



Case study on the Mittelstand 4.0 Competence Centres, Germany

Contribution to the OECD TIP Digital and
Open Innovation project

Federal Ministry of Economic Affairs and Energy,
Germany

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1. The process of creation

1.1. What are the main factors and background conditions that motivated the creation of the Mittelstand 4.0 Competence Centres?

Big companies and start-ups in Germany are performing well: Germany is leading in Industry 4.0 applications and start-ups in new business models. However, existing SMEs (which account for around 99% of businesses in Germany and 48% of GDP) are not fully aware of the opportunities and new chances of the digital transformation of their business; many of them do not have a strategy and a lack of personal and financial resources. The gap between big companies/start-ups and SMEs is widening, and if German SMEs do not manage the digital transformation in the upcoming years, they risk losing their competitiveness.

In view of this, the Federal Ministry for Economic Affairs and Energy (BMWi) commissioned a study on the chances and implications of Industry 4.0 for small and medium sized businesses. In this study, executed by a consortium of three German research institutes, an action plan for industry and politics was drawn for a widespread adoption of Industry 4.0 in SME¹. The Mittelstand 4.0 Competence Centres is one of the initiatives under this action plan.

1.2. What stakeholders were involved in the creation of the Mittelstand 4.0 Competence Centre initiative?

The above-mentioned study included also consultation with stakeholders, especially of the private sector by interviews with individual SMEs as well as by evaluation workshops with around 40 participants.

Besides, there are institutional processes for consultations with the private sector. A relevant example is the annual National Digital Summit², where the needs of digital transformation are discussed permanently in working groups. The summit gathers high-level representatives from the government (ministers in charge), industry (mainly CEOs of digital companies), commerce, trade unions, academia and society. In the course of the National Digital Summit, current initiatives are presented to the audience and evaluated. As a result a declaration is released pointing out the main challenges for the future and steps to approach the problems.

1.3. Did the creation of the Mittelstand 4.0 Competence Centres involve co-ordination with other policy areas? What mechanisms facilitate such co-ordination?

The BMWi is responsible for the Mittelstand 4.0 Competence Centres as it is a measure for the economy (German fundamental law).

As it is always handled in such case, the leading department develops the main strategy and procedural guidelines and involves the relevant departments and other ministries (like

¹See: <http://www.bmwi.de/Redaktion/DE/Publikationen/Studien/erschliessen-der-potenziale-der-anwendung-von-industrie-4-0-im-mittelstand.html>

² See the Press release of the 2017 Digital Summit: <https://www.de.digital/DIGITAL/Redaktion/EN/Meldungen/2017/2017-06-13-zyppies-opens-2017-digital-summit.html>

research) by establishing discussion groups and expert meetings. Main documents are closely coordinated between all relevant actors before they are forwarded to the final decision maker. This is due to a federal law which outlines the mechanism and rules of behaviour in decision making processes.

2. Main features of the Mittelstand 4.0 Competence Centres

2.1. What is the mandate and the specific objectives of the Mittelstand 4.0 Competence Centres?

The “Mittelstand 4.0 – Digital Production and Work Processes” initiative aims to support small and medium-sized enterprises to become digitised, to network, and to start using Industry 4.0 applications.

The Mittelstand 4.0 Competence Centres is one of the initiatives under this action plan. The Mittelstand 4.0 Competence Centres are meant to be cross-sector and cross-thematic digitalization ecosystems supporting the knowledge and technology transfer to SMEs. By offering workshops, demonstration plants and networks with representatives of the complete value chain, SMEs are practically supported in developing their own Industry 4.0 solutions. Their work does not favour any particular provider, and is available free of charge. SMEs are free to go there directly and receive consultations and advice for free.

The Mittelstand 4.0 Competence Centres are founded by separate consortiums consisting of e.g. universities, Fraunhofer institutions and other external partner like chambers of commerce. Within these consortiums each partner takes over a specific role due to their specific competence (e.g. 3D printing, flexible manufacturing, new business models). All partners act together in order to promote the overarching topic of digital transformation.

Currently, there are 23 Mittelstand 4.0 Competence Centres. 17 Mittelstand 4.0 Competence Centres are spread over Germany. They offer support to SMEs regarding general issues and questions around digitalisation. Additionally, six Mittelstand 4.0 Competence Centres focus on specific sectors, such as IT, textile, eStandards or Usability, Crafts and smart building.

Lastly, key information is being provided for established transfer agencies and multipliers, both in the form of training sessions and written information material. There are four Mittelstand 4.0 agencies, each of which focuses on a specific issue of digitisation and eBusiness (see 2.5). These agencies pass on their expertise to Mittelstand 4.0 Competence Centres and use multipliers, such as business chambers, to share it with companies, i.e. the agencies are primarily addressing multipliers and not SMEs. The agencies also produce publications and run trainings and webinar sessions that address mainly existing multipliers. By addressing the multipliers, the initiative Mittelstand-Digital has a wider impact, providing knowledge transfer from the scientific community to the SME and motivation for successive steps in SME's digitization process.

2.2. What are specific targets of the Mittelstand 4.0 Competence Centres?

Mittelstand 4.0 Competence Centres help businesses to first gauge at what stage of digitalisation they are currently at, develop together with the company an individual digitalisation road map and assist it in the selection and implementation of suitable

measures. The Mittelstand 4.0 Competence Centres are also at hand to advise companies on whether a technical solution is economically viable and which security aspects must be considered.³

An important aspect of this initiative is its practical approach: The training and demonstration plants⁴ of the research and transfer partners of the Mittelstand 4.0 Competence Centres are modelled on real businesses. In these plants, entrepreneurs can see how digital technologies would change their business. They can also test out own technical solutions in the demo plants, for instance by testing a production control software before purchasing it for their own business.

In addition to general information on the topic of digitalisation, each Mittelstand 4.0 Competence Centre has its own focus area. The spectrum ranges from smart production, to new requirements relating to organisation of the workplace and IT security right through to legal matters. All Mittelstand 4.0 Competence Centres provide information on their topics of expertise on a national level with the help of information brochures, talks at trade shows and events, websites, webinars and training courses.

The Mittelstand 4.0 Competence Centres address various elements in the “enabling chain” for SMEs in digital transformation. The main targets are:

- to inform businesses about the possibilities and chances of digitisation,
- to demonstrate use cases,
- to show ways to qualify the employees,
- to support businesses to make a concept for digitisation,
- to show ways of implementation of digital technologies in their businesses.

2.3. What type of specific support schemes/activities do the Mittelstand 4.0 Competence Centres provide in order to reach the abovementioned objectives?

Support provided by the Mittelstand 4.0 Competence Centres to SMEs includes:

1. **Information, qualification and training about digital transformation:** The competence centres make information available to SMEs through various channels, including leaflets, brochures, and guides. They help and train them via online questionnaires for self-checks, workshops, talks, seminars, “office hours” for companies, road shows, online- and blended learning units, guided visits to best practice companies, etc. Within the consortia of the centres there are always partners like business chambers or business associations with close contact to SMEs. These partners are able to speak the language of small businesses and are direct information partners for SMEs.
2. **Test new solutions out in practice:** Many of the competence centres maintain demonstration plants where they show variants of new digital techniques in simulated production processes. These demonstration plants are mostly run by the

³See also: https://www.bmwi.de/Redaktion/EN/Publikationen/Mittelstand/mittelstand-digital.pdf?__blob=publicationFile&v=3.

⁴ The demonstration factories allow simulating business and production processes. They show digital technologies in a similar to real-world environment. Each factory is different.

research partners within the competence centre consortia, like universities or scientific institutions. This means, that they are not real plants rather than just a simulation of business and production processes. Their specific purpose can vary from Competence Centre to Competence Centre (e.g. 3D printing, sensors ...). They are brought to the SME in course of the consultation process.

A specific example of an activity that targets SMEs is the visit of experts from the Mittelstand 4.0 Competence Centre to interested companies who are looking for a first, concrete approach to digitization in their own company. Within this 2-3 hours visit, individual information for this company is given. The key questions which should be answered during this visit are: 1) What technologies and concepts are promising for my company? 2) What are the next steps on the way to digitization for my company? 3) Which offers of the competence centre help me along this way?

2.4. What are the main areas of action of Mittelstand 4.0 Competence Centres

The Mittelstand 4.0 Competence Centres provide SMEs with information and training about digitisation, and give them the opportunity to view and test new solutions out in practice across the different regions.

2.5. Are the activities of Mittelstand 4.0 Competence Centres focused on specific sectors or technologies? If so, which ones?

The Mittelstand 4.0 Competence Centres offer different emphases:

- The centre in Hanover is concerned with topics ranging from the digitisation of specific production and logistics processes to dealing with legal and economic issues through to Work 4.0. The centre hosts one general factory, nine expert factories and one mobile factory which bring state-of-the-art solutions directly to the companies.
- The centre in Darmstadt offers further training in order to help companies upgrade their knowledge on value creation processes, Work 4.0, IT security, new business models and energy management.
- The centre in Dortmund offers support to SMEs across three regional hubs that focus on new approaches to smart automation of products and production systems, helping SMEs to adopt autonomous and adaptable logistics systems and new solutions in the field of production technology.
- The centre in Kaiserslautern has a completely modulised, vendor-neutral Industry 4.0 plant which enables SMEs to gain access to realistic demonstration and test environments. By way of best-practice examples, SMEs are shown solutions for networking production processes, starting from engineering processes up to IT systems.
- The centre in Berlin provides guidance on the following four digital transformation processes: value creation processes 4.0, digital marketing, business models and human resources.
- The centre in Chemnitz offers a broad service portfolio of instruments for integrating Industrie 4.0 while taking account of legal aspects, particularly concerning SMEs.

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- The centre in Ilmenau offers five “model plants” especially for small enterprises. It focuses on new production value chains and business models as well as on Industrie 4.0 and 3 D printing.
 - The centre in Hamburg places a special focus on logistics in terms of conducting a comprehensive supply chain analysis. Other important cross-cutting topics are the development of new business models and catering to the needs of employees facing the difficult challenges related to technological change.
 - The centre in Augsburg provides technological solutions in the field of automation solutions, and software and assistance systems. Furthermore, the centre addresses questions concerning cross-cutting topics such as human resources, organisation, as well as technology and business models. It offers an Industrie 4.0 academy and a mobile lab.
 - The centre in Stuttgart presents digitisation solutions in the areas of smart mobility, smart production, smart building and smart health.
 - The centre in Magdeburg is a contact point for the issues of digital business models, networking and standardisation, safety and security, and user-friendliness and public acceptance.
 - The centre in Saarbrücken offers specialised expertise in the following fields: digital business models, networking of production, human-technology interaction, assembly and servitisation.
 - The centre in Lingen concentrates on helping SMEs in the maritime sector adapt to the future and gives support to the development of data-driven business models.
 - Using the slogan “Skilled work in the digital transformation”, the centre in Siegen mainly helps SMEs to cope with the socio-technical challenges of digitisation.
 - The centre in Rostock offers special help with the development of innovative solutions for the digitisation and networking of SMEs in the fields of tourism, healthcare and medical technology.
 - The Centre for the Digital Skilled Crafts with its five locations in Bayreuth, Dresden, Oldenburg, Krefeld and Koblenz uses showcases in order to raise awareness of digitisation for companies in the craft sector.

Furthermore, the Mittelstand 4.0 agencies also focus on different issues and businesses. For example:

- The agency for the Cloud provides support on the application and growing use of cloud based provision of services.
- The agency for Processes offers help with the use of digital process and resource management.
- The agency for Communication supports innovation management and helps raise the use of digital communication processes.
- The agency for Trade is there to answer questions on new technologies in digital trade, such as eBilling, and on production-related trade.

2.6. Are there mechanisms in place to ensure interdisciplinary approaches to research and innovation?

The main objective of Mittelstand-Digital Initiative and within it the Mittelstand 4.0 Competence Centres is not to do research and innovation but to transfer knowledge on innovations to small and medium enterprises. The Mittelstand 4.0 Competence Centres have access to the latest innovations on the one hand and know-how to address the special needs of SME on the other hand. Each consortium includes research institutions (such as universities and Fraunhofer institutions) and transfer partners (such as chambers of commerce and industry as well as chambers of trade) who are familiar with the special needs of SMEs. This ensures an appropriate mix between frontier research and technology transfer expertise.

In addition to the interdisciplinary structure, the so-called accompanying research ('Begleitforschung') leverages the knowledge, know-how and best practice experiences for the entire Mittelstand-Digital Initiative. Tasks performed by the accompanying research are primarily (1) monitoring of current global digital transformation trends and activities and research within the Mittelstand-Digital Initiative, (2) provide support related to evaluation and development of best-practice related to the activities performed within Mittelstand-Digital, (3) transfer of knowledge through publications and communications within Mittelstand-Digital and (4) coordination of the Mittelstand-Digital network.

- **What is the annual budget allocated to the Mittelstand 4.0 Competence Centres? What are the sources of funding? Please describe its funding model.**

The annual budget amount is about EUR 36 million p. a. (between EUR 1.5 and 2 million per Competence Centre). The source of funding is the federal budget (100%). The funding concerns only the cost of staff and does neither include the cost of infrastructure nor the test environment. The idea is to provide SMEs with neutral, cost-free information and qualification.

3. The Mittelstand 4.0 Competence Centres in practice

3.1. How are the Mittelstand 4.0 Competence Centres structured? How do they operate in order to achieve their objectives?

The projects within Mittelstand-Digital are completely funded by the BMWi. The BMWi issues an invitation to tender to which project consortia can apply. The project consortium describes in detail their action plan to achieve the objectives of the tender. Although the Mittelstand 4.0 Competence Centres are funded by BMWi, a separate project management agency oversees all Mittelstand 4.0 Competence Centres. During the project time, the Mittelstand 4.0 Competence Centres are obliged to constantly report to the project management.

The project performance is regularly assessed by the project management and the initial action plan is constantly adapted in regards to demands and the impacted of the services so far offered.

Additionally the projects are requested to analyse the digital maturity of their SME target groups at the start of their project. They carry out a permanent self-evaluation with the aim to adjust their operations early.

Lastly, as described above, the accompanying research evaluates the projects and gives constantly feed-back in order to optimise the project.

3.2. Regarding the geographical location of Competence Centres: what are the criteria for the establishment of centres across the territory? Does the creation of regional centres follow a top-down approach or bottom-up approach?

There are currently 17 regional Mittelstand 4.0 Competence Centres, 1 Mittelstand 4.0 Competence Centre for crafts, 5 thematic Mittelstand 4.0 Competence Centres (see 2.5).

The idea of regional Mittelstand 4.0 Competence Centres was supported by the federal states and is based on the idea that SMEs should have short ways and specific/thematic offers.

The BMWi invited to two public tenders. The 23 consortium partners were chosen amongst 75 offers. The Mittelstand 4.0 Competence Centres were selected with respect to the overall performance of the consortium, regarding reachability by SMEs and thematic scope and excellence. The partners found themselves independently and applied as a consortium to the tender.

3.3. To what extent do the Mittelstand 4.0 Competence Centres collaborate with other actors to provide support to SMEs?

All Mittelstand 4.0 Agencies and Mittelstand 4.0 Competence Centres have universities or research institutions like Fraunhofer institution within their consortium. Their role, i.e. consortia leader or contributor, depends on the structure of each consortium (please see above).

Companies are contributing to Mittelstand 4.0 Competence Centres via implementation projects. The experts from the Mittelstand 4.0 Competence Centres help individual companies and the companies agree that their case will be published as a Best-Practice example for other companies.

3.4. What challenges have been faced during the process of design and/or implementation of the Mittelstand 4.0 Competence Centres (if any) and how are these being (or planning to be) addressed?

One of the inherent challenges of the Mittelstand-Digital Initiative is to transfer the knowledge from cutting edge research to practitioners in SMEs. Therefore, the academic staff of the research institutions and the staff of multipliers that are part of the consortiums of Mittelstand 4.0 Competence Centers must be familiarised with the adequate language and transfer media for small businesses and skilled crafts. This challenge is mainly addressed by train-the-trainer workshops offered by the Mittelstand 4.0 Agency for Communication as well as the accompanying research and a strict quality proof of the published media by the project management agency (see section 3.1).

Another key challenge the Mittelstand 4.0 Competence Centres face is attracting staff specialized in digitalisation topics, due to the high demand of private companies.

3.5. Are other policy initiatives (also in other policy areas) in line with the objectives of the Mittelstand 4.0 Competence Centres? In what ways do they reinforce each other?

There are other initiatives in place to support SMEs in their individual steps and projects towards digital transformation (e.g. providing advice and coaching, financing investments). In particular, a new initiative named ‘Go Digital’⁵ started recently to provide professional counselling to individual SMEs on specific digital issues, such as IT security, new business models and exploring new digital markets. This new initiative is complementary to the work of the Mittelstand 4.0 Competence Centres, which only give general advice to SMEs. If SMEs need individual advice they have the possibility to address to authorized counsellors who are specialised in counselling on digital issues. The costs are subsidised by 50%. The budget for this initiative is EUR 10 million per year. At the federal level, many states have networks of Digital Hubs that are focusing on start-ups and regional ecosystems.

In order to strengthen programmes already in place, a new Digitalisation Campaign for SMEs (Digitalisierungsoffensive Mittelstand) will offer specific incentives to SMEs for investing in digital transformation. The central aspect of the digitalisation campaign for SMEs is a Digital Investment programme for SMEs (Digitales Investitionsprogramm Mittelstand) with a volume of EUR 1 billion available until 2018. Overall, the campaign will include the following elements:

- A user-friendly portal on digitalisation to improve the visibility of available funding programmes and for reaching out to a broader range of prospective recipients.
- Assistance provided will include analysis and consulting, personnel and organisational development activities, development of target-group-specific technologies, and investment grants for spurring investments and IT implementation projects at SMEs, including assistance in the implementation process.
- These measures should at the same time contribute to developing new internet-based platforms and business models.
- In addition, funding and assistance should also be provided for strengthening the digital connectivity of German SMEs in Europe by creating European and international networks as part of digital transformation.
- Expand and intensify consultation services with Digitalisation Guides (Digitalisierungslotsen) to give SMEs access to broad knowledge of ICT solutions.
- Develop new initiatives and funding programmes for non-technical innovations because they are also important drivers of new digital business models.
- Set up of a Digitalisation House (Haus der Digitalisierung) in Berlin for SMEs with a national and European outreach – as a meeting point and showroom for the possibilities and feasibility of such projects, with rotating presentations and exhibits.

⁵ For more information, see (only in German):

<https://www.bmwi.de/Redaktion/DE/Artikel/Digitale-Welt/foerderprogramm-go-digital.html>

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- Strengthen the digitalisation process by matching established companies with start-ups and research organisations and with best-practice examples (businesses learning from each other).
 - Set up an SME Digitalisation Task Force and a one-stop agency. This task force is intended to coordinate the various activities and assist the BMWi in iterative development of the initiatives. This also comprises sponsoring the creation and operation of a central office that assists the task force as a type of one-stop agency.

4. Governance

4.1. What is the governance of the centres?

As described above, the Mittelstand 4.0 Competence Centres are founded and run by individual consortia. All Mittelstand 4.0 Competence Centres are supervised by a project management who himself is accountable to the BMWi. The central project management agency, together with the accompanying research, take care of mobilizing network synergies and compliance with common service standards. Each centre has internal evaluation procedures. Additionally, many Mittelstand 4.0 Competence Centres have established governing boards with stakeholders (mostly business associations).

5. International dimension

5.1. Does the Mittelstand 4.0 Competence Centres have an international dimension?

The primary aim of Mittelstand-Digital is to transfer knowledge to SMEs in Germany. SMEs from other EU member states are also allowed to address to the Mittelstand 4.0 Competence Centres.

Nevertheless, the Mittelstand-Digital initiative attracts (political) attention from many countries even outside the EU (i.e. Japan, China or Norway). Experts from other countries use the possibility to visit the Mittelstand 4.0 Competence Centres and to exchange best-practice examples. Cross- country collaborations are currently in discussion.

For example, Mittelstand 4.0 Competence Centres will be represented on the Hannover Fair. On this occasion, representatives of other countries are going to visit the fair and have an exchange with the Mittelstand 4.0 Competence Centres regarding the experiences made.

5.2. In what ways did experiences from other countries inform the development of the Mittelstand 4.0 Competence Centres? Have these Competence Centres motivated the implementation of similar centres in other countries?

We have information about examples in other countries like the Netherlands, Italy or Sweden, but their approach differs from ours. We are in continuous exchange with the European Commission who is observing the process very closely.

The EU has its own agenda on Digital Innovation Hubs (i.e. a network of competence centres within regional ecosystems that aim at stimulating transnational exchanges between hubs on the basis of demand and supply of services).

6. Impact

6.1. Has the Competence Centres' impact already been evaluated? If so, what have been the outcomes? If not, how and when are impacts planned to be evaluated?

Each Mittelstand 4.0 Competence Centre is being visited once to twice per year by representatives of the BMWi, the project management and the accompanying research for a workshop on the project status. On these meetings comparisons between targets and actual performance is been made.

With respect to the output and outcomes of the initiative, an annual evaluation is conducted by accompanying research, based on a survey amongst the Mittelstand 4.0 Competence Centres and Agencies. This evaluation comprises amongst other things the quantity of events, workshops and trainings, the number of SMEs assisted, the main topics covered as well as feedback from SMEs.

A more general assessment of the impact of the Mittelstand-Digital Initiative is much more challenging. The digital transformation of enterprises and their production and service processes is an ongoing megatrend which is expected to dominate the business headlines for the coming years. Besides Mittelstand-Digital, other institutions like business associations, chambers of commerce, software suppliers, the Plattform Industrie 4.0, etc. are informing companies on the chances and possibilities of digital innovations. Therefore, it will be challenging to solely measure the impact of the Mittelstand-Digital Initiative on businesses digitisation investments and to distinguish impacts from those of other initiatives and actions initiated by other institutions.