primarily acquire foreign technology through buy-back agreements but are increasingly emerging as Tier 1 suppliers to global original equipment manufacturers (OEMs).
- **Workforce and training:** The German apprenticeship system ensures a skilled, loyal workforce, fostering company culture and long-term retention. SMEs in India lack structured training programmes, struggle with standardised skill levels, and face high employee attrition, often losing trained workers to competitors—making employers reluctant to invest in lifelong skilling.
- **Global expansion and risk appetite:** SMEs in Germany dominate niche B2B markets but remain hesitant to expand outside Europe due to cultural and market differences. SMEs in India, supported by government schemes, are highly entrepreneurial, risk-tolerant, and actively seek international expansion.
- **Succession and growth:** SMEs in Germany, often family-owned and rural-based, face succession challenges as younger generations either opt out or seek equity partnerships. Indian family businesses actively modernise and expand, with second and third generations driving technology adoption and scaling enterprises into conglomerates, e.g., Reliance, Hero Motors, and JBM.
- **Financial constraints and market barriers:** SMEs in Germany, despite strong profit margins, often have limited liquidity and are risk-averse, restricting their ability to explore new markets. Additionally, language barriers and a preference for proximity hinder their expansion beyond Europe.
- **Need for structured support:** Both SMEs in Germany and SMEs in India require sustained government-backed programmes for cross-border collaboration, including financial aid, trust-building mechanisms, and long-term engagement initiatives. While Germany offers funding for SME technology adoption, India currently lacks similar grants for technology upgrades and international partnerships.

### Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) – Innovation Promotion in MSMEs (2018–2020)[58]

The GIZ–MSME Innovation Programme, funded by Germany through GIZ, focused on strengthening capacity development in the SME sector in India by

58. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). "Innovation Promotion in Micro, Small and Medium-sized Enterprises". Web resource. 2020. https://www.giz.de/en/worldwide/14479.html (accessed on April 1, 2025).

promoting innovation and fostering linkages between enterprises, research institutions, and policymakers. The programme was specifically designed to support domestic innovation ecosystems and did not include funding for cross-border cooperation activities. Implemented in close collaboration with the Indian MoMSME, the programme introduced several strategic components to enhance the innovation capabilities of SMEs in India.

The programme supported institutions that promote economic development, such as business chambers and associations, in developing a range of innovation-enabling services for MSMEs. GIZ also helped produce training materials on innovation management aimed at establishing new mechanisms to support start-ups. The project had a strong demand focus—both in terms of bridging the gap between MSMEs and academia, and between MSMEs and the demands of international (German) manufacturers. At the national level, the programme advised the MoMSME on developing new support instruments to foster innovation and modernisation in the MSME sector.

### Make in India Mittelstand (MIIM)

The MIIM programme is an initiative launched and owned by the Embassy of India in Berlin to promote investment and collaboration between SMEs in India and SMEs in Germany across various sectors.[59] Its objective is to facilitate technology transfer, joint ventures, and investments, focusing on fields such as automotive, machine tools, renewable energy, biotechnology, and smart cities. The MIIM team consists of multiple partners, including Rödl & Partner, Khaitan & Co., KfW (Kreditanstalt für Wiederaufbau) Development Bank, State Bank of India (SBI), and Deutsche Bank, with the Indo-German Chamber of Commerce (Auslandshandelskammer – AHK Indien), supporting programme implementation.

The programme provides handholding support to German *Mittelstand* companies looking to set up operations or partner with SMEs in India, assisting with regulatory approvals, land acquisition, and other administrative processes. It involves collaboration between the Government of India, industry associations, and German counterparts, such as the DIHK.

While the programme is not specifically targeted at technology cooperation and does not provide funding itself, participating SMEs from Germany may be eligible for various investment incentives and tax benefits offered by the Government of India under the broader Make in India initiative.

### Indo-German Science and Technology Centre (IGSTC)

The IGSTC[60] is a joint initiative between the Government of India and the Federal Government of Germany. It promotes bilateral R&D projects, with a focus on applied and industrial research, including SMEs with potential for innovation, technology transfer, and commercialisation.

SMEs can benefit from funding schemes that support industry–academia cooperation, including:

- **2+2 Project Funding:** This scheme supports collaborative research projects involving at least one academic or research institution and one industry partner, including SMEs from India and Germany.
- **Workshops:** IGSTC funds bilateral workshops organised between academic institutes or research organisations and industry from both countries. These workshops serve as a platform for interaction and project initiation between researchers from academia and industry.
- **Small Immediate Need Grants:** This scheme supports, amongst others, personnel from the industry with specific requirements in applied research and technology development. It provides funding of up to EUR 10,000 (USD 11,303/INR 955,370) for joint initiatives and individual proposals related to rapid prototyping, technology demonstration, or industrial R&D.

While this initiative provides the most specific support for SMEs seeking to enhance technology cooperation between India and Germany, it suffers from a lack of visibility amongst its target group.

59. Embassy of India, Berlin. "Make in India Mittelstand (MIIM). Business Support Programme for German Mittelstand and Family-Owned Enterprises". Web resource. 2022. https://indianembassyberlin.gov.in/pages?id=MTQ,&subid=MTY5 (accessed on August 15, 2024).
60. Indo-German Science and Technology Centre (IGSTC). "Programmes". Web resource. 2024. https://www.igstc.org/ (accessed on August 18, 2024).

## 5.1.2 Good practices with international partners

A number of initiatives by the Federal Government of Germany and the Government of India, as well as those at the EU level, focus on international cooperation with partner countries. These programmes could serve as role models and be adapted for future Indo-German SME technology cooperation.

### Global Innovation & Technology Alliance (GITA)

GITA is a public–private partnership in India, jointly established by the DST and the Confederation of Indian Industry (CII), to promote industry-led innovation and strengthen international R&D cooperation. As an implementation partner for several bilateral programmes, GITA facilitates joint research, technology development, and commercialisation between Indian enterprises and their global counterparts. Examples of international cooperation models include:

- **India–Israel Industrial R&D and Technological Innovation Fund (I4F):**[61] This innovation fund is a bilateral initiative by India's DST and the Israel Innovation Authority (IIA), established with a joint budget of USD 40 million (EUR 35.40 million/INR 3.39 billion) over five years. It supports collaborative industrial R&D projects between Indian and Israeli companies, aimed at co-developing and commercialising innovative technologies. The programme is implemented by GITA in India and overseen by the IIA in Israel. Projects are co-funded by both governments, covering up to 50–66% of eligible costs, with higher rates available for start-ups. Eligible applicants are R&D-performing companies from both countries, with at least one partner from each side. Research institutions may join as subcontractors. Focus sectors include agriculture, water, energy, healthcare, and ICT.
  I4F offers tailored funding instruments such as:
  - Feasibility studies (up to USD 100,000/EUR 88,470/INR 8.48 million)
  - R&D projects (up to USD 2.5 million/EUR 2.21 million/INR 212.09 million)
  - Pilot projects (up to USD 1 million/EUR 884,700/INR 84.84 million)
  - Strategic projects (up to USD 5 million/EUR 4.42 million/INR 424.18 million)

  Successful examples include IoT-based healthcare sensors, biotech mosquito control, and satellite-enabled environmental data platforms.
- **India–Russia Joint Innovation Programme:**[62] The India–Russia Joint Technology Assessment and Accelerated Commercialisation Programme is a flagship initiative by the DST, Government of India; the Foundation for Assistance to Small Innovative Enterprises (FASIE), Russian Federation; and the Federation of Indian Chambers of Commerce and Industry (FICCI). It aims to foster industrial R&D partnerships and accelerate the commercialisation of technologies jointly developed by Indian and Russian SMEs and start-ups. The programme supports collaborative projects in areas such as information technology (including AI and virtual reality (VR)), health and pharmaceuticals, clean energy, aerospace, environment, advanced materials, biotechnology, and robotics. Two tracks are available: one for joint R&D, and another for technology transfer or adaptation between the two countries.
  Eligible participants include science- and technology-based SMEs and start-ups legally registered in India or Russia. Each project must include at least one partner from each country, with the option to involve universities and research institutes as subcontractors for up to 30% of the project work. Each selected project may receive co-funding of up to approximately USD 180,000 (EUR 159,246/INR 15.27 million) for Indian applicants and approximately USD 160,000 (EUR 141,552/INR 13.59 million) for Russian applicants. Indian participants must co-finance 50% of the grant requested, and Russian participants 30%.

61. Israel Innovation Authority. "Israel – India Industrial R&D and Technological Innovation Fund (I4F)". Web resource. 2025. https://innovationisrael.org.il/en/foundation/i4f-israel-india/ (accessed on April 1, 2025).
62. Federation of Indian Chambers of Commerce and Industry (FICCI). "India-Russia Joint Technology Assessment and Accelerated Commercialization Programme". Web resource. 2025. https://www.indiarussiainnovate.org/ (accessed on April 1, 2025).

### ZIM – Bilateral Cooperation

ZIM is the core funding programme for market-oriented technologies in Germany. It provides funding for SMEs to finance R&D projects, with no restrictions on specific topics or technologies. The programme supports the development of new products, technical services, and advanced production processes, fostering cooperation between companies as well as between industry and academia. ZIM also runs bilateral programmes with selected countries. An example of its international cooperation models is:

- **Vinnova and AiF Project Collaboration:**[63] Vinnova, Sweden's national innovation agency, and the BMWK aim to support joint German–Swedish R&D projects to develop innovative products, processes, or technical services across all technology and application areas. Funding is available for projects that result in new products, technical services, or processes that offer sustainable solutions with high market potential. In Germany, funding is provided through ZIM, and in Sweden through Vinnova. Both Vinnova and AiF Projekt GmbH, the ZIM project management agency, assist project partners throughout the proposal submission, evaluation, and implementation phases. Eligible participants from Germany and Sweden must finance their costs through their respective funding schemes and their own resources. Funding from one agency does not guarantee funding from the other. Project proposals must meet the following guidelines:
  - Include at least one SME in Sweden and one SME in Germany
  - Involve additional research organisations and companies as partners or subcontractors, if desired
  - Allow participation by companies or research organisations from other countries, though they will not be funded by Vinnova or ZIM
  - Focus on the development of new products, technical services, or processes with strong market and commercialisation potential
  - Demonstrate a clear benefit from the collaboration between participants from both countries

### INGENIOUS Internationalisation Grants[64]

The INGENIOUS Internationalisation Grants are part of the EU-funded INGENIOUS Eurocluster project, aimed at helping SMEs from energy-intensive industries expand into global markets. With grants of EUR 2,500 (USD 2,825/INR 238,845) per company, the programme supports targeted international activities that enhance competitiveness and foster cross-border cooperation. Eligible activities include:

- Participation in international trade fairs and conferences
- Business missions and delegation visits
- Market research and feasibility studies
- Partnerships with international clusters or companies
- Product and service adaptation for new markets

In the most recent funding round, SMEs explored opportunities across Asia, Africa, North and Latin America, with destinations including India, Canada, South Korea, Peru, and Saudi Arabia. The grants enable companies to evaluate new markets, connect with potential partners, and prepare for international expansion.

## 5.2 Opportunities and challenges for technology cooperation

Given the broader economic and policy environment, along with the institutional framework and international collaboration programmes outlined above, the stakeholder dialogue initiated by the Fraunhofer Office India and the DWIH New Delhi focused on Indo-German technology cooperation. As a first step, it identified several opportunities and challenges faced by SMEs in India.

### Opportunities for technology cooperation

- **Contributions to domestic production and export earnings:** SMEs in India play a critical role

63. Federal Ministry for Economic Affairs and Climate Action (BMWK) and Vinnova. "6th German-Swedish Call for Proposals for Joint R&D Projects by Small and Medium-sized Enterprises (SMEs)". Web resource. 2025. https://www.zim.de/ZIM/Redaktion/DE/Downloads/International/6-call-sweden.pdf (accessed on April 1, 2025).
64. Eurocluster INGENIOUS. "Home Page". Web resource. 2025. https://ingenious-eurocluster.eu/ (accessed on April 1, 2025).

in domestic manufacturing and export revenue generation. Their growth potential is enhanced by adopting new technologies that improve product quality and productivity, allowing them to compete in global markets.

- **Flexibility and lower investment requirements:** SMEs are more agile than larger firms and have lower capital investment needs. This flexibility allows them to adopt new technologies more quickly without the financial burden faced by larger companies, positioning them to benefit from cutting-edge innovations.
- **Indigenous technology development:** SMEs in India can develop and adapt indigenous technologies tailored to local needs. International technology cooperation can further strengthen this capability, enabling SMEs to create cost-effective, high-quality solutions that meet both domestic and global demands.
- **Outsourcing, subcontracting, and ancillary opportunities:** The increasing trend of outsourcing, subcontracting, and the establishment of ancillary units, particularly in non-core sectors such as automobiles, engineering, and consumer electronics, has created significant opportunities for SMEs in India to integrate advanced technologies into their operations.
- **Competitiveness in global markets:** Technology adoption allows SMEs to enhance their competitiveness in both domestic and international markets. The use of advanced technologies helps SMEs better align with global quality standards, improving their prospects in export markets.

### Challenges to technology cooperation and adoption

- **Financial constraints and low R&D investment:** Many SMEs in India face financial difficulties and are hesitant to invest in R&D due to concerns over return on investment. This reluctance slows technology adoption and limits their ability to innovate and remain competitive.
- **Unstructured data management and inconsistent innovation:** SMEs often struggle with unstructured data management, especially at the machine and process levels. This lack of standardised data practices leads to inconsistent innovation and prevents them from progressing beyond the proof-of-concept stage, stalling technological advancement.
- **Lack of focus on IPR:** Many SMEs overlook IPR management, limiting their ability to protect and commercialise innovations. Without proper IPR strategies, SMEs risk losing competitive advantages and may hesitate to invest in technological development.
- **Limited industry–academia collaboration:** Compared to countries like Germany, collaboration between industry and academia in India is relatively weak. This gap slows the flow of new technologies from research institutions to SMEs, hindering innovation and commercialisation processes.
- **Shortage of technically skilled HR:** A significant shortage of skilled labour within SMEs in India limits their ability to adopt and implement new technologies effectively. This lack of technical expertise is a major barrier to optimising technology use and improving productivity.
- **Limited access to technological information and consultancy:** SMEs face barriers in accessing up-to-date technological information and expert consultancy services. This lack of access to knowledge and guidance limits their ability to identify, adopt, and implement appropriate technologies.
- **Isolation from technology hubs:** Many SMEs are geographically and institutionally isolated from major technology hubs, limiting their exposure to innovation and technological advancements. This isolation reduces their ability to participate in global technology networks and benefit from international cooperation.

## 5.3 Gaps in funding and support

As highlighted in the stakeholder dialogue initiated by the Fraunhofer Office India and the DWIH New Delhi, SMEs play a crucial role in innovation. While they recognise the need to expand international technology cooperation—including cooperation between India and Germany in general—the primary barrier to collaboration is that costs often outweigh the added value to their businesses. Given Germany's and India's demographic developments, along with their commitment to multilateralism and shared values, it is imperative for both nations to strengthen cooperation in innovation and research.

An analysis of funding mechanisms shows that many programmes are available to SMEs at the national level, with some supporting international cooperation, but there is no dedicated funding mechanism for Indo-German technology cooperation. Following the discontinuation of the Intech project, and despite declarations during the subsequent intergovernmental consultations, technology cooperation in the SME sector has stalled.

The main schemes for international cooperation funded by Germany, such as CORNET and IraSME, are not open to SMEs in India since India is not an official partner country. SMEs in India can participate in programmes such as the ZIM – International Innovation Networks or Eurostars if they are partnered with SMEs in Germany and are able to cover their costs, e.g., through Indian national funding schemes. Current schemes that at least partially address SMEs are not widely known and would benefit from greater visibility.

To overcome these funding and support gaps, one approach could be to open existing schemes to India, e.g., under the CORNET or ZIM bilateral cooperation framework. Additionally, to enhance Indo-German cooperation, a new funding mechanism dedicated to SMEs for international technology collaboration should be developed and implemented.

Germany's focus on the *Mittelstand* to remain globally competitive and India's focus on creating jobs for the masses to benefit from its demographic dividend compel both nations to prioritise SME collaboration for innovation and research. It is essential that, in developing the funding framework, SMEs and research institutions are actively involved to assess their needs and tailor the instruments accordingly.

## 5.4 Barriers to Indo-German cooperation

During stakeholder consultations and discussions, the following challenges to fostering Indo-German technology transfer were identified:

- SMEs in India and Germany are concentrated in different industries, leading to incongruence in objectives and technologies.
- The size and number of SMEs differ between the two countries, creating a mismatch in cooperation possibilities.
- SMEs generally have limited financial and personnel resources for international cooperation and tend to prefer operating within single markets.
- There are significant legal uncertainties regarding international IPR protection.
- Identifying a matching and trustworthy partner is difficult without established contact.
- There is a lack of knowledge about the other country's market, industries, research systems, legal framework, and support mechanisms.
- From the German perspective, the large number of SMEs in India and the lack of knowledge about their technological capabilities pose challenges.
- There is a lack of platforms and programmes that sustainably support international SME cooperation.

While these barriers impact Indo-German technology cooperation at all levels, opportunities for collaboration remain strong. Given the increasing significance of the growing Indian market and the availability of specialised German technologies, both countries stand to benefit greatly from closer, more sustainable, and expansive economic relations based on technology transfer, adaptation, and development.

CHAPTER 06

# Recommendations

## Ensure targeted selection of SMEs for innovation cooperation

To maximise the potential of new cooperation schemes, it is essential to carefully select SMEs that demonstrate readiness and capability for international collaboration:

- SMEs in both geographies should be open to international collaboration. They should have some presence in or access to either market, offering complementary strengths and the ability to leverage their respective capabilities. Their technology, products, or services should be relevant to these markets.
- Selected SMEs should demonstrate a Technology Readiness Level (TRL) of 5–7 on a scale of 10.
- SMEs must have personnel proficient in English and a long-term perspective and mindset to effectively navigate intercultural challenges.
- Collaboration sectors should be strategically chosen for quick wins, with potential areas including machine tools, medical technology, automotive components, and water technologies.

## Establish a robust framework for collaboration

To enhance SMEs' access to new technologies and international competitiveness, a structured and sustainable framework is necessary:

- Consolidate existing fragmented efforts into a unified setup that addresses the specific needs and possibilities of SMEs.
- Create a sustainable ecosystem to support German companies entering the Indian market, while increasing awareness of SMEs from India in Germany.
- Strengthen collaboration between government and industry stakeholders, fostering closer ties between Indian associations such as CII and FICCI, and German associations such as VDMA – Verband Deutscher Maschinen- und Anlagenbau (German Engineering Federation) and OAV – Ostasiatischer Verein (German Asia-Pacific Business Association).
- Enhance dialogue on IPR and collaboration in disruptive technologies.
- Link existing projects and implement strong public relations and marketing strategies to promote bilateral relationships and garner large-scale support from both governments.

## Facilitate knowledge sharing and market access for SMEs

To promote and strengthen joint innovation and bilateral technology cooperation, both countries should expand formats and support mechanisms for knowledge sharing and market access for SMEs:

- Establish a consistent format for interaction between SMEs and experts in both countries through regular SME forums and expert dialogues, enabling them to share insights, experiences, and innovative solutions.
- Implement structured business matchmaking programmes to help SMEs find complementary partners and boost competitiveness.
- Support market access programmes—such as the

European Institute of Innovation and Technology (EIT) Health Bridgehead model—that are implemented by clusters and accelerators to assist research-driven SMEs in entering each other's markets.

## Strengthen cooperation between SMEs and research institutions

To facilitate joint projects between SMEs and research institutions and deepen collaboration:

- Explore and implement innovative and sustainable funding mechanisms that leverage private and public sector resources to sustain impactful partnerships.
- Expand and initiate publicly financed joint research projects to encourage collaborative research initiatives, enabling SMEs and academic institutions to work on cutting-edge advancements, e.g., using CORNET mechanisms.
- Create an international exchange programme, including industrial fellowships and internship programmes for students, PhD candidates, postdocs, and research staff, fostering cross-pollination of ideas, skill development, and long-term partnerships.

## Develop a comprehensive digital platform

To foster knowledge sharing and collaboration, a digital platform should be created to connect industry, academia, research organisations, and Indo-German technology projects:

- The platform should unite industry, academia, and research organisations.
- It should provide answers to collaboration-related questions and showcase ecosystem and funding opportunities.
- The platform should offer matchmaking and networking tools for organisations seeking and offering specific technologies.
- It should provide practical support and guidance, particularly for SMEs, to enhance their ability to navigate collaboration processes.

This multi-pronged strategy will strengthen Indo-German ties, enhance technological innovation, and position both countries as global leaders in addressing shared challenges through collaborative R&D.

CHAPTER 07

# List of abbreviations

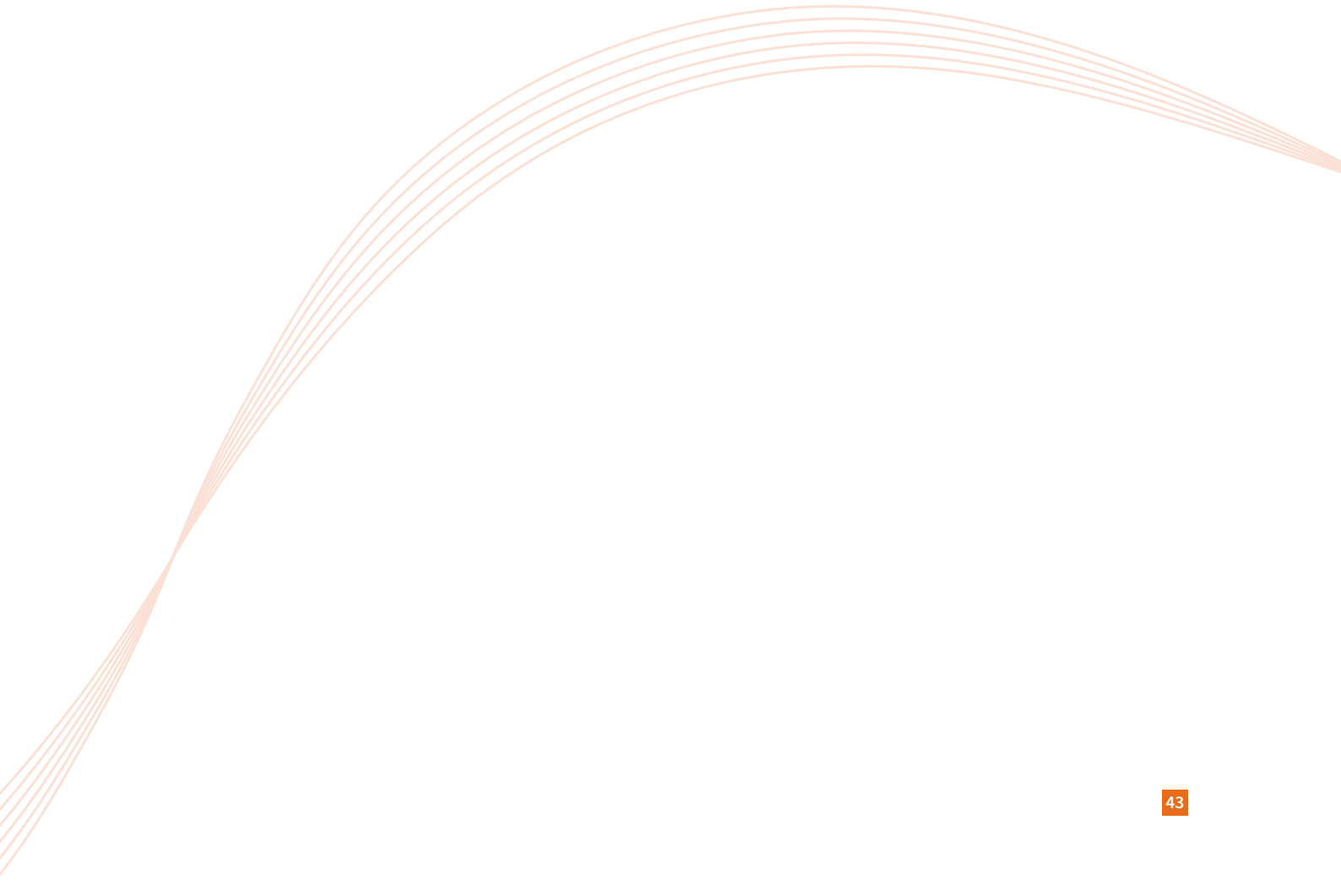
| Abbreviation | Full form |
|---|---|
| **AHK** | Auslandshandelskammer<br>(German Chamber of Commerce Abroad) |
| **AI** | Artificial Intelligence |
| **AiF** | Arbeitsgemeinschaft industrieller Forschungsvereinigungen<br>(German Federation of Industrial Research Associations) |
| **ASEAN** | Association of Southeast Asian Nations |
| **ASPIRE** | A Scheme for Promotion of Innovation, Rural Industry and Entrepreneurship |
| **BHIM** | Bharat Interface for Money |
| **BMBF** | Bundesministerium für Bildung und Forschung<br>(Federal Ministry of Education and Research) |
| **BMFTR**<br>**(Name of the ministry from May 2025)** | Bundesministerium für Forschung, Technologie und Raumfahrt<br>(Federal Ministry of Research, Technology and Space) |
| **BMWi**<br>**(Name of the ministry from Dec 2021 to May 2025: BMWK)** | Bundesministerium für Wirtschaft und Energie<br>(Federal Ministry for Economic Affairs and Energy) |
| **BMWK**<br>**(Name of the ministry from Dec 2021 to May 2025; thereafter renamed to BMWi)** | Bundesministerium für Wirtschaft und Klimaschutz<br>(Federal Ministry for Economic Affairs and Climate Action) |
| **BVMW** | Bundesverband mittelständische Wirtschaft<br>(German Association for Small and Medium-sized Businesses) |
| **CGTMSE** | Credit Guarantee Fund Trust for Micro and Small Enterprises |
| **CHAMPIONS** | Creation and Harmonious Application of Modern Processes for Increasing the Output and National Strength |

| Abbreviation | Full form |
|---|---|
| **CII** | Confederation of Indian Industry |
| **CIS** | Commonwealth of Independent States |
| **CLCSS** | Credit Linked Capital Subsidy Scheme |
| **CORNET** | Collective Research Networking |
| **COVID** | Coronavirus Disease |
| **DAAD** | Deutscher Akademischer Austauschdienst<br>(German Academic Exchange Service) |
| **DIHK** | Deutscher Industrie- und Handelskammertag<br>(Association of the German Chambers of Industry and Commerce) |
| **DLR** | Deutsches Zentrum für Luft- und Raumfahrt<br>(German Aerospace Center) |
| **DPMA** | Deutsches Patent- und Markenamt<br>(German Patent and Trademark Office) |
| **DST** | Department of Science & Technology |
| **DWIH** | Deutsches Wissenschafts- und Innovationshaus<br>(German Centre for Research and Innovation) |
| **EIT** | European Institute of Innovation and Technology |
| **EPC** | Export Promotion Council |
| **EPCG** | Export Promotion of Capital Goods |
| **ESDP** | Entrepreneurship and Skill Development Programme |
| **EU** | European Union |
| **EUR** | Euro |
| **FASIE** | Foundation for Assistance to Small Innovative Enterprises |
| **FICCI** | Federation of Indian Chambers of Commerce and Industry |

| Abbreviation | Full form |
|---|---|
| **GDP** | Gross Domestic Product |
| **GITA** | Global Innovation & Technology Alliance |
| **GIZ** | Deutsche Gesellschaft für Internationale Zusammenarbeit (German Agency for International Cooperation) |
| **HR** | Human Resources |
| **I4F** | India–Israel Industrial R&D and Technological Innovation Fund |
| **ICT** | Information and Communication Technology |
| **IGF** | Industrielle Gemeinschaftsforschung (Industrial Collective Research) |
| **IGSTC** | Indo-German Science and Technology Centre |
| **IIA** | Israel Innovation Authority |
| **IMF** | International Monetary Fund |
| **INR** | Indian Rupee |
| **IP** | Intellectual Property |
| **IPR** | Intellectual Property Rights |
| **IraSME** | International Research Activities by SMEs |
| **ITTP** | International Technology Transfer Programme |
| **KfW** | Kreditanstalt für Wiederaufbau (Credit Institution for Reconstruction) |
| **KMU** | Kleine und mittelständische Unternehmen (Small and Medium-sized Enterprises) |
| **LMCS** | Lean Manufacturing Competitiveness Scheme |
| **LOEWE** | Landes-Offensive zur Entwicklung Wissenschaftlich-ökonomischer Exzellenz (State Offensive for the Development of Scientific and Economic Excellence) |

| Abbreviation | Full form |
|---|---|
| **MDA** | Market Development Assistance |
| **MIIM** | Make in India Mittelstand |
| **ML** | Machine Learning |
| **MoMSME** | Ministry of Micro, Small & Medium Enterprises |
| **MSE** | Micro and Small Enterprise |
| **MSECDP** | Micro and Small Enterprises Cluster Development Programme |
| **MSI** | Medium-scale Industrial Units |
| **MSME** | Micro, Small and Medium Enterprise |
| **NMCP** | National Manufacturing Competitiveness Programme |
| **NRDC** | National Research Development Corporation |
| **OAV** | Ostasiatischer Verein<br>(German Asia-Pacific Business Association) |
| **OEM** | Original Equipment Manufacturer |
| **PMEGP** | Prime Minister's Employment Generation Programme |
| **PSL** | Priority Sector Lending |
| **R&D** | Research and Development |
| **RAMP** | Raising and Accelerating MSME Performance |
| **SBI** | State Bank of India |
| **SC** | Scheduled Castes |
| **SFURTI** | Scheme of Fund for Regeneration of Traditional Industries |

| Abbreviation | Full form |
|---|---|
| **SME** | Small and Medium-sized Enterprise |
| **SRI** | Self-Reliant India |
| **SSI** | Small-scale Industrial Units |
| **ST** | Scheduled Tribes |
| **TCSP** | Technology Centre Systems Programme |
| **TDC** | Technology Development Centre |
| **TRL** | Technology Readiness Level |
| **UNIDO** | United Nations Industrial Development Organization |
| **UPI** | Unified Payments Interface |
| **USD** | United States Dollar |
| **VDMA** | Verband Deutscher Maschinen- und Anlagenbau (German Engineering Federation) |
| **VR** | Virtual Reality |
| **ZED** | Zero Defect Zero Effect |
| **ZIM** | Zentrales Innovationsprogramm Mittelstand (Central Innovation Programme for SMEs) |



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