



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



EMPOWERING DIGITAL TRANSFORMATION IN SMALL ENTERPRISES THROUGH NATIONAL POLICIES: AN INTERNATIONAL BENCHMARKING

2023





NEO-UFRGS

This study was led by the Organizational Engineering Group (NEO-UFRGS). NEO-UFRGS is a research group formed by professors and researchers from the Graduate Program in Production Engineering (PPGEP) at the Federal University of Rio Grande do Sul (UFRGS). NEO-UFRGS combines production engineering tools with strategic and organizational management approaches to understand organizational problems and develop practical solutions for companies and policy makers.

NEO-UFRGS's mission is to develop relevant solutions for the business environment based on advancing scientific knowledge about organizational engineering and operations management.

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UNIDO's vision is a world without poverty and hunger, where industry drives low-emission economies, improves living standards, and preserves the livable environment for present and future generations, leaving no one behind.

SEBRAE

This study was commissioned by the Brazilian Micro and Small Business Support Service (SEBRAE). SEBRAE is a non-profit private entity that aims to promote sustainable and competitive development for small businesses.

SEBRAE's purpose is to transform small businesses into protagonists of sustainable development in Brazil.

SEBRAE's vision is to be a reference in promoting entrepreneurship and generating value for small businesses.



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SEBRAE is developing an initiative named “**Industry Hub**”. The objective of this hub is to support the revitalization of the value chain of strategic industrial sectors, aggregating and disseminating information, solutions, content, and best practices related to industrial themes, such as Industry 4.0 and digital technologies (IoT, big data, AI). SEBRAE and NEO-UFRGS are collaborating on a project to support the mission of the SEBRAE Industry Hub, specifically focusing on the strategic pillar of Smart Industry. The project aims to critically analyze the role of the SEBRAE Industry Hub in promoting Smart Industry among small companies in Brazil. Additionally, the project will involve the development of studies and materials to facilitate the dissemination of Smart Industry concepts and practices to small companies.

To establish the work plan, the initial step involves conducting a comprehensive investigation into

the key initiatives undertaken by various entities and governments worldwide to implement digital technologies in small firms. The present document represents the outcome of this study, which was jointly conducted by NEO-UFRGS and SEBRAE in collaboration with the Division of Digital Transformation and artificial intelligence Strategies at the Directorate of Sustainable Technical Cooperation (TCS) at UNIDO. Note that this assessment is not exclusive of numerous existing initiatives that may be implemented by regional and local governments. Different ministries, other than industry, also have programmes for small firms with a different focus. And finally, private sector and chamber of commerce also have a myriad of programmes to support small companies. Consider this study an evolving material to contribute to the understanding of the digital transformation in the countries covered.



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Forewords by

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In today's rapidly evolving global landscape, the digital transformation driven by emerging technologies has brought forth unprecedented opportunities and challenges for economies around the world. As we stand at the threshold of this technological revolution, it is imperative to recognize the pivotal role that Small and Medium Enterprises (SME) play in shaping the future of industries. It is with great pleasure that I introduce this comprehensive report, which delves into the digitalization within the SME sector in economies including Argentina, Brazil, China, Columbia, Germany, India, Mexico, Russia, South Africa, Tunisia, as well as the European Union.

SME are lifeblood of economies, contributing significantly to employment, innovation, and economic growth. In the BRICS countries, SME have proven to be engines of transformation harnessing the power of digital technologies to enhance their competitiveness and sustainability. This report examines how initiatives these economies employ can help accelerating digitalization in SME, thus propelling them towards a new era of economic prosperity.

The insights gleaned from this report underscore the transformative potential of digitalization in SME. We witness compelling examples of how advanced technologies are streamlining processes, optimizing supply chains, and enabling targeted marketing strategies. Moreover, the utilization of digital technology is empowering SME with data-driven decision-making capabilities, enhancing their ability to innovate and scale their businesses.

However, while the prospects are remarkable, challenges persist. It is vital to acknowledge that not all SME are well equipped to embark on this digital journey. Disparities in digital awareness, technological readiness, access to resources, and digital skills would widen divides, exacerbating existing inequalities. This report serves as a clarion call to policymakers, industry leaders, and stakeholders to collaborate in fostering an inclusive environment that ensures equitable access to digital resources, empowering SME to benefit from digitalization.

I appreciate the support from the Brazilian Micro and Small Business Support Service- SEBRAE, our associates in Brazil at Universidade Federal do Rio Grande do Sul (UFRGS), and the efforts made by the researchers who have meticulously crafted this report, which has aimed to share insights with policymakers from various countries to foster effective strategies for digital transformation in SME on a global scale. Together, let us forge ahead, harnessing the boundless potential of digitalization to build more inclusive, resilient, and prosperous economies for all.

Small businesses usually require specialist help to grow and succeed. The fact that they account for almost 99% of all companies in Brazil gives us a broad view of the challenge we face. At SEBRAE, the Brazilian Micro and Small Business Support Service, we assist with their development in typical ways (regarding management issues), but also in more disruptive directions. Recently, when supporting small manufacturing companies, we have tried to focus on introducing advanced technology. This is one of many aspects of the enormous task of enhancing the productivity of Brazilian small businesses.

While Industry 4.0 has immense potential, it is crucial to acknowledge that it is more commonly adopted by larger organizations with significant resources. Small businesses, on the other hand, usually face other issues: limited budgets, limited access to advanced technologies and a lack of awareness about the benefits of Industry 4.0. Despite these, small businesses in Brazil have displayed remarkable resilience and adaptability, and have taken significant strides towards embracing this transformative wave.

Furthermore, this report emphasizes the importance of industry stakeholders collaborating and sharing knowledge. We have illustrated the collective effort behind the growth of Industry 4.0 in Brazil's small business sector, by showcasing partnerships between small businesses, technology providers, government agencies, and academia. We have also examined the role of

supporting policies, funding initiatives, and skill development programs in nurturing a conducive environment for digital transformation.

Moreover, this benchmark study helps planners and small businesses in two important ways. The first is that it showcases the best practices in not only countries with a comparable level of development as Brazil, but also in developed economies. This gives us the good examples we need to offer better solutions to our clients, based on what is already producing strong results elsewhere in the world. The second main goal of this report is to show that, in fact, we already have good solutions and a thriving environment that helps small businesses be innovative in Brazil. From this point forward, it is our responsibility to advise them on how to achieve international competitiveness.

Small businesses can survive and thrive in the rapidly changing landscape of the Fourth Industrial Revolution, by adopting innovative technologies, fostering collaboration, and investing in skills development. A sustainable future is only possible if our business can work smarter.

Together, we can create a vibrant environment where small businesses can flourish in the Industry 4.0 era.

Forewords by

Luiz Carlos Bohn

*President of the State
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EXECUTIVE SUMMARY

This document provides a summary of benchmarking findings, focusing on policies and initiatives for the digitalization of small companies in regions such as the BRICS countries, Tunisia, Germany, the European Union, Argentina, Mexico, and Colombia.

Following the description of each country's initiatives, the Diffusion of Innovation theory was applied as a theoretical framework to categorize them. A total of 39 initiatives were classified into



AWARENESS

It refers to how small firms become aware of the existence and potential benefits of digital technologies.



IMPLEMENTATION

It refers to how small firms adopt digital technologies.



MAINTENANCE

It refers to how small firms sustain the use of digital technologies over time.

the stages of innovation diffusion: **Awareness (A), Implementation (I), and Maintenance (M)**. This classification offers valuable insights into the adoption and sustainability of these initiatives within their specific contexts.

The benchmarking results show that most digitization initiatives for small firms worldwide are still in the early stages of the diffusion of innovation process, which comprehends the **awareness** stage. These initiatives encompass various activities such as: providing training programs to enhance digital skills and knowledge, offering workforce qualification programs tailored for working with technologies, delivering consulting services, organizing events to facilitate knowledge sharing and business skills development, establishing dialogue platforms that connect SME with digital service providers, and providing access to pertinent information related to Industry 4.0.

Furthermore, several countries have initiatives to leverage and foster the **implementation** of digital technologies by small firms. These initiatives play a crucial role in providing valuable assistance to small businesses by offering various support mechanisms, such as:

Providing subsidies to help small firms acquire and implement technologies without the need for repayment.

Offering access to financing options with subsidized fees, making it more affordable for small businesses to invest in digital technologies.

Provide consultancy and training services on a free or subsidized basis and to facilitate the implementation process, usually through Institutes of Science and Technology or associated institutions.

Offering promotional and facilitated values for small companies to invest in technology.

With the exception of two initiatives in Brazil, it was observed that there is a lack of initiatives focused on the **maintenance** of digital technologies within small companies. These results can be attributed to the current stage of maturity of small companies in digital transformation. These companies are still learning about the technology and its benefits, so most initiatives focus on awareness. Initiatives focused on implementation often rely on funding as a means to overcome the barrier faced by decision-makers in small firms. Although digital technologies may not be inherently expensive, subsidies and funding provide the necessary support to facilitate initial implementation. The goal is to create a critical mass of early adopters, which can then inspire other firms to follow suit without the need for government funding. By demonstrating the benefits and success of digital

technologies, it is expected that a self-sustaining momentum will be created, driving wider adoption among small businesses.

To conclude, to ensure that small businesses make the most of these technologies, initiatives must cater to the three stages of innovation: diffusion-awareness, implementation, and maintenance. In this way, initiatives that seek to develop small companies in their digitization process must follow their path from beginning to end (from awareness to maintenance). For this to happen, the same initiatives can be divided into three stages, where each stage develops a part of the innovation diffusion process. Through this strategy, it is possible to structure the development of small companies towards digitalization and make room for companies in different stages of maturity to benefit from the initiative. In addition, there must be a reference location for the initiatives that contemplate the three development stages, such as centers of excellence or hubs. Partnerships are also important for building an initiative encompassing the three stages, such as universities, consultancies, and technology providers.



1. INTRODUCTION

In this study, Brazil's SEBRAE and UNIDO's Division of Digital Transformation and AI Strategies have collaborated to understand how policymakers worldwide are advancing the digital transformation of small and medium-sized enterprises (SMEs). Digitalization and AI are identified as crucial for enabling SMEs to leapfrog to greater productivity and sustainability, especially in developing countries.

This research underscores global strategies promoting the adoption of digital tools and AI by SMEs in the industrial transformation sector. The Organizational Engineering Group (NEO-UFRGS) of Brazil spearheaded this benchmarking research answering to a demand of SEBRAE. The study centers on economies within the BRICS (Brazil, Russia, India, China, and South Africa) and extends to Tunisia, Germany, the European Union, Argentina, Mexico, and Colombia. While the characteristics of SMEs vary across countries, most face challenges in integrating digital tools and AI into their operations. Despite SMEs being economic growth pillars in many nations, they encounter significant obstacles in embracing digitalization, primarily due to limited financial and human resources. Consequently, public policies play a pivotal role in facilitating the adoption of digital technologies within SMEs.

Furthermore, this research illuminates how public initiatives should be structured to encompass the various stages SMEs undergo to fully harness digital technologies. Drawing from the theory of innovation diffusion, this study categorizes global initiatives into three stages: awareness, implementation, and maintenance. Initially, public policies should concentrate on enlightening SME leaders about the potential benefits of digital technologies and AI. Subsequently, these policies should aid SMEs in implementing these technologies, assisting them in surmounting financial and infrastructural challenges. Lastly, policymakers must ensure that SMEs are effectively utilizing

these technologies and assess the benefits, promoting broader awareness among firms.

This study is anticipated to serve as a valuable reference and inspiration for policymakers worldwide, guiding the optimal allocation of public resources to bolster SMEs in their journey towards a competitive edge through digital transformation and AI.



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2. METHODOLOGY

As outlined earlier, the central focus of this report is to showcase the most effective initiatives implemented by various entities and governments worldwide to drive the advancement of Industry 4.0, digital transformation, and AI applications in small companies. To accomplish this, the study

The selection of countries for analysis was based on two criteria: similarity to Brazil's characteristics and being considered a reference in Industry 4.0. The chosen countries include: (i) BRICS countries because of their significance as emerging economies and their shared characteristics in terms

After the definition of the countries, a keyword research approach was employed, utilizing relevant terms such as "small companies," "digitization," "Industry 4.0," "digital transformation," country names, and related acronyms. This targeted search approach ensured alignment with the specific theme and language of each country. To ensure the accuracy and completeness of the collected information, a team of five researchers from the NEO-UFRGS team organized the data in a spreadsheet format. Presentation pitches were conducted to review and validate the collected information, as well as identify any areas for improvement. To further expand the search and include additional sources, a list of major government organizations provided by UNIDO was utilized. This comprehensive methodology helped gather a wide range of information on practices and initiatives from various countries, enabling a comprehensive analysis of the global landscape for supporting small business digital transformation.

data. The main objective of these interviews was to validate the previously identified initiatives from the initial desktop research phase, particularly in cases where obtaining comprehensive information was difficult. In instances where scheduling interviews with experts was not possible, written documents based on the desktop research were shared with them for validation. This approach allowed for gathering feedback and ensuring the accuracy and reliability of the collected information.

The interviewees in this study were experts from the analyzed countries who possessed extensive knowledge of the subject matter and could provide valuable insights. To identify suitable contacts for gathering information, we sought assistance from the UNIDO representative, who helped connect our team with relevant country representatives. The interviews were conducted virtually, taking into consideration the availability of the interviewees. Prior to the interviews, a predetermined set of questions was prepared to further explore the initiatives identified during the desktop research and uncover any additional initiatives that may not have been captured through that method. A scripted set of questions was utilized during the interviews to ensure systematic collection of all pertinent information.



Figure 1 – Study steps

methodology followed three primary steps, as depicted in Figure 1. The specific procedures carried out within each step will be elaborated on in the subsequent sections.

2.1 DESKTOP RESEARCH

In the case of our study, we mainly used government websites related to the research topic since we were looking for widely disseminated initiatives with credibility and reliability.

of economic development.; (ii) Germany, as the birthplace of the Industry 4.0 concept, is recognized as a key reference in this field; (iii) European Union initiatives, since the EU's support for small companies aligns with Brazil's approach, making it a relevant comparison; (iv) the main economies in Latin America due to the geographical proximity and similarities in supporting small companies make them relevant for analysis; (v) and Tunisia, based on recommendations from interviewees who highlighted the country's noteworthy initiatives in promoting digital transformation among small businesses.

2.2 INTERVIEWS AND LITERATURE VALIDATION

Into as the second step in the benchmarking research, interviews were conducted to collect

2.3 CLASSIFICATION OF INITIATIVES

The **Diffusion of Innovation theoretical framework**¹ was employed to classify the initiatives in each country, taking into account their specific characteristics. This classification focuses on three crucial elements of innovation diffusion: Awareness, Implementation, and Maintenance. **Awareness** pertains to how small firms become aware of the existence and potential benefits of digital technologies. **Implementation** refers to how small firms adopt these technologies. **Maintenance** relates to how small firms sustain the utilization of digital technologies over time.

The classification framework used in this study provided a structured approach for analyzing and interpreting the initiatives, enabling a comprehensive understanding of the diffusion of digital innovations among small firms. The process involved researchers from the NEO-UFRGS team assigning classifications to the initiatives, which were then reviewed and finalized during a validation phase. This rigorous process ensured a comprehensive understanding of the development context of digitalization in small companies across the analyzed countries.

¹ Rogers, E. M., Singhal, A., & Quinlan, M. M. (2019). *Diffusion of innovations. In An Integrated Approach to Communication Theory and Research, Third Edition (5th ed., pp. 415–433)*. <https://doi.org/10.4324/9780203710753-35>





3 FINDINGS

The evaluation of practices and initiatives adopted by small companies in the context of Industry 4.0 encompassed benchmarking activities in several economies, including BRICS members, the European Union, Germany, Tunisia, Colombia, Mexico, and Argentina. The findings from this benchmarking analysis are highly valuable as they offer valuable insights into effective practices and initiatives that can enhance the competitiveness of small firms and capitalize on the opportunities presented by digitalization and AI. These results can also contribute to the formulation of public policies and programs aimed at fostering innovation and modernization among small businesses.



3.1 BRICS

3.1.1 BRAZIL



The **Sebraetec**² is an innovation consultancy that offers micro and small entrepreneurs personalized service, market specialists, and differentiated technologies and services. The solutions help micro and small companies innovate and do their activities better while spending less. For this, the initiative covers between 60% and 100% of the consulting fee (depending on the state and the type of services contracted). Sebraetec has a network of technology service providers to carry out the services, promotes access to innovative solutions, and monitors all stages to ensure the best results. Among the areas covered by the services are: design, production and quality, technological development, and sustainability.

Among the categories aimed at implementing Industry 4.0 technologies in small manufacturing companies is Process Improvement, which has an initiative focused on **Process Optimization with Connectivity (IoT, Internet of Things)**³. The objective of this initiative is to carry out, based on intelligent sensing, the supervision of the company's machines and equipment with the capacity to generate alerts, alarms, reports, and history of the production process, making it possible to monitor in real-time the quality, production, management of equipment failures and availability. The solution works in parallel and independently of the supervised production system, working in a versatile way in different environments. In this way, the consultancy helps small companies to define, install and configure IoT devices (hardware and software solutions) according to the needs identified in each process. The service includes the installation of one Logic Controller, up to five digital sensors, an electrical panel, and inputs (wires, terminals, connections). For the solution to be implemented, the small entrepreneur must pay up to BRL 6,000.00.

The consulting work is carried out in four stages: alignment of the proposal, mapping, and setup of the production process, installation and configuration for data collection and connectivity, and implementation of tools and IoT technology.

Step 1 - Alignment of the proposal: holding an opening meeting to level the scope of work and validate the service execution plan. Rationale, presentation, and demonstration of enabling technologies for supervision of machines and equipment based on Internet of Things (IoT) competence. Visit “ground zero” to validate the process in which the solution will be applied.

Step 2 - Mapping and setup of the production process: performed remotely to diagnose the company and its process to analyze a pilot solution for connectivity.

Step 3 - Installation and configuration for data collection and connectivity: commissioning of the device to acquire data via sensing, the organization, and definition of the installation and configuration of devices for data collection and connectivity, the configuration of the IoT devices (hardware) according to the company's process, the parameterization of the data and the implementation of the supervisory system with its functionalities of visualization and generation of alerts, alarms, reports, and histories.

Step 4 - Implementation of IoT tools and technology: data analysis and validation remotely to support actions to implement the continuous improvement process in the production area, monitoring the supervisory system solution, and collective demonstration of benefits.

² <https://sebrae.com.br/sites/PortalSebrae/sebraetec#texto2>

³ https://sebraetec.com/produto/conectividade_iot/



The **Alavanca Digital**⁴ initiative aims to subsidize the contracting of specialized technical services to support the digital journey of micro and small companies through acculturation and the funding of specialized technological services. Benefits are offered especially to micro and small companies located in the State of Rio Grande do Sul, carried out in conjunction with Companies Providing Specialized Services (EPSE) and/or Scientific and Technological Institutions (ICTs) from the development and/or implementation of technological tools for the digital transformation of products, processes and/or services. To participate, entrepreneurs must submit a proposal aimed at the effective development and/or implementation of technological tools for the digital transformation of products, processes and/or services. Proposals will receive non-refundable grant resources through a technological bonus, which is the object of the Innovation Law (Decree No. 9,283/2018) and is part of a set of government policy mechanisms to promote the competitiveness of national companies. The technological bonus will bring the small business closer to the public or private ICT service provider and make the provision of technological development services feasible.

The call for micro and small industries involves requesting resources for a minimum of BRL 30,000.00 (thirty thousand reais) and a maximum of BRL 100,000.00 (one hundred thousand reais) per proposal. The available resources for this modality come from the SEBRAE/RS budget and are released according to budgetary and financial availability of up to BRL 1,000,000.00 (one million reais). The technical participation and the contribution of resources from the beneficiary companies in the project to be developed are mandatory. Therefore, the presentation of 10% (ten percent) of financial contribution on the amount to be granted will be required.



The **Polo Sebrae de Indústria**⁵ seeks to qualify entrepreneurs on several fronts, working on three strategic pillars – ESG, Competitiveness, and Intelligent Industry. The initiative especially seeks to bring information, content, and solutions that are relevant for decision-making by entrepreneurs in matters such as product differentiation, improvement of production processes, access to technology and management tools, development of business internationalization, and assistance in the search for investment and financing alternatives.

Among the initiatives of the Polo Sebrae de Indústria aimed at the implementation of Industry 4.0 technologies in micro and small companies is the project in partnership with the Organizational Engineering Group of the Federal University of Rio Grande do Sul (NEO-UFRGS) linked to pillar Smart Industry. This project focuses on developing materials and studies to support the mission of the Polo Sebrae de Indústria, particularly in the area of Smart Industry. The project is divided into two main components: “Positioning” and “Dissemination”. The “Positioning” component involves critically analyzing the role that the Polo Sebrae de Indústria needs to play in promoting smart industry among small companies in Brazil. This includes conducting pilot implementation projects and creating a work plan specifically for the Polo Sebrae de Indústria in the context of the Smart Industry pillar. The “Dissemination” component aims to create materials for promoting and disseminating the concept of smart industry among small companies. This includes preparing white papers and videos that highlight technological solutions tailored to the challenges faced by micro and small businesses. The materials will also showcase the evolution and outcomes of the pilot projects implemented.

⁵ <https://digital.sebraers.com.br/blog/empreendedorismo/polo-sebrae-de-industria-mapeia-desafios-e-oportunidades-no-rs/>



The **Brasil Mais Produtivo**⁶ program is a federal government initiative that aims to increase the productivity and competitiveness of micro, small and medium-sized enterprises through the adoption of management improvements and digital solutions of rapid implementation, low cost and high impact, and to foster the development of new technologies aimed at this public. The program is coordinated by the Ministry of Development, Industry, Commerce and Services (MDIC) and carried out in partnership with the Brazilian Agency for Industrial Development (ABDI), the National Service for Industrial Learning (SENAI), the Brazilian Support Service for Micro and Small Enterprises (Sebrae) and the National Bank for Economic and Social Development (BNDES).

The Brasil Mais Produtivo program provides three service modalities: Productivity, Digital Transformation, and Smart Factory. SENAI (National Service for Industrial Apprenticeship) offers assistance in the productivity domain, utilizing a consulting methodology that focuses on enhancing industrial productivity through the application of lean manufacturing tools. This service has consistently achieved impressive results, with an average productivity increase of over 40%. Additionally, SENAI provides digital transformation services that aim to drive clear and measurable objectives. These services recommend and implement technologies tailored to the specific needs and digital maturity of each company. The objective is to enhance operational efficiency, streamline processes, improve product/service quality, reduce costs, and achieve other desired outcomes associated with digitalization.

Through the Brasil Mais Produtivo program, SENAI empowers companies to optimize their productivity and embrace digital transformation, enabling them to thrive in the evolving industrial landscape. In the Smart Factory modality, the focus is on developing and adopting 4.0 solutions. The objective is to support the development of

⁶ <https://brasilmaisprodutivo.mdic.gov.br/>

new products that solve classic problems faced by various industrial sectors and accelerate the adoption of Industry 4.0 enabling technologies by SME. For this, SENAI intends to support at least 60 Research, Development, and Innovation (RD&I) projects, with subsequent validation in at least 1,200 pilot clients, which will reduce the cost of acquiring these technologies. In this sense, the target audience comprises companies providing technology 4.0 in partnership with the SENAI Institutes to construct technological solutions aimed at their application in SME.

Available financial resources total BRL 28 million distributed among the projects, with BRL 7 million per cycle (total of 4 cycles). The maximum value of the project is conditioned to the minimum number of applications in SME, being BRL 800 thousand for applications in 20 or more SME, BRL 600 thousand for applications between 15 and 19 SME, BRL 400 thousand for applications between 10 and 14 SME and BRL 200,000 for investments between 5 and 9 SME. The project's duration is 12 months and may be extended for another six months, and the SME counterpart must correspond to at least 30%, up to 20% Economic and at least 10% Financial.

⁴ <https://www.worldlabs.org/opportunity/alavanca-digital-2023>

3.1.2 RUSSIA



- » Educational services.
- » Export delivery assistance.
- » Analysis and research.



Russian Export Center (REC)⁷ is an institute owned by the State and established by the Government to promote the development of the non-commodity export industry. REC strives to support Russian exporters in exploring foreign markets and building capacity in global trade by offering a vast array of financial and non-financial support tools. As a point of interaction with relevant domestic ministries and agencies, REC collaborates with key industries and business players in Russia to enhance export conditions and overcome trade barriers. In this way, support for the digital transformation of companies focuses on connecting with potential customers and financial support.

REC was established by the Federal Law No. 185-FZ dated June 29, 2015 “On Amendments to the Federal Law “On the Bank for Development” and Article 970 of Part 2 of the Civil Code of the Russian Federation”. The Russian Export Center Group incorporates the Russian Agency for Export Credit and Investment Insurance (EXIAR JSC) and Eximbank of Russia JSC aiming to offer comprehensive integrated services to the export-oriented companies.

REC offers its services to all the exporters of non-commodities’ products, goods and services with no industry restrictions. REC aims at providing the exporting companies with continuous support from the proposal and planning phase all the way to the successful completion of the export contract and implementation and beyond – including the e-commerce channels. The main services of the Russian Export Center include:

- » Credit and guarantee support.
- » Insurance.
- » Special export support programs.
- » Certification, patenting, licensing.
- » Support for early stage projects.
- » Promotion to foreign markets.

The full list of services of the Russian Export Center can be found at <https://www.exportcenter.ru/services/>



Accessing to new analytical products of the Russian Export Center is possible through the “My Export” platform⁸. Among the innovations there are:

- » Market search service, which allows exporters to get a detailed picture of the countries that are promising sales markets for a particular product of Russian origin, including a list of potential trading partners.
- » New analytical reports.
- » New sources of information: Central Bank of Russia, Rosstat, IMF, World Bank, Tenders, etc.
- » New analytical sections (export indicators of the national project, the number of exporters, exports by regions of the world and the Federal District of Russia, etc.).
- » A deep interface for customizing reports is available (for example, for a commodity report, it became possible to select the region of Russia from which products are exported, and the direction of movement - the country or region of the world).



The **Chamber of Commerce and Industry of the Russian Federation**⁹ is a non-governmental organization representing the interests of small, medium and large companies covering all business sectors. The chamber aims to contribute to the economic growth of all sectors and integrate them into the world economy.

⁸ Services for the export of goods from Russia. Russian Export Center official website. Support for Russian exports.

⁹ <https://tpprf.ru/ru/>

The Chambers have helped small and medium-sized enterprises (SME) to digitally transform through training programs in digital skills and knowledge, consulting services, organizing events and connecting SME with digital service providers.



The “**Digital Economy Strategy**”¹⁰ is a strategic program launched by the **Ministry of Digital Development, Communications and Mass Media**¹¹ of the Russian Federation in 2018 with the aim of boosting the development of the digital economy in the country. The program includes investments in digital infrastructure, development of advanced technologies, and the formation of skilled labor in the technology field. Some of the program’s goals include increasing the contribution of the digital economy to Russia’s GDP by 3 percentage points by 2024, doubling the number of Russian companies with a digital presence by 2024, and increasing the proportion of workers employed in the digital economy by 1.5 times by 2024. The program also includes measures for data protection and cybersecurity, with the creation of secure information systems and the formation of digital security experts.

To participate in the “Digital Economy” program in Russia, some of the minimum requirements for a company include:

- » Being a registered company: the company needs to be legally registered and operating in Russia.
- » Having a digital transformation project: the company needs to have a project or plan to transform its business through digitization, automation, or other cutting-edge technologies.
- » Having a qualified team: the company must have a team of professionals qualified in technology, finance, marketing, project management, among other related areas.
- » Willingness to collaborate with other compa-

¹⁰ <https://documents1.worldbank.org/curated/en/860291539115402187/pdf/Competing-in-the-Digital-Age-Policy-Implications-for-the-Russian-Federation-Russia-Digital-Economy-Report.pdf>

¹¹ <https://digital.gov.ru/en/>

nies and institutions: the company needs to be willing to collaborate with other companies and public and private institutions to create innovative solutions and achieve common goals.

- » Having a long-term vision: the “Digital Economy” program in Russia is a long-term effort to transform the country’s economy, so the company needs to be committed to participating in the program and contributing to its evolution over time. Additionally, the company needs to have the financial capacity to invest in technology projects and have an entrepreneurial and innovative mindset to adapt to rapid changes in the technology industry.



The **Ministry of Industry and Trade**¹² is a government agency in Russia responsible for implementing state policy in the industrial and trade sectors. Within the Ministry, there is a dedicated department for digital development, which is responsible for implementing the Digital Economy program. The Department for Digital Development focuses on promoting the development of the digital economy in Russia. It aims to increase the competitiveness of Russian companies in the digital sector, develop digital infrastructure and services, and promote the use of digital technologies in various industries. The department also works to improve digital literacy and skills among the population, with a particular focus on young people.

Some of the key initiatives of the Department for Digital Development include the development of a national program for the development of the Internet of Things (IoT), the implementation of measures to improve the security of critical information infrastructure, and the promotion of the use of artificial intelligence (AI) in various industries. The department also works to promote the development of e-commerce, the use of electronic signatures, and the digitization of government services.

Some of the types of companies that may be eligible for assistance from the department include:

¹² <http://government.ru/department/54/events/>

⁷ <https://www.exportcenter.ru/en/>

- » Software development companies - this includes companies involved in the development of software applications, computer games, and other digital products.
- » IT services providers - companies that provide IT services, such as website development, network security, and cloud computing services.
- » Hardware manufacturers - companies that produce computer hardware, such as servers, storage devices, and other computer equipment.
- » Digital content providers - companies that produce and distribute digital content, such as videos, music, and e-books.
- » Telecommunications companies - companies that provide telecommunications services, such as internet service providers, mobile network operators, and satellite providers.
- » Startups and entrepreneurs - the department is also focused on supporting startups and entrepreneurs who are developing innovative digital products and technologies.

ЭКОНОМИКА

An **Autonomous Non-profit Organization (ANO) “Digital Economy”**¹³ coordinates the participation of expert and business community in the implementation, development, and evaluation of the program’s effectiveness. Created by Russian high-tech companies (Yandex, Mail.Ru Group, Rambler & Co, Rostec, Rosatom, Sberbank, Rostelecom, the Skolkovo Foundation, the Agency for Strategic Initiatives, and others), the organization functions as a platform for state-business dialogue to create a digital economy ecosystem in Russia. It forms and coordinates the activities of working groups and competence centers for the program’s areas and evaluates the overall implementation of the program. In addition to ensuring the interaction with business and scientific community, its functions include support of digital technology start-ups and small/medium-sized enterprises (SME)¹⁴ as well as foresight and digital development forecasts.

¹³ <https://data-economy.ru/>
¹⁴ https://tadviser.com/index.php/Company:ANO_Digital_Economy

3.1.3 INDIA



The **SME Champions Scheme**¹⁵ is an initiative implemented by the **Ministry of Micro, Small and Medium Enterprises**¹⁶ in India to promote competitiveness among SME companies. The scheme has several sub-schemes that aims to reduce waste through lean manufacturing practices, support design improvement, create awareness on intellectual property rights, implement the “Zero Defect, Zero Effect” (ZED) scheme, digitally empower SME through the Digital SME programme, promote creativity and innovation in companies, and encourage adoption of advanced technologies through incubation. The scheme provides a platform for SME to showcase their products and services and connect with potential customers and investors. It also provides support for capacity building, technology adoption, and market access.

Small companies falling under the category of SME can apply for the SME Champions programme, which consists of three components: SME-Sustainable (ZED), SME-Competitive (Lean), and SME-Innovative (for incubation, IPR, design, and DigitalSME). Actions undertaken under the programme include lean manufacturing practices, design improvement, IP awareness, digital empowerment, creativity and innovation support, and technology adoption through incubation.

Aligned with digital transformation, the **SME Innovative Scheme**¹⁷ is a sub-scheme under the SME Champions Scheme in India. It aims to develop and nurture innovative ideas among SME by providing support for incubation, design intervention, and intellectual property rights (IPR) protection. The scheme aims to create awareness among SME about India’s innovation and motivate them to become SME champions. The scheme will act as a hub for innovation

¹⁵ <https://www.champions.gov.in/Government-India/Ministry-MSME-Portal-handholding/msme-problem-complaint-welcome.htm>

¹⁶ <https://msme.gov.in/>

¹⁷ https://innovative.msme.gov.in/Documents/FinalGuidelines_MSME_Innovative.pdf

activities facilitating and guiding development of ideas into viable business propositions that can benefit society directly and can be marketed successfully. The scheme will help entrepreneurs in developing new ventures and promote and support the untapped creativity of the SME sector. There are three activities conducted by the SME Innovative Scheme: Incubation, Design Intervention, and Intellectual Property Rights (IPR) Protection. In Incubation, institutions eligible as Host Institute (HI) (Technical Colleges, Universities, other Professional Colleges/ Institutes, R&D Institutes, NGOs involved in incubation activities) are recognized to act as a Business Incubator (BI) (MSME-DIs/ Technology Centres or any Institute/Organization of Central/ State Government). After the approval of the incubated ideas submitted through the HI is made, the approved ideas receive assistance for nurturing ideas by HI, and finally, assistance is provided to Capital Support to HI for Plant and Machinery. Financial assistance to develop and nurture the ideas is a maximum of Rs. 15 lakh per idea. For Plant and Machinery up to Rs. 1.00 cr. (max) provided for procuring and installing relevant machinery, including hardware and software, R&D activities, and common incubatee facilities.

The *Design scheme* has two major parts: Design Projects and Design Awareness Programme. The Design Project aims to help SME develop new design strategies and/or design-related products through interventions and consultancy. On the other hand, the Design Awareness Programme aims to create general awareness and sensitization about the value and power of design for businesses through seminars, talks, workshops etc. The purpose of these activities is to sensitize SME about the usage of design/innovation in various facets of their industry. To be eligible for the Design scheme, the beneficiary unit(s) must typically be a registered micro, small or medium enterprises as per the definition in SMED and should have a valid UAM or Udyam Registration. The manufacturing SME may be a profitable entity preferably in the at least one year out of last three financial years. The designer that a unit employs in this scheme should be qualified Industrial designers having relevant experience in that field. Implementing agencies should verify all the relevant documents. The Design scheme

provides financial assistance under the Design Component for SME to develop new design strategies and/or design-related products through interventions consultancy. Financial assistance under this activity will be utilized for engagement of design consultants for design interventions and expenses pertaining to development of prototype/product. The total project cost will be provided as grant in 3 stages: Stage 1 – Strategy & Concept- 40%; Stage 2 – Detail Design - 30%; Stage 3 – Successful Completion of the prototype/product and Final Report submission - 30%.

The *Intellectual Property Right (IPR)* Component of the Design scheme offers legal and intellectual property filing support including patents, trademarks, copyrights, designs, geographical indications (GI) etc. The programme also provides IP advisory, consultation, Patentability Searches, Technology Gap Analyses and IP commercialisation through establishment of Intellectual Property Facilitation Centres (IPFCs) across the country by reimbursing costs.

The SME can apply for the SME Innovative scheme by registering as a Host Institute (HI) through the MIS portal of the DC SME website (<https://innovative.msme.gov.in>). Once they have registered as an HI, they can submit their application online on the portal.



The **Credit Linked Capital Subsidy Scheme for Technology Upgradation (CLCSS)**¹⁸ is an initiative of the Indian government, administered by the **National Institute for Micro, Small and Medium Enterprises (NIMSME) under the Ministry of Micro, Small and Medium Enterprises (SME)**. The program aims to facilitate the modernization and technological upgrading of small enterprises by providing subsidies for the purchase of advanced machinery and equipment. The objective of the scheme is to facilitate technology up-gradation in MSEs by providing an upfront capital subsidy of 15% (on institutional finance of up to Rs 1 crore availed by them) for induction of well-established

¹⁸ <https://clcss.dcmsme.gov.in/>

and improved technology in the MSE sector. Eligible companies can obtain subsidies, subject to prior approval from NIMSME, based on a fixed percentage of the loan amount obtained. Small businesses that are registered as manufacturing, processing, or service units, have been in operation for at least one year, and meet the requirements of the program, can participate. The goal of the program is to increase the competitiveness and productivity of small businesses, contributing to the economic growth of the country through the adoption of advanced technologies in their operations. The SME can apply for the scheme online through the Ministry of Micro, Small and Medium Enterprises website.

To claim the subsidy under CLCSS, eligible MSEs must apply online through Primary Lending Institutions (PLIs) from where MSEs avail term loan. The completed application is being submitted by PLI via the Online Application and Tracking System to the attached Nodal Agency which in turn recommends online application to the DC Office (MSME) for grant release. After processing the request and subject to the availability of funds, due approval is granted by the Competent Authority with the consent of the Internal Financial Area, after which the funds are released to the Nodal Agencies. The resources are then transferred by the Nodal Agencies to the PLIs where the MPE's account is used.



The **Digital Services Facilitation through Aggregation Services**¹⁹ program is an initiative of the **Ministry of Micro, Small and Medium Enterprises (MSME)** of the Government of India. Its objective is to enable small businesses in the country to benefit from the digital ecosystem by providing access to aggregated services on a centralized online platform. The platform simplifies registration processes, obtaining licenses and certifications, and provides training in digital skills. Small businesses can participate as service providers or as service consumers. The program aims to facilitate access to essential services,

¹⁹ <https://www.nsic.co.in/schemes/DigitalServices>

contributing to the growth and development of companies. Among the Sub-Categories of ICT Enabled Digital Services and Scope for Service Providers there are Software Services (Such as ERP, Accounting, Manufacturing Design, Regulatory Compliance including GST, other software packages etc., Cloud Services [platform as a Service (PaaS), Software as a Service (SaaS)], Digital Infrastructure (IaaS, Hardware, Smart devices), Artificial Intelligence Solutions, Internet of Things (IoT) and Machine to Machine M2M solutions, B2B and B2C E-Commerce Solutions, and Other ICT Enabled Digital Services.

SME can apply for digital services either online on SME mart portal²⁰ Digital Services or offline at the branch offices/NTSCs for products/services offered by NSIC by way of filling a Customer Application Form CAF and making full payment of products/services chosen by them after referring to the Product-and-Price P&P List of NSIC. The Customer Application Form CAF can be downloaded from NSIC website.

²⁰ <https://msmemart.com/>

3.1.4 CHINA



Torch High Technology Industry Development Center is a national technology enterprise incubator established by China's Ministry of Science and Technology. **The Torch High Technology Industry Development Center**²¹ supports small companies by providing them with financial support and technical support. The center also provides incubation services for small and medium-sized enterprises (SME) and start-ups. The Torch High Technology Industry Development Center provides financial support to small companies through its technological financial support system. The center strives to build a "1+4+X" technology and financial system²², i.e. "one capital platform + four project-capital matchmaking platforms + a series of financial innovation products", so as to actively tackle the financing problems of micro, small and medium-sized enterprises. The Torch High Technology Industry Development Center provides technical support to small companies through its Torch Program²³. The program aims to facilitate the combination of industry and technology by the market system and of the development of high and new technology industries. The center also has an evaluation system for science and technology enterprises that can help it better discover, cultivate and support local SME with strong R&D capabilities and mastering core technologies. The platform connects startups and technology-based SME with investors, including venture capital firms, private equity firms, and other financial institutions.



The **Ministry of Industry and Information Technology (MIIT)** is working on a five-year

²¹ <http://www.chinatorch.gov.cn/english/>
²² https://www.investxiamen.org.cn/detail_en/541.html
²³ http://www.cdht.gov.cn/gaoxin/c141902/2021-10/29/content_8352fe29260144fab2e17f9883e777of.shtml



Financing is also an important part for SME' innovation, especially for digital technology innovation. Finance for startups and scaleups in China is ranked 9th in 2022²⁵ (WIPO, 2022). China has a robust venture capital industry, with a large number of funds focusing on early-stage startups in the emerging technology areas. Besides, private equity firms in China focus on later-stage investments in established companies in traditional industries as well as the emerging technology areas.

Furthermore, guided by the government, **National Financing Guarantee Fund** was established with a registered capital of CNY 66.1 billion in 2018,

²⁴ https://english.www.gov.cn/statecouncil/ministries/202110/26/content_WS6177eb35c6d0df57f98e3d50.html
²⁵ https://www.wipo.int/edocs/pubdocs/en/wipo_pub_2000_2022/cn.pdf

whose business covers re-guarantees for SME credit loans or direct PE investments. National Guide Fund for Venture Investment in Emerging Industries account for an aggregate investment of over CNY 22.5 billion in 2018²⁶. Jointly initiated and established by the Ministry of Finance, the National Development and Reform Commission, as well as social investors such as the National Development and Investment Corporation and the Postal Savings Bank of China, 80% of this fund will be invested in venture capital funds engaged in early-stage and mid-stage investment in emerging industries, and 20% of the funds can be directly invested in non-listed mature companies. Though established by the government, the fund is operated in a market-oriented manner, mainly by supporting the development of high-tech SME and guiding social capital into the field of venture capital for emerging industries²⁷.

3.1.5 SOUTH AFRICA



The **Small Enterprise Development Agency (SEDA)** is an agency of the **Department of Small Business Development (DSBD)**²⁸ to support the development of SME. This agency is responsible for the **SEDA Technology Programme** that provides financial and non-financial support to small enterprises through **business incubation, quality and standards services, and technology transfer and innovation support**²⁹.

The **Incubation Unit** offers a three-year program to promote entrepreneurship and technology commercialization in South Africa. Those with a viable business idea or a struggling registered SMME can apply. Each incubator has its own selection process, so applicants should contact their relevant incubator for criteria. Incubators are mainly distributed in sectors of advanced manufacturing, information and communication technology (ICT), digital industry 4.0, agriculture and finance.

The **Quality Systems and Conformity Standards Unit** promotes the importance of conformity assessment by providing technical support to SMMEs. This includes quality health checks, management systems development, product testing, and product design.

Together, the Quality Systems and Conformity Standards Unit and the Technology Transfer and Innovation Support Unit offer technical business interventions for SME. Innovative SMMEs can apply for these interventions via the **nationwide SEDA branches and business incubators**. These units support recognized SMMEs to increase productivity and competitiveness, improve sales and employment and grow the economy.

Activities related to **innovative support** include:

- » Open Innovation Challenges: Large public and private companies collaborate with SEDA branches and incubators to identify innovative SME with specific skills, products, and services that can provide solutions related to the supply chain and the development of suppliers for these large companies.
- » SMME Innovation Forums: These forums are designed to share business knowledge and skills with SME in specific sectors, providing introductions to the latest industry innovations. Examples of these sectoral forums include Industry 4.0, the Automotive Sector, and the Textile Sector.
- » Investor Pitching: National pitching competitions are organized with funding panels to improve access to finance for SME and create impactful deal flows for investors.

Technology Transfer Fund³⁰ supports SMMEs in the manufacturing sector with an annual turnover below five million Rand to acquire innovative and production-enhancing technology and intellectual property. To apply, SME need to fill in an application form and provide supporting documentation. Approved applicants are required to commit to three years of continuous performance monitoring and reporting to demonstrate impact and return on investment through job creation and increased turnover. SME can request a maximum amount of 600,000 Rand, which needs to be justified by demonstrating a return on investment. However, funding is limited, and only the top 10% of applications received annually can be funded.



The **Technology Innovation Agency (TIA)** is a national public entity that serves as the key institutional intervention to bridge the innovation chasm between research and development from higher education institutions, science councils, public entities, and private sector, and commercialization. TIA provides both financial and non-financial support. Here we will highlight two initiatives of this agency: **Global Cleantech Innovation Programme** and **Technology Stations Programme**.



The **Global Cleantech Innovation Programme (GCIP)**³² is a global initiative that promotes clean technology innovation and supports entrepreneurs in growing their Small, Medium, and Micro Enterprises (SMMEs) and start-ups. The specific areas of focus for the program are energy efficiency, renewable energy, waste beneficiation (including e-waste), water efficiency and green buildings, green transportation, and environmental protection (air, sea, and land).



The **Technology Stations Programme**³³ offers non-financial technology-based services through transfer centers hosted at Higher Education Institutions. The aim is to improve competitiveness through innovation and facilitate interaction between industry and academia. Thus, universities respond better to industry needs and will support entrepreneurs, SME, and industrial sectors.

There are 18 Technology Stations (TS) based at 11 Higher Education Institutions in South Africa. The technology stations and institutes of the universities focus on fields such as electronics, metal casting, materials and processing, product development, chemical technology, clothing and textile, agrifood, tooling, and environmental technology. These institutions aim to foster innovation and provide support for research and development in their respective areas of expertise. The program offers services such as testing, rapid prototyping, consultation, process improvement, research and development, technology demonstration, and training.

To access technology station services, companies need to fill out a Customer Acquisition Form (CCF) and provide the company registration number or a copy of the identity document for startups or

²⁶ <https://aecm.eu/wp-content/uploads/2020/04/OECD-Score-board-2020.pdf>

²⁸ <http://www.dsbd.gov.za/>

²⁷ <https://www.reuters.com/article/china-national-startup-fund-0510-idCNKBS186074>

²⁹ [www.seda.org.za/Publications/Publications/SEDA Annual Review 2020-21.pdf](http://www.seda.org.za/Publications/Publications/SEDA%20Annual%20Review%2020-21.pdf)

³⁰ [Seda Stp Technology Transfer - Information Sheet 2018.pdf](#)

³¹ <https://www.tia.org.za/>

³² <https://www.tia.org.za/non-financial/#1574882028321-24f1cab5-e1d6>

³³ <https://www.tia.org.za/programmes/>

individuals. Clients under 18 need a guardian or teacher to accompany them, and large groups (i.e. schools or organisations) need the entity's representative to sign the CCF³⁴.

TIA provides a catalog with information on the services provided by each center and details on how interested companies can obtain them, so companies can purchase the services that best suit their needs.



SAtion is a training ecosystem that seeks to demystify the fourth industrial revolution. The **SMME Hub**³⁵ is a set of tools by SAtion, Thinkroom, Microsoft, Business Unity South Africa (BUSA) and the Commission for Conciliation, Mediation and Arbitration (CCMA) to empower SMMEs on their digital transformation journey.

Eligible Participants can receive up to \$120,000 in Azure credits, subscriptions for Visual Studio, Office 365, Dynamics, and GitHub Enterprise, Enterprise-grade Azure support and access to engineers, Community Building/Exchange, and Go-to-market support. Besides, they can use a practical Labour Web Tool for South African Small Businesses launched by Business Unity South Africa (BUSA) and the Commission for Conciliation Mediation and Arbitration (CCMA) to help smaller businesses with their labor relations processes and matters.

Also, the SMME Hub offers free licenses of the Thinkubate tool for training focused on SMME with the objective of assisting in the health and digital transformation of your business. Training for Small Medium Business accessing to Microsoft training, digital events, and webinars to improve technical and operational skills. Participation in Global Social Entrepreneurship Program that supports social impact companies with technologies, connections, and experience. For this, Microsoft looks for commercial and non-commercial organizations and start-ups whose primary product and/or service contributes to attaining one or more of the United Nation's Sustainable Development Goals (SDGs).

³⁴ <https://www.tia.org.za/programmes/>

³⁵ <https://sation.org.za/smme-hub/>

To use these services, the SMME can register on their website by filling out a registration form. Once registered, they will be able to access all of their services.



The **Department of Trade, Industry, and Competition (The dtic)**³⁶ was established as a result of the merge between The Department of Trade and Industry and The Economic Development Department. Its ultimate objective is to foster an industrial revolution towards a dynamic and internationally competitive economy. The department coordinates the efforts of government agencies, state and civil entities to promote economic development. It seeks to enhance the alignment between economic policies, government plans, agencies, and objectives to maximize their effectiveness.

One initiative between the dtic and Microsoft South Africa was the Digital Transformation Program³⁷ launched in 2019. The program aims to unlock the business potential of up to 10 members of dtic's Black Industrialist Support and Gazelle programs. Eligible candidates must be registered legal entities in South Africa and approved Black Industrialists or Gazelles. Successful applicants will receive assistance in developing a personalized digital transformation strategy focused on improving operational efficiency and technical sustainability in the Fourth Industrial Revolution (4IR). The last Request for Application (RFA) window was open for qualified Black Industrialists and Gazelles to apply for the program in 2021.

³⁶ <http://www.thedtic.gov.za/>

³⁷ <http://www.thedtic.gov.za/the-dtic-and-microsofts-digital-transformation-programme/>





3.2 EUROPE

3.2.1 EUROPEAN UNION



The **European Commission** has a **European Innovation Council and SME Executive Agency (EISMEA)** responsible for all European Innovation Council (EIC) activities and programs related to small and medium-sized enterprises. The aim is to strengthen the Single Market, open up opportunities for SME, and maintain high standards of protection for its citizens towards a more competitive, digital, green, and inclusive EU. Among the EISMEA programs aligned with the digital transformation of small and medium-sized enterprises are the **European Innovation Council (EIC)**, the **European Innovation Ecosystems (EIE)**, and the **Enterprise Europe Network (EEN)**. In addition to these programs managed by EISMA, the **European Commission has European Innovation Centers (EDIHs)**.

The **European Innovation Council (EIC)** is Europe's leading innovation program aiming to identify, develop and scale up breakthrough technologies and innovations. The EIC was established under the EU's **Horizon Europe program**. The council has a €10.1 billion budget to support breakthrough innovations, from early-stage research to proof of concept, technology transfer, and funding and scaling startups and SME. The EIC provides funding opportunities for innovators looking to scale and create new markets. Funding opportunities include *Pathfinder EIC*, *EIC Transition*, and *EIC Accelerator*.



Pathfinder EIC is a program that supports teams of entrepreneurial scientists and researchers from universities, research organizations, startups, high-tech SME, or industrial sector stakeholders interested in technological research and innovation. This program aims to finance innovative and emerging technologies, offering grants ranging from 3 to 4 million euros for the initial development of future technologies up to proof of concepts. In addition, projects can receive

additional funding to test the innovation potential of their research results. Companies interested in receiving funding from the Pathfinder EIC can apply for grants through calls such as the *Pathfinder Open* and the *Pathfinder Challenges*, which open once a year. Most funding is carried out through public notices for the presentation of proposals without predefined thematic priorities. Around 163.5 million euros are currently earmarked for challenges related to clean and efficient cooling, construction digitalisation, precision nutrition, responsible electronics, and in-space solar energy. These challenges directly support EU policy goals such as RePowerUE, the Chips Act, the New European Bauhaus, food security, and EU missions in Horizon Europe.

EIC Transition aims to mature new technologies and develop a business case for bringing them to market. EIC Transition projects must deliver results that include an effective technology for the intended application, a business model, initial validation, and a business plan for its market development. The grant for this type of project can reach €2.5 million and is made available to validate and demonstrate the technology in a relevant application environment and to develop market readiness. EIC Transition calls for proposals do not have pre-established thematic priorities. However, the innovation proposal must result from EIC Pathfinder Projects, FET Flagships, European Research Council Proof of Concept Projects, and the European Defense Fund to get this type of funding. For the transition challenges, interested parties must prove that they are the owners or holders of Intellectual Property Rights (IPRs) or have the necessary rights to commercialize the results of one of these eligible projects. It is possible to check the complete list of eligible projects on the program's website.

The **EIC Accelerator** is the European Commission (EC) and the European Innovation Council (EIC) funding program under Horizon Europe. The program aims at startups and spin-outs, particularly those with female CEOs, to develop and expand breakthrough innovations. The accelerator supports individual Small and Medium Enterprises (SME) with grants of up to €2.5 million and investments of up to €15 million. EIC Accelerator provides support in two modes: EIC Accelerator Open and EIC Accelerator Challenges. The EIC Accelerator Open has no

predefined thematic priorities and is open to proposals in any field of technology or application. The EIC Accelerator Challenges identify key strategic areas and specific objectives for which highly innovative startups and SME are invited to propose new technologies, pioneering solutions, and breakthrough innovations. EIC Accelerator funding can be requested at any time through the EIC Platform. To apply, you must submit a video pitch and a slideshow and answer a short set of questions about your innovation and your team. Applications that meet all criteria in the remote evaluation phase and are positively evaluated by the EIC jury will receive funding. If not, they will receive a Seal of Excellence to help them obtain funding from other sources.



The **European Innovation Ecosystems (EIE)** program is part of Horizon Europe and aims to create more connected, inclusive, and efficient innovation ecosystems and support the expansion of companies. The program seeks to unite people or organizations whose goal is innovation and link resources, organizations, investors, and policymakers. EIEs promote greater collaboration among participants by developing opportunities to share ideas, knowledge, and resources, leading to the creation of new products and services. The program also provides access to funding through angel investors, venture capitalists, and other funding sources. This access to funding often proves crucial for startups to grow quickly. In addition, EIE attracts and retains the best talent, including scientists, engineers, and other qualified professionals. It also provides access to new markets and enables the economic growth of participating companies.

EIE 2023 – 2024 actions are organized into CONNECT and INNOVSME. CONNECT aims to build inclusive and interconnected innovation ecosystems across Europe, building on the existing strengths of national, regional, and local ecosystems and attracting new actors and underrepresented territories to define, undertake and achieve collective ambitions around the challenges for the benefit of society, including the green, digital and social transitions. INNOVSME

aims to support the European Partnership on InnovativeSME/Eurostars. This partnership aims to help innovative SME and project partners (such as large companies, universities, and research organizations) by funding collaborative international R&D and innovation projects. By participating, organizations can increase their research and innovation (R&I) capacity, increase productivity, and more easily enter new markets.

To participate in the program, it is necessary to pay attention to the call notices for participation on the website of the European Commission. National and/or regional innovation authorities, private actors, innovativeSME, startups, social innovators, public companies, academia, technology transfer centers, investors, foundations, clusters, associations, and civil society, are eligible to participate in the notices. Applications normally require a plan for the exploitation and dissemination of results, including communication activities.



The **Enterprise Europe Network (EEN)** was launched by the European Commission in 2008. This network is funded through the Single Market Programme (SMP) and implemented by the European Commission's European Innovation Council and SME Executive Agency (EISMEA).

The EEN is the world's largest support network for SME helping them to innovate and grow internationally through support for transitioning to more sustainable and digital business models. Active worldwide, the network brings together expert members from organizations recognized for their excellence in business support. Member organizations include chambers of commerce and industry, regional development organizations, universities, research institutes, and innovation agencies.

EEN's core practices involve the assessment of digitization needs and potentials, division of tasks to provide basic digitization support, services and advice, joint activities and events in cooperation with *EDIHs (European Centers for Digital Innovation)*, and references and combinations

of customers for specialized services. These services are provided by international business experts using Europe's largest online database of business opportunities and access to funding and innovation opportunities. EEN receives funding through the *European Union's Single Market Programme*. To obtain financing, small companies grouped in regional consortia are selected through calls for proposals. On the EEN website, companies can find local contact points according to the company's location. At these points, finding out more details about the network and receiving advice, support, and opportunities for international partnerships is possible.



European Digital Innovation Centers (EDIHs) are hubs that help companies and public sector organizations tackle digital challenges and become more competitive. They work by supporting SME to improve business/production processes, products, or services using digital technologies to:

- » Provide access to technical knowledge, tests, as well as the possibility to test before investing;
- » Providing innovation services such as financial advice, training, and skills development that are essential for a successful digital transformation;
- » Help SME deal with environmental issues such as sustainability and circularity.

The network's European coverage facilitates the exchange of best practices between hubs in different countries and the provision of specialized services across regions. Funding is divided between DIGITAL and Member States, associated countries, their regions, and/or private sources. The EDIH Network aims to build a vibrant community of hubs and other stakeholders to promote cooperation and knowledge transfer activities between EDIH, e-capsSME, the public sector, and other relevant stakeholders and initiatives.

The EDIH network portal includes tools to assess the EDIH network's performance and measure its customers' Digital Maturity progress. EDIHs

should develop a strong connection with other networks such as EEN, EIC, and Start-up Europe to provide an integrated service to SME in local and regional ecosystems.



The **ICT Innovation for Manufacturing SME (I4MS)** initiative is funded by the European Commission's Horizon 2020 program. It aims to support small and medium-sized enterprises (SME) in the manufacturing sector in their digital transformation. The I4MS platform offers a database with training on various technological applications in manufacturing. Training varies in format and can be online, mixed, or face-to-face, and includes topics that can contribute to the digital transition of SME, such as artificial intelligence (AI), robotics, 3D printing in manufacturing, internet of things (IoT), predictive maintenance, cyber security, among others. The program consists of 4 phases:

- » Phase 1 - Create Digital Innovation Centers (DIHs) and establish a core I4MS community/ecosystem.
- » Phase 2 – Further growing the core I4MS community/ecosystem.
- » Phase 3 – Focus on reinforcing the I4MS ecosystem. During this phase, European SME and mid-caps were exposed to new approaches and methodologies on business models, access to finance, and training opportunities to upskill staff. Total funding of €34 million was available at this stage.
- » Phase 4 – Current phase of the program aims to accelerate the adoption of digital technologies in processes across Europe, focusing on extending the transformative impact across companies, regions, and sectors and supporting personalized and cost-effective small-scale production based on secure digital technologies. To help service providers (IAs, DIHs, and CCs) to provide a business-oriented description of the technology services they offer, complemented by the identification of Best Practices. A total funding of €35 million is available for this phase.

Through the initiative, SME and mid-caps can apply for funding through technological and/or

financial support and access relevant calls for expressions of interest and service calls from European institutions. Organizations can also utilize the infrastructure provided by I4MS to experiment with different innovative technologies and services and evaluate their benefits before investing in them. Resources are also available for companies to foster the development of digital skills and skills for digital transformation.



The **Digital Europe Programme** is a funding initiative by the European Union aimed at enhancing digital capabilities and promoting the adoption of digital technologies across the EU. The program focuses on areas such as artificial intelligence, cybersecurity, supercomputing, advanced digital skills, and the utilization of digital technologies in the economy and society. The objective is to accelerate Europe's economic recovery and drive its digital transformation, benefiting Europe's citizens and businesses, and in particular SME. Part of the money also seeks to build and strengthen the network of European Digital Innovation Hubs, with the aim of having a Hub in each region to help companies benefit from digital opportunities. The program will complement the funding available through other EU programmes, such as the Horizon Europe programme for research and innovation and the Connecting Europe Facility for digital infrastructure, the Recovery and Resilience Facility and the Structural funds.

How to participate³⁸:

- » Find a suitable call for proposals. The European Commission and its funding bodies publish calls for proposals on the Funding & Tenders Portal. Users can search for relevant opportunities by entering keywords or selecting specific EU funding programs. Calls are divided into topics, implemented by different type of actions.
- » Find project partners (optional). Review

38 <https://digital-strategy.ec.europa.eu/en/activities/get-funding-digital>

the partnership conditions and eligibility requirements for a call. Post a partnership request or offer, or choose the partners available on the website.

- » Create an EU Login account and register an organization. Each user must have an EU Login account to access the Portal's interactive features and register their organization.
- » Submit the grant proposal. All proposals need to be submitted.
- » Evaluation. All proposals are evaluated against the criteria published in the Work Programme, resulting in a list of proposals in priority order. Independent experts specialised in the relevant fields may be involved in the evaluation.
- » Grant agreement. The European Commission will draw up a grant agreement with each of the successful participants within the limits of the allocated budget. The grant agreement describes the activities to be undertaken, in line with the objectives of the call, the project's duration, budget, rates and costs, as well as the European Commission's contribution, the rights and obligations and other specificities linked to the topic covering the specific grant agreement.



The Digital Europe Programme supports initiatives like the Digital Skills and Jobs Coalition and the Digital Skills and Jobs Platform. The **Digital Skills and Jobs Coalition**³⁹ is a multi-stakeholder partnership that seeks to promote digital skills and jobs. The coalition brings together companies, training providers, education providers, social partners and other organizations to work towards reducing the digital skills deficit in Europe.

Organizations are invited to join the Digital Skills and Jobs Coalition as pledgers, committing to actions within their sphere of influence to promote digital skills and jobs. Pledgers are able to propose innovative actions, access a platform for sharing ideas and accomplishments, and promote their

39 <https://digital-strategy.ec.europa.eu/en/policies/digital-skills-coalition>

commitments and receive recognition. The actions pledged can range from training unemployed persons, offering coding classes for children, providing cutting-edge training to ICT specialists to hosting massive open online courses (MOOCs) for educators⁴⁰.

As part of the Digital Skills and Jobs Coalition, the European Commission created the **Digital Skills and Jobs Platform**⁴¹, which is a hub where stakeholders can share information, resources, and best practices on digital skills and jobs. It also serves as a space where Coalition members can exchange ideas, participate in events, and collaborate on projects. Anyone can access the platform, and it offers a wide range of resources on digital skills and jobs, including reports, videos, and guidelines. SME can either be a pledger or take advantage of training, events and other initiatives offered on the Digital Skills and Jobs Platform.



EIT Digital⁴² is a European Union initiative that offers education, research, and innovation in the field of digital technology. It is an ecosystem that brings together leading companies, universities, research centers, and startups to drive digital innovation in Europe. EIT Digital offers various programs, such as Master's programs, doctoral programs, and entrepreneurship programs, to help students and professionals develop skills in digital technology.

Among the EIT Digital services that support European SME in their digital transformation journey include networking with experts, training and education programmes, opportunities and access to a network of partners.

40 <https://digital-skills-jobs.europa.eu/en/about/digital-skills-and-jobs-coalition>

41 <https://digital-skills-jobs.europa.eu/en/about/digital-skills-and-jobs-platform>

42 <https://www.eitdigital.eu/>

3.2.2 GERMANY



The German government has the **Digital Strategy 2025**⁴³, a strategy coordinated by the Federal **Ministry of Economy and Climate Protection** with the active involvement of other public sector organizations and companies, academia, the scientific community, and social partners. The strategy combines the Federal Government's political priorities for digital transformation as a cross-cutting theme. Below are listed some of the German government initiatives that encompass SME.

Mittelstand-Digital



Mittelstand-Digital⁴⁴ is an initiative promoted by the Federal Ministry of Economy and Climate Protection that helps SME from all sectors to embrace digital transformation in their business. To this end, it offers information, guidance, and funding based on three fundamental pillars:

Mittelstand-Digital Innovation Hubs: The concept is a "one-stop shop" providing a point of contact for all SME, regardless of their sector and degree of digitalization, with "Mittelstand 4.0 centers of excellence" deliberately distributed throughout the country. Through these centers of excellence, SME receive guidance through expert knowledge, workshops, training sessions, demo centers, discussions, networking, disseminating information, and using practical examples on digitization.

Digital Now investment grant programme: Digital Now provides funding for digital technologies and skills to companies in any industry, as well as providing a workforce. Financing can be up to

43 https://www.bmwk.de/Redaktion/EN/Publikationen/digitale-strategie-2025.pdf?__blob=publicationFile&v=3

44 <https://www.mittelstand-digital.de/MD/Navigation/DE/Home/home.html>

50,000 euros per company. If it is a network of companies, funding can be up to 100,000 euros per company. Allowance is measured according to the size of the company. To receive this funding, the company needs to present a digitization project, explain the type and number of qualification measures, and show the company's current state of digitization and the objectives to be achieved with the investment.

Cybersecurity for SME: CyberSecurity for SME is a cybersecurity initiative with the Cybersecurity for SME Transfer Center (TISiM). This initiative provides customized services to support SME. This support takes place using TISiM professionals as cybersecurity consultants for these SME. TISiM is the point of contact for questions related to digital security in person, with a headquarters in Berlin and others throughout Germany, but mainly online, offering practical information on dealing with cyberattacks. In addition, TISiM promotes various services to assist companies in carrying out individual or collaborative projects, such as individual analysis of the company to see the difficulties in relation to digital security.

**DIGITAL
JETZT**

The Federal Ministry of Economy and Climate Protection administers the **Digital Jetzt Program**⁴⁵. It supports SME and craft companies interested in investing in digital technologies and skills for the digital transformation of their businesses. The program aims to promote more investment in digital technologies by medium-sized companies and qualify and develop its employees' skills in this area. With this, it seeks to encourage the digitization of processes in different sectors, such as small and medium-sized companies and handicrafts, to improve digital business processes in companies, to create more opportunities through digital business models, and to reinforce the competitiveness and innovation of SME. It also aims to train employees to identify digitalization opportunities and initiate new investments in this area, ensure greater IT security in companies, and strengthen companies in economically fragile

⁴⁵ <https://digital-skills-jobs.europa.eu/en/opportunities/funding/digital-jetzt-programme>

regions. To participate, companies need to send the project to Digital Jetzt, which will analyze the project, and only after approval will they start receiving funding.

Beneficiaries are companies that have 3 to 499 workers in all sectors that meet the following requirements:

- » Are legally independent companies in the commercial sector;
- » Have a permanent place of business/branch in Germany;
- » Do not exceed the maximum grant amount allowed under the "minimum" provisions;
- » Have a digitization plan.

In addition, among the financing conditions are:

- » The project cannot have started at the time of grant approval;
- » Measures must be implemented within 12 months;
- » Beneficiaries must be able to prove the use of funds;
- » The maximum investment is 50,000 euros.

The maximum funding investment is 50,000 euros per company. For investments in value chains and/or networks, it can go up to 100,000 euros per company. In module 1 and with cumulative use of modules 1 and 2, the minimum funding amount is 17,000 euros. In module 2, the amount is 3,000 euros. The subsidy is proportional to the company's investment costs. The financing rate (in % of investment costs) is measured according to the size of the company:

- » Up to 50 employees: up to 40%;
- » Up to 250 employees: up to 35%;
- » Up to 499 employees: up to 30%.



The **Zentrales Innovationsprogramm Mittelstand (ZIM)**⁴⁶ is the largest innovation program for SME in

⁴⁶ <https://www.zim.de/ZIM/Navigation/DE/Home/home.html>

Germany. It is an initiative of the Federal Ministry of Economy and Climate Protection that finances innovative companies that want to develop new products, processes or technical services or significantly improve existing ones. The program is open to all sectors and fields of technology, but projects must be highly innovative, market-oriented and involve substantial technological risk. Examples of ZIM-funded initiatives are listed below:

- » **Individual R&D Projects** (National Activities only)⁴⁷: Innovative companies with business operations in Germany and with less than 500 employees can receive financing of up to 45% of their costs.
- » **Cooperation Projects** (including Transnational Activities)⁴⁸: Financing cooperative R&D projects between SME or SME and non-profit public and private research and technology organizations. Within ZIM, there are several ways to cooperate with transnational partners. German companies working with foreign partners on a ZIM project receive a 10% bonus on regular funding rates, up to a maximum funding rate of 60%.
- » **Innovation Networks** (including Transnational Activities): There needs to be a minimum of six German SME partners mandate an organization to manage the network. ZIM supports networks with international partners. However, financial support is only for the German partners involved. To be eligible under the ZIM international cooperation program, the network must include at least four German SME mandated by a German organization to manage the network and at least three partners from other countries (two SME and an organization that acts as a coordinator and provides overseas network management).

Before applying to an R&D project at ZIM, a feasibility study can also be funded. The **R&D Feasibility Studies (including Transnational**

⁴⁷ <https://www.zim.de/ZIM/Navigation/DE/Foerderangebote/Einzelprojekte/einzelprojekte.html>

⁴⁸ <https://www.zim.de/ZIM/Navigation/DE/Foerderangebote/Kooperationsprojekte/kooperationsprojekte.html>

Activities)⁴⁹ aim to determine the feasibility and prospects for the success of innovative products, processes, or technical services by funding feasibility studies in the form of an R&D project. It has a maximum duration of 8 months, and within 12 months, a maximum of two feasibility studies can be approved for a company. The initiative is aimed at micro-enterprises, young companies, or SME that have never received funding from ZIM. The grant will be awarded as a non-refundable grant of up to EUR 130,000 for individual studies and up to EUR 240,000 for studies in cooperation with other companies. For small businesses, the maximum funding rate is 70%.

For application, companies must choose the initiative that fits their project idea, check its eligibility, and apply online by filling in the form and required documents.

go-digital

Go-digital⁵⁰ is a program of the Federal Ministry of Economy and Climate Protection for funding that supports SME and craft companies that aim to optimize their business processes with the help of digital solutions efficiently and securely, service and customer oriented. Funded companies can obtain expertise and support from authorized consultancies in digitizing processes, digital market development, and IT security.

Consultancies are carried out by professional Information and Communication Technology consultants certified in advance based on technical knowledge, economic stability, experience working with SME, and technological neutrality. The funds can represent a maximum of 50% of the project's total value, reaching 16,500 euros per company. The duration of a consultancy project should not exceed six months.

Companies with less than 100 employees, which have an annual turnover or an annual balance sheet total not exceeding 20 million

⁴⁹ <https://www.zim.de/ZIM/Navigation/DE/Foerderangebote/Durchfuhrbarkeitsstudien/durchfuhrbarkeitsstudien.html>

⁵⁰ <https://www.innovation-beratung-foerderung.de/INNO/Navigation/DE/go-digital/go-digital.html>

euros in the year before the conclusion of the contract and falling under the de minimus regulation, are eligible. The application can be completed online and requires an application form, declaration de minimus, self-assessment of the degree of digitization, SME declaration, and design of a federal grant application.

PLATTFORM INDUSTRIE 4.0

The **Plattform Industrie 4.0**⁵¹ is the largest industry 4.0 network in the world. The platform is directed and led by the Federal Ministry of Economy and Climate Protection, the Federal Ministry of Education and Research, and high-ranking representatives from industry, science, and trade unions. It aims to identify all relevant trends and developments in the manufacturing sector and combine them to produce a common understanding of Industry 4.0. The platform has news, documents, events, and working groups focused on Industry 4.0.

The initiative is not only aimed at small companies, but small companies can use the platform to gain knowledge about Industry 4.0 trends. Experts from business, science, associations, and unions develop operational solutions with representatives of various federal ministries in thematic working groups.

To access the content, just access the platform. It's like a website with updated information about I4.0. To participate in the working groups, it is necessary to send an e-mail showing interest.

⁵¹ Plattform Industrie 4.0 - Homepage (plattform-i4o.de).



3.3 LATIN AMERICA

3.3.1 ARGENTINA



INDTech40

INDTech 4.0⁵² is a public-private initiative in Argentina that aims to lead the digital transformation of SME, articulating a comprehensive range of solutions with Argentine technology. The project proposes to be a technological offer hub, a digital transformation accelerator, and an environment for experimentation, research, and innovation where specialists can train and develop. The initiative offers a digital maturity self-diagnosis for SME. In addition, the hub provides a national offer of courses, training, postgraduate courses, and webinars on digital transformation and Industry 4.0. Solution providers can directly upload their service offerings, which INDtech will validate before publication. Developers can validate and test their new products on a user-friendly preview platform. To access HUB INDtech services, companies can search by application, technology, geographic location, implementation time, cost, and other categories. These services can be accessed by registering on the platform's website (<https://indtech.ar/registro.htm>). Among the services provided by the hub are:

- » IoT Platform: The INDtech 4.0 HUB IoT platform is a space for experimentation and innovation that allows SME to experiment with digital transformation solutions for all types of processes, products, and multiple communication technologies. The platform is free and open to access. The platform aims to allow PyMEs a device management tool to experiment with and test digital transformation products and solutions.
- » IND.Ar 4.0: The 1st Public-Private Accelerator of 4.0 projects for the Industrial Sector. IND.Ar is an acceleration program for young companies that develop Industry 4.0 solutions that seek to assist, finance, and connect ventures with industrial companies in strategic sectors to generate business alliances and work contracts. The selection process consists of opening the call for companies and selecting the

most innovative startups, introducing them to leading companies in the sector, matching and signing a contract, and starting the StartUp Acceleration and Internationalization Program.

- » Argentina Tecnológica: It works as a channel where it is possible to learn about the work that INDtech is carrying out collaboratively between public and private actors so that Agenda 4.0 plays a fundamental role in the productive development of Argentina, with the strong participation of SME. Through this channel, it is possible to discover Startups 4.0, news about events, fairs, and other actions that boost the supply and demand of I4.0, successful cases of technological implementation in small companies, available financing, and workshops to enable digital transformation.
- » AMD INDtech: The Digital Maturity Self-Diagnosis tool that will allow the SME to know the degree of digitization of the company and the steps to follow to improve your situation. The small business must register on the website to carry out the self-diagnosis. After registering, the SME can access the Digital Maturity Self-Diagnostic Test.



Ministerio de
Desarrollo Productivo
Argentina

The “**Programa de Apoyo a la Competitividad**” (PAC)⁵³ is an Argentine government program conducted by the Ministry of Productive Development that aims to promote the country's economic and social development. The main objective of the program is the digital transformation of small Argentine companies, with the aim of improving their competitiveness and productivity. In all cases, the small company must present a current MiPyME Certificate and, if requesting the advance payment of the Contribution, must present a guarantee. Applications are made through the Remote Procedures platform. To more information (www.argentina.gob.ar/produccion/pac). The available PACS are:

PAC Productive ICT Clusters: The small company can obtain a Non-Refundable Contribution (ANR) to finance the export strategy or development of

52 <https://indtech.ar/amdIndtech.htm>

53 Programa de Apoyo a la Competitividad (PAC) | Argentina.gob.ar

the company's ICT Productive Cluster. If the SME is part of an ICT Productive Cluster or intends to associate with other SME to start a common productive activity, the SME can request an ANR of up to \$1,500,000 to carry out the initiative. Bearing in mind that the ANR will cover a maximum of 90% of the project and the company may allocate the Cluster's products and services to export, develop ICT products and solutions to support the production of local goods, provide general and customized digitization and automation solutions or supply for the implementation of Internet of Things (IoT), Artificial Intelligence and Data Science in productive sectors of the region.

PAC Entrepreneurs for Innovation: This PAC can grant a Non-Refundable Contribution (ANR) of up to 85% to finance an innovative project or the company's venture into solutions based on the new technologies of Industry 4.0. The amount to be delivered from the ANR will depend on the level of project implementation. If you are in the ideation and/or start-up phase (building the SME's value proposition without making the first sale), the maximum is \$1,200,000. If in an early stage of development or growth, \$3,000,000 maximum. To receive the ANR, projects must have a few main objectives, such as:

- » Development of services and technological activities related to industry 4.0 and/or innovations that tend to generate changes that improve productivity and/or competitiveness in value chains and/or productive sectors.
- » Adoption of technology and/or types of innovations based on the new technologies of industry 4.0 for the generation of improvements in the productivity of the venture.
- » Creation of new product/service lines and/or expansion of productive capacity to provide products and/or provide innovative solutions that strengthen value chains and contribute to productive development.

When submitting the project, the company must choose a Specialized Entrepreneurship Support Entity (EEAE) to provide technical assistance.

PAC Kaizen 4.0: This PAC aims to grant an ANR of up to 70% to finance a project that aims to improve the productivity of SME. The value to be

delivered from the ANR will depend on the level of implementation of the project:

- » Level 1 (up to \$115k ANR): quick updates. For example: understanding the basics of Kaizen philosophy, laying the groundwork for implementing continuous improvement processes in the company, 5s method, implementation process, standardization and records.
- » Level 2 (up to \$140k ANR): Process improvements. For example: developing skills to implement Kaizen, implementing problem-solving methodologies and tools in practice and performing root cause analysis.
- » Level 3 (up to \$224k ANR): process redesign + 30% in digitization acquisitions.
- » Level 4 (up to \$335k ANR): infrastructure, strengthening management capabilities + 30% in digitization acquisitions.

Companies that are at levels 3 and 4 can also submit projects that include process digitization and consulting associated with contracts up to a maximum value of \$400,000 ANR. They may also acquire associated equipment and systems in a proportion not exceeding 30% of the total ANR and up to 60% of the value of this acquisition will be covered.

Digital transformation of PAC: With this PAC, the company can receive a non-refundable contribution (ANR) of up to 70% to finance projects that implement the digital transformation of its SME processes. It is necessary to have a project aimed at a digital transformation in the SME in order to improve business management, increase productivity and improve the efficiency and quality of processes.

The company can access technical assistance funded with an ANR of up to \$600,000. The ANR will be achieved as follows: Up to \$360,000 for technical support services. Up to 10% for the UTD that prepares the pre-diagnosis, coordinates the execution of the project with the beneficiary company and prepares the final impact report. Up to 30% may be used to purchase goods associated with technical assistance.

PAC Entrepreneurs Productive Reactivation: The company can obtain a non-refundable

contribution (ANR) of up to 85% to finance a project that contributes to the reactivation of the productive activity of a company that can contribute to the reactivation of the productive activity through the development and/or adoption of technological solutions, as well as the introduction of equipment, tools and innovations in the production process.

If the project is still in the ideation and/or start-up phase, the company can obtain financing of up to US\$550,000. If you are already in the early stages of development or growth, you may be able to access financing of up to \$2,000,000. For projects to be accepted to receive the ANR, they need to have some objectives such as:

- » Adoption of technologies and innovations to improve productivity.
- » Development of services and technological activities tending to generate innovative changes. For example: teleworking, logistics, e-commerce and electronic payment platforms and process automation.
- » Creation of new lines of products/services and/or expansion of production capacity to contribute to compliance with required protocols.

In the projects presented, technical assistance to the entrepreneur will be provided by a Specialized Entrepreneurship Support Entity (EEAE).

3.3.2 MEXICO



The Government of Mexico works to encourage digital transformation in small and medium-sized companies through investments in incentive programs. Among the programs are: Fit for Partnership and Prosoft Industria 4.0 MX.



The Mexico-German Cooperation Program, "Fit for Partnership"⁵⁴, is an initiative aimed at managers and executives of small and medium-sized Mexican companies to provide knowledge about the German market and establish lasting business relationships. Participating in the program can explore new markets through direct business contacts in several areas, including manufacturing, automotive, food, health, industry 4.0, energy, waste management, software, crafts, construction, logistics, and services.

Although the program started virtually in 2020 and 2021 due to the pandemic, in 2023, it will be offered in a more developed format that combines the advantages of virtual training with face-to-face modules. This approach will allow participants to prepare for cooperation with the German business community optimally.

Over nine months, participants will undertake approximately 200 hours of online training through German training centers, followed by two weeks in Germany for internships. The structure of program is organized as follows:

- » Induction: This step begins with registration on the MP Campus platform, through which program activities are carried out, as well as an introductory online session to the program and topics relevant to starting trade

⁵⁴ <https://www.gob.mx/se/acciones-y-programas/programa-fit-for-partnership-with-germany-217547?state=published>

negotiations with Germany and establishing first contact with support groups in program development.

- » Training: The training phase is designed as the interaction between the three main elements of the program: interactive and practice-oriented training sessions, company visits, and one-on-one meetings with German companies (B2B). The phase begins with a six-week online period. Here the main emphasis is on interactive training sessions, which impart knowledge and apply this knowledge in practice with exercises. At the same time, participants are preparing for their individual meetings with German companies. The online program is complemented by a two-week stay in Germany, which focuses on hands-on experience with German companies through group visits and one-on-one B2B meetings with your potential German partner.
- » Transfer: This phase lasts six months, during which participants work on implementing their cooperation project. It has monthly monitoring of activities by the German training center, where the exchange of knowledge and experiences between participants is through the “MP Campus” platform.
- » Networking Event: A two-day event in Mexico after completing training, certificates are handed out to participants, and the alum networks in Mexico are introduced.

To participate in the program, participants must bear the cost of the Mexico-Germany-Mexico ticket and any additional expenses arising from the extension of their stay. However, the German government will cover expenses for accommodation, meals with half board, basic insurance, and group travel under the program. Participation in the program offers participants the possibility to:

- » Develop management skills that can be useful in overcoming the economic impacts of the coronavirus pandemic.
- » Exchange of experience with German leaders in combating the effects of the pandemic;
- » Opportunity to go to Germany to follow up on virtually prepared business contacts.

To participate in the program⁵⁵, small business owners can visit the Ministry of Economy of Mexico website or the German Embassy in Mexico to find more information about the call. The small entrepreneur must fill out documents such as an application form, data protection declaration, and acknowledgment of participation. Applications must be made by sending documents by email, and those with the best applications will be invited to Mexico City to be interviewed in English.

The evaluation⁵⁶ criteria are to be SME between 10 and 199 workers, be proficient in English, present a project with collaborative potential with German entrepreneurs, and performance in the interview in English with the German representative from GIZ.



Prosoft Industria 4.0 MX⁵⁷ is a program developed by the Programa para el Desarrollo de la Industria de Software (PROSOFT) to promote economic innovation by creating and strengthening Industrial Innovation Centers⁵⁸ (CIIs) and public policies that foster the development of innovation ecosystems. The program aims to provide specialized technical human capital and services based on Information Technology (IT). The CIIs are semi-public spaces that rely on public and private investments for training, specialization, and certification of human capital, in addition to offering specialized services. CIIs can be formed in two ways: individual or consortium, and are accessible to all types of companies from different sectors to use 4.0 technologies, training, and consultancy. Its objective is to help Mexican SME to become more competitive, efficient, and innovative, contributing to the country’s economic growth. Key benefits of the initiative include:

- » Certifications;
- » Use of infrastructure;
- » Validation of proofs of concept;
- » Associations;

⁵⁵ <https://mexiko.diplo.de/mx-es/temas/wirtschaft/fit-for-partnership/878158>

⁵⁶ <https://www.gob.mx/se/acciones-y-programas/programa-fit-for-partnership-with-germany-217547>

⁵⁷ <https://www.gob.mx/se/acciones-y-programas/programa-para-el-desarrollo-de-la-industria-de-software-prosoft-y-la-innovacion-2016>

⁵⁸ <http://www.prosoft.economia.gob.mx/industria4-0.aspx>

- » Increased competitiveness;
- » Access to physical infrastructure;
- » Human capital training;
- » Development of the state ecosystem to link companies, research centers, higher education institutions, and private consultants specialized in the manufacturing sector.

However, there have been no updates on new centers and calls since 2020. As of 2019, there were 41 centers across Mexico. The movement started with the idea of expanding the information technology area (Prosoft 3.0) then centers focused on I4.0 were incorporated (approximately ten centers):

- » Intelligent industry 4.0 training and innovation center;
- » Aguas Calientes Industrial Innovation 4.0 Center;
- » Center for Innovation in Logistics 4.0;
- » Coahuila 4.0 innovation;
- » Innovative training and development center in industry 4.0 for the Nuevo Laredo industry;
- » Creation of the regional productivity center 4.0 (ceprodi.4.0) as a driver for the automotive and manufacturing sector and its supplying companies in Querétaro and El Bajío;
- » Intelligent training and innovation center for Industry 4.0;
- » Creation of the productivity and innovation center for Industry 4.0 (ceprodi -4.0) in the state of Mexico;
- » Lab i4.0: industrial innovation center for developing and integrating talents and technologies in machine-to-machine, internet of things, and big data.

To participate, the company must register as a beneficiary of Prosoft and apply for the calls that are announced on the Prosoft website.



The **Business Coordination Council (CCE)**⁵⁹ is the highest representative body of the private sector and brings together Mexico’s 14 major business organizations. It is not a governmental

⁵⁹ <https://cce.org.mx/>

entity but acts strongly to develop the Mexican industry. This council has developed a seminar program entitled: **“Las PyMEs en la era digital”**⁶⁰. The initiative aimed to equip Mexican SME with the skills and knowledge needed to compete in an increasingly digitized environment and help them grow and develop in the national and international markets. The seminars are aimed at those responsible for innovation projects in SME, investors, academics, young students, and the general public. The CCE is responsible for informing about the dates and details of the seminars, which are free of charge and transmitted through the CCE channel on *YouTube*⁶¹, with the objective that an increasing number of SME come together to adopt new processes and benefit from the technological advances to grow and prosper their businesses and communities. Among the main themes of the seminars are:

- » Challenges of innovation and technological development;
- » Industry 4.0;
- » Implementation of good practices in the adoption of new processes;
- » Promotion of training and skills development;
- » Training of highly specialized talents;
- » Cybersecurity in the digital age;
- » Artificial intelligence for strategic decision-making;
- » Applications and impact of the metaverse on companies, among others.

⁶⁰ <https://cce.org.mx/wp-content/uploads/2022/06/VF-Comunicado-No.-20-Webinar-La-importancia-de-la-innovacion-en-Pymes.pdf>

⁶¹ https://www.youtube.com/playlist?list=PLIjeoMxWAd6hXiBbq_zJWF-p3HbvL5CjFW

3.3.3 COLOMBIA



The **Ministry of Commerce, Industry, and Tourism of Colombia** has a department called the **Directorate of Micro, Small, and Medium Enterprises (MIPYMES)**⁶², which is responsible for promoting financial and non-financial policies, plans, and programs for the development of micro, small, and medium-sized enterprises. An important arm for digitalization initiatives in this department is **Colombia Productiva**.



Colombia Productiva⁶³ was created by the Ministry of Commerce, Industry, and Tourism in 2008 to promote productivity and competitiveness in the industry and face the challenges of the National Competitiveness and Productivity Policy, reinforced by the publication of the Productive Development Policy. The entity supports companies in the country through public notices and programs that improve important indicators to increase the efficiency of production processes, such as quality, human capital, and productivity. Colombia Productiva is the entity that promotes the productive transformation of companies, i.e., helping them to produce more with better quality and greater added value. The organization's actions are in line with the guidelines of the current Productive Development Policy, which establishes 90 actions framed in 7 axes: i) Transfer of knowledge and technology, ii) Innovation and entrepreneurship, iii) Human capital, iv) Financing, v) Productive chains, vi) Quality, and vii) Foreign trade.

Generally, the actions promoted by Colombia Productiva are carried out based on the following steps: the entity goes to the company, analyzes its production processes in detail, identifies its needs, and proposes improvement plans that

impact areas such as human capital, sales, production, marketing, logistics, between others. For this, they have important allies such as chambers of commerce, syndicates, SENA, mayors, and governors. Among the impacts, the most obvious is the increase in profitability and the reduction of excess costs. In addition, companies that improved their production processes could produce more, in less time, with lower costs, achieving higher sales. Other companies could certify their products and services internationally, opening the door to more export markets. Companies have also incorporated digital tools to improve and streamline their production, customer service, and marketing processes. Among Colombia Productiva's actions in line with the **digital transformation of small businesses**, we find **SENAInnova**, **Capacitate**, and **Compra Lo Nuestro**.



SENAInnova – Productividad para las Empresas⁶⁴, is a program created by SENA and Colombia Productiva to support companies and/or organizations in the productive sector with co-financing resources for the development of projects that lead to innovation, technological development, and/or sophistication of their processes, products and/or services, through the incorporation and/or transfer of knowledge and technologies, aiming at improving its productivity and competitiveness, thus contributing to the economic growth and social reactivation of the country. The 2022 call provided a resource pool of up to \$18 billion pesos to co-finance selected projects. These resources are part of SENA's contribution to the program.

Projects qualified for SENAINnova⁶⁵ can be submitted in two ways: *Individual Proponent*, who can request co-financing of up to two hundred million pesos M/CTE (US\$200,000), regardless of the size of the company. In the case of micro, small, and medium-sized companies, a minimum amount of 10% of

the project's total value must be paid in return. The other modality is the *Grouped Proponent*, where projects can request a co-financing amount of up to four hundred million pesos M/CTE (US\$400,000), regardless of the size of the company or organization of the productive sector. In turn, the executing entity must also provide a cash consideration in the minimum amount of 10% of the project's total value when it is micro, small, or medium-sized.



Capacitate⁶⁶ is a free training service from Colombia Productiva, where entrepreneurs can access more than 300 virtual training courses focused on topics such as quality, energy efficiency, human capital, and regulatory frameworks, among others, always focusing on the growth of industry and tourism national. This service responds to the challenges defined by the National Government in the Productive Development Policy, which, among others, seeks to raise the level of knowledge and qualification of the country's human capital and companies in strategic sectors for the economic and social growth of the country's regions. On this online training platform, it is possible to filter courses according to the topic sought: sectors, partners that provide training, regions of Colombia, publication theme, and year.

To help small businesses accelerate their digital transformation, some training courses seek to explain factors that must be taken into account when adopting technological solutions according to the needs of each business, such as: Integrating people and culture in digital transformation; Identifying the moments of the customer experience; Digitize the business model; Make sure technology impacts processes. To access the courses, just go to the Colombia Productiva website and click on the Capacitate menu, where you can access all the online courses in video format available on YouTube.



Compra Lo Nuestro⁶⁷ is a campaign by the Ministry of Commerce, Industry and Tourism and Colombia

Productiva that encourages business between national companies, bringing together supply and demand from the local industry. This campaign invites businessmen from all sectors to access and participate in www.compralonuestro.co, a business social network that connects companies that intend to supply and/or purchase goods, services, and raw materials.

Among the free services that the aforementioned social network has created to support companies are the 'Purchase Announcements', in which businessmen will be able to publicize their supply needs and meet potential Colombian supplier companies. 'Free access to the international bar code system' which is the most widely used system for identifying products, services, locations, and electronic exchange of information in the world. 'Agreements with financial institutions' that allows companies to send a credit request directly to the banks associated with the program, reducing processing times and costs. 'Digital acceleration and incursion into e-commerce' making available to companies a platform (**Softwhere**) developed in conjunction with Fedesoft that consolidates itself as the meeting point between companies that need technological solutions and developers who make them available.



Softwhere⁶⁸ acts as a meeting point between companies that need technological solutions and the developers that offer them. Its operation is based on three pillars. The first is the self-diagnosis and digitization plan that helps adopting companies identify the path to digital transformation with an online self-diagnosis tool. The second pillar is the search for the best technological solutions that allow companies to search for technological developments from suppliers according to the type of solution, sector, or niche they want to focus on. And the third is the publication of technological services and products where suppliers can promote their technological solutions according to the type of solution in the sector or niche they focus on. To complete the self-diagnosis plan, simply register

⁶² <https://www.mipymes.gov.co/>

⁶³ <https://www.colombiaproductiva.com/>

⁶⁴ <https://www.sena.edu.co/es-co/Empresarios/Paginas/SENA-INNOVA-2022.aspx>

⁶⁵ <https://www.colombiaproductiva.com/senainnova>

⁶⁶ <https://www.colombiaproductiva.com/capacitate>

⁶⁷ <https://compralonuestro.co/>

⁶⁸ <https://softwhere.com.co/>

and provide the requested information. After that, the platform sends the analysis of the level of Digital Maturity of the company's Processes and some recommendations to be implemented. In addition, the information is used to formulate strategies that promote the productive use of information technologies, to minimize time and risks in the processes of incorporating these solutions in companies. To search for technological solutions, just select what you want to look for in the website menu and contact the supplier right there, being able to send questions or service requirements. And to publish services and products as a technology provider, simply register on the site.



3.4 AFRICA

3.4.1 TUNISIA



Tunisia's strategic geographic⁶⁹ location and openness to the world make it an attractive destination for investment in Industry 4.0. As a regional hub for information and communication technologies, it boasts a talented pool of human resources. It provides access to various regional opportunities in Europe, Africa, and the Middle East. Therefore, the **Tunisian Government** has been actively developing strategies to promote digital transformation to capitalize on this potential. This led to the creation of the **Digital Tunisia 2020**⁷⁰, which aims to support the digitalization of all companies in the country, including small and medium-sized enterprises (SME). The development of this plan was the starting point for the creation of the **Digital Transformation Center** and the implementation of the **Make It in Africa** project. The plan incorporates various measures, such as promoting e-commerce, establishing a unified electronic portal for businesses, and digitizing government processes. Its implementation began in 2016 with a provisional budget of 70 million dinars. The key strategic pillars of "**Digital Tunisia 2020**"⁷¹ include:

- » Ensuring social inclusion and reducing the digital divide through better access to information and knowledge, democratization of access equipment as well as broadband access and implementation of very high-speed network.
- » Developing digital culture through the widespread use of ICT in educational curricula and content digitization.
- » Moving towards an e-Administration serving citizens, equitable, transparent, agile, and efficient.
- » Ensuring the reduction of unemployment and job creation in the digital and offshoring sectors, as well as the creation of national success stories.
- » Supporting the creation of added value, ensuring the sustainability of organizations and employment, supporting entrepreneurship, and stimulating innovation.
- » Improving the competitiveness of companies in all sectors by investing in ICT and positioning themselves in the digital economy.
- » Ensuring Tunisia's transition to a fully digital

state through the establishment of an appropriate regulatory framework, governance, and security environment.

To ensure the successful implementation of the Digital Tunisia 2020, the Tunisian Government has established a **National Strategic Council**, which is led by the head of the Government and involves representatives from the public and private sectors, as well as civil society. Additionally, a steering committee chaired by the **Minister of Digital Economy** supports the Council. The goals set are allocated to departments in their respective areas of operation. The main strategic goals are:

- » Increase the contribution of the IT sector to economic production.
- » Create an additional 25,000 jobs annually.
- » Increase the IT sector's exports fivefold, establishing Tunisia as a leading international location for IT services.



The **Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH** started supporting the **Ministry of Information and Communication Technologies and Digital Transformation (MTCTD)** of Tunisia in 2019 on behalf of the **German Federal Ministry for Economic Cooperation and Development (BMZ)**, in line with the development of **Digital Tunisia 2020**. The objective of this partnership is to enhance the Information and Communication Technology (ICT) sector in Tunisia and throughout the continent by promoting job creation and training, as well as supporting transparent and effective administration. In support of the BMZ's special initiative for Training and Employment, Invest for Jobs, GIZ is developing a "**Digital Transformation Center**"⁷² in Tunisia to work collaboratively with relevant partners in implementing the country's digital strategy. The transformation strategy focuses on various areas, including start-up support, industry 4.0, GovTech, digital infrastructure, cybersecurity, and digitization of multiple sectors, including digital finance, e-commerce, and healthcare.

⁶⁹ IST-África (ist-africa.org)

⁷⁰ TICAD 8 - Site oficial - Tunísia Digital

⁷¹ <https://www.giz.de/en/worldwide/86916.html>

⁷² <https://www.bmz-digital.global/en/initiatives/digital-transformation-center-tunisia/>

To support the Ministry of Industry's goal of achieving Industry 4.0, have established Digital Transformation Center in Sousse and Sfax to aid at least 200 companies using digital solutions in the next two years. Since its creation in 2019, the center, now known as "The DOT" after merging with a project of Expertise France in June 2021, has a physical location where it offers various services, including the AI Hub and the GSMA Mobile Solution Hub. With over 50 strategic partnerships with European companies, the center promotes improved working conditions and quality in the ICT sector in Tunisia and supports the implementation of Tunisia's Start-up Law.

- » **AI Hub**⁷³ - The service offered at The DOT Digital Transformation Center provides access to artificial intelligence and machine learning technologies for the emerging ecosystems in Tunisia, including startups, academic institutions, and companies focused on developing and implementing AI technologies across various industries. The aim of the AI Hub is to promote the development of the national AI strategy and ensure its implementation.
- » **GSMA Mobile Solution Hub**⁷⁴ - The service offered at The DOT Digital Transformation Center provides access to artificial intelligence and machine learning technologies for the emerging ecosystems in Tunisia, including startups, academic institutions, and companies focused on developing and implementing AI technologies across various industries. The aim of the AI Hub is to promote the development of the national AI strategy and ensure its implementation.

Furthermore, it provides digital solutions to help the public sector implement transparent and efficient administration. Integrated into the pan-African entrepreneurship initiative, Make-IT in Africa, the project aims to raise awareness of the opportunities and risks of digitization and disseminate information about available technologies.

⁷³ <https://www.instadeep.com/2021/11/instadeep-and-ai-hub-announce-collaboration-to-benefit-tunisian-ai-ecosystem/>

⁷⁴ <https://www.gsma.com/mobilefordevelopment/ecosystem-accelerator/the-gsma-mobile-innovation-hub/>

The Digital Transformation Centers are expected to serve as smart industry schools where companies can gain a practical understanding of technology operations. The Centers are also hiring engineers to assist SME with their digital transformation. Furthermore, the project aims to promote the creation of new businesses, improve youth employability, and enhance company competitiveness by providing access to digital services and technologies. The center comprises two main pillars:

- » **Digital4Jobs** - which aims to support the creation of new companies, with a specific focus on providing access to demand-driven services and technologies, relevant training courses, and market access. This project is part of the pan-African technical entrepreneurship initiative called Make-IT in Africa, which provides training and support to over 100 start-ups in Tunisia. Moreover, the project is committed to creating a sustainable ecosystem that fosters digital innovation in the Tunisian economy, primarily targeting the manufacturing and agriculture sectors.
- » **Digital4Reforms** - This pillar focuses on enabling the implementation of projects that improve digital solutions for the Tunisian public and harnesses Tunisia's resources in the field of digital administration. GIZ supports the development of action plans in important areas such as cybersecurity, smart mobility, and artificial intelligence. By 2023, the Digital4Reforms program aims to launch projects that enhance digital solutions for the Tunisian public and provide training for employees in digital administration, with a special focus on regions, youth, and women.

Through the Digital Transformation Center, small businesses receive support in training and education programs, consulting, accessing digital tools and platforms, and incubating and accelerating programs. The training and education programs teach small businesses about digital technologies and how to leverage them to improve their operations. These programs may include workshops, seminars, and online courses that cover topics such as social media marketing, e-commerce, digital branding, and cybersecurity. The consulting Services aim to help small businesses to develop

and implement digital strategies. These services may include needs assessments, technology audits, and recommendations for specific digital tools and platforms that can help improve business processes and drive growth. Access to Digital Tools and Platforms supports small businesses in choosing to streamline operations, automate processes, and reach new customers. For example, a center may provide access to cloud-based accounting software, digital marketing platforms, or e-commerce solutions. Incubation and Acceleration Programs aim to support startups and entrepreneurs in the digital space. These programs provide mentorship, funding, and access to resources to help startups grow and succeed.

The two Digital Transformation Centers are supported by private initiatives, allowing free services, particularly for SME that require zero initial costs to take their first steps toward digital transformation. This helps SME become more aware of the potential for growth using technology. The centers also assist these companies in finding financing from banks and financial institutions. Small businesses can access Digital Transformation Centers through online resources such as websites or portals, in-person visits, referrals from government agencies, business associations, and other organizations, or through networking events and conferences. These sources provide access to information, training materials, and other resources related to digital transformation.



The pan-African initiative for technology-driven entrepreneurship, "Make-IT in Africa"⁷⁵ has trained and supported over 100 early-stage companies in Tunisia. The activities aim to improve access to financing and markets and business skills in the digital economy. A cornerstone in cooperation with the "Orange Digital Centre", which provides Tunisian youth and startups with digital skills to increase their employability. GIZ will also help develop action plans in key areas such as cybersecurity, smart mobility, and artificial intelligence. A particular focus will be given to the needs of regions, youth, and

⁷⁵ [giz2020-en-digitalzentrum-tunesien.pdf](https://www.giz2020-en-digitalzentrum-tunesien.pdf)

women. By 2022, the project will create projects through the *Digital4Reforms* program to improve digital solutions for the Tunisian public and train Tunisian officials in digital management. The project also contributes to creating a sustainable ecosystem that facilitates digital innovation in Tunisia's economy, focusing on manufacturing and agriculture. It increases awareness of the opportunities of digitization and the risks of introducing digital solutions too late or too slowly. The project disseminates information on available technologies and applications, their benefits, conditions, and relevant impacts.

The project aims, in particular, to improve access to financing and markets and management skills in the digital economy. At the same time, the two Digital Transformation Centers are supported by private initiatives, which allow for free services, especially for SME that need zero initial costs to take their first steps toward digital transformation. Thus, helping SME to become more aware of their growth potential with the use of technologies. The centers also assist these companies in finding financing from banks and financial institutions.

To do so⁷⁶, the center offers small companies trustworthy support for reaching potential partners, acquiring the necessary skills, and establishing access to partners, investors, mentors, and networks. To facilitate the connection of stakeholders and to support hubs or associations in providing start-ups and other ecosystem actors high-quality services, such as co-working spaces, exchange platforms, or the testing of new technologies, the center promotes the development of networks (e.g., investor networks). Together with the partners, it provides innovation enablers with strategic support, relevant learning tools, advice on resilience building, and more. To connect public and private sector partners in Africa and Europe, it facilitates peer learning and networking. It creates visibility, for example, through target-group-specific dialogue formats or publicly accessible information on start-up funding policy.

⁷⁶ <https://www.giz.de/en/downloads/giz2021-en-make-it-in-africa.pdf>



4 BENCHMARKING ANALYSIS OF INTERNATIONAL INITIATIVES

The theoretical lens of **Diffusion of Innovation** was employed to categorize the identified initiatives. It should be noted that certain initiatives were excluded from the classification process as they did not align with the project's scope, i.e., diffusion of digital technologies and AI in small industrial firms. Specifically, initiatives that were not specifically targeted towards small companies (e.g., startups) or those unrelated to the industrial transformation sector (i.e., technology development) were not considered.

Based on the principles of Diffusion of Innovation, Table 1 showcases the classification of 39 initiatives from various countries worldwide. These initiatives have been categorized according to the stages of innovation diffusion, namely **Awareness (A)**, **Implementation (I)**, and **Maintenance (M)**. The classification provides insights into the level of adoption and sustainability of these initiatives within their respective contexts.



TABLE 1 – CLASSIFICATION OF INITIATIVES THAT AIMS DIGITALIZATION OF SMALL INDUSTRIAL COMPANIES.

Initiative	Description	Classification
Sebraetec (Process Optimization with Connectivity - IoT)	The initiative consists in a consulting service for the alignment of the proposal, mapping, and setup of the production process, installation and configuration for data collection and connectivity, and implementation of tools and IoT technology.	A I M
Alavanca Digital	The program aims to subsidize the contracting of specialized technical services to support the digital journey of micro and small enterprises (MSE) through acculturation and the funding of specialized technological services.	A I M
Polo Sebrae de Indústria	The initiative involves conducting pilot implementation projects with small firms and the dissemination of knowledge through white papers and videos focused on technological solutions for MSE.	A I M
Brasil Mais Produtivo	The initiative supports SME with subsidized digital transformation services and projects to develop and adopt Industry 4.0 solutions.	A I M
The Chamber of Commerce and Industry	The Chamber helps SME digitally transform through training programs in digital skills and knowledge, consulting services, organizing events, and connecting SME with digital service providers.	A I M
Digital Economy Strategy	The program includes investments in digital infrastructure, the development of advanced technologies, and the training of skilled labor in technology.	A I M
ANO Digital Economy	It serves as a platform for business dialogue to form and coordinate the activities of working groups and competence centers for programmatic areas.	A I M

Caption: A Awareness I Implementation M Maintenance

Initiative	Description	Classification
Credit Linked Capital Subsidy Scheme for Technology Upgradation (CLCSS)	The program aims to facilitate small companies' modernization and technological updating, providing subsidies for purchasing advanced machinery and equipment.	A I M
Digital Services Facilitation through Aggregation Services	The platform simplifies registration processes, obtaining licenses and certifications, provides digital skills training, and facilitates the acquisition of ICT Enabled Digital Services.	A I M
SEDA Technology Programme	Among the program's actions is access to the Technology Transfer Fund, which supports SME in the manufacturing sector in acquiring innovative technology and improving production and intellectual property. In addition, forums and competitions are held to share business knowledge and skills.	A I M
Technology Stations Programme (TS)	TS offer technology-based non-financial services through transfer centers hosted at Higher Education Institutions. The program offers testing, rapid prototyping, consulting, process improvement, research and development, technology demonstration, and training.	A I M
Digital SATion	A training platform that seeks to demystify the fourth industrial revolution.	A I M
Black Industrialist Support and Gazelle programs (DTIC + Microsoft)	Assistance in developing a customized digital transformation strategy focused on improving operational efficiency and technical sustainability in the Fourth Industrial Revolution (4IR).	A I M
Digital Transformation Center (Digital Tunisia 2020)	Through the Digital Transformation Center, small companies receive support in training and education programs, consulting, access to digital tools and platforms, and incubation and acceleration of programs. The centers also help these companies find financing from banks and financial institutions.	A I M

Caption: A Awareness I Implementation M Maintenance

BRAZIL

RUSSIA

INDIA

SOUTH AFRICA

TUNISIA

GERMANY

Initiative	Description	Classification
Mittelstand-Digital Innovation Hubs (Mittelstand-Digital)	At the Mittelstand-Digital Innovation Hubs, SME receive guidance through expert knowledge, workshops, training sessions, demo centers, discussions, networking, information dissemination, and practical digitalization examples.	A I M
Digital Now investment grant programme (Mittelstand-Digital)	Provides funding for digital technologies and skills to companies in any industry with a digitization project.	A I M
Digital Jetzt Program	Provides funding for companies that have had their project approved to invest in technologies aligned with their digitization plan. They also offer employee training services to identify digitization opportunities and initiate new investments in technology.	A I M
Go-digital	Funded companies can obtain expertise and support from authorized consultancies in process digitization, digital market development, and IT security.	A I M
Plattform Industrie 4.0	The platform has news, documents, events, and working groups focused on Industry 4.0 to identify relevant trends and developments in the manufacturing sector in pursuit of a common understanding of Industry 4.0.	A I M

EUROPEAN UNION

Enterprise Europe Network (EEN)	Provides assessment of scanning needs and potentials, basic scanning support, and consulting services. They work in joint activities and events with EDIHs and indicate suppliers for specialized services.	A I M
European Digital Innovation Centers (EDIHs)	They promote access to technical knowledge, tests, and the possibility of testing technologies before investing. They provide financial advisory services, training, and skills development for digital transformation.	A I M
European Digital Innovation Centers (EDIHs)	The I4MS platform offers a database with training in several technological applications in manufacturing. Through the initiative, SME can also apply for financial and technological support. SME can also use the infrastructure provided by I4MS to try out different innovative technologies and services and evaluate their benefits before investing in them.	A I M

Caption: A Awareness I Implementation M Maintenance

EUROPEAN UNION

Initiative	Description	Classification
Digital Europe Programme	The Digital Europe Program aims to enhance digital capabilities and encourage the adoption of digital technologies through funding. Each call for program proposals has specific areas of focus, which may include funding for software creation, technology implementation and testing, and training. The program emphasizes developments in areas like artificial intelligence, cybersecurity, advanced digital skills, and supercomputing to ensure digital technologies' widespread usage benefits society and the economy.	A I M
Digital Skills and Jobs	The Digital Skills and Jobs Coalition is a multi-stakeholder partnership to promote digital jobs and skills. Organizations can join the coalition by making pledges to take actions within their range of influence that promote jobs and digital skills. These engagements might include training programs, certifications to help SME upskill their workforce and adapt to digital transformation.	A I M
EIT Digital	EIT Digital is an ecosystem that strives to promote digital innovation in Europe. EIT Digital offers various programs such as master's, doctoral and entrepreneurship programs to assist students and professionals in developing skills in digital technology. European SME undertaking digital transformation can benefit from EIT Digital services, which include offerings such as access to a network of partners,	A I M

ARGENTINA

Plattform IoT (INDTech 4.0)	The platform aims to provide SME with a device management tool to try and test digital transformation products and solutions.	A I M
Technological Argentina (INDTech 4.0)	Through this channel, it is possible to learn about Startups 4.0, news about events, fairs, and other actions that enhance the supply and demand of I4.0, successful cases of technological implementation in small companies, available financing, and workshops to enable digital transformation.	A I M
AMD INDtech (INDTech 4.0)	Digital Maturity Self-Diagnosis Tool that allows SME to know the company's degree of digitization and the steps to follow to improve their situation.	A I M

Caption: A Awareness I Implementation M Maintenance

Initiative	Description	Classification
PAC Entrepreneurs for Innovation (Programa de Apoyo a la Competitividad - PAC)	Financing for innovative projects that seek adoption of technology and/or types of innovations based on the new technologies of Industry 4.0 for the generation of improvements in the company's productivity. The SME needs technical assistance from the entrepreneur through a Specialized Entrepreneurship Support Entity (EEAE).	A I M
PAC Kaizen 4.0 (Programa de Apoyo a la Competitividad - PAC)	Companies in levels 3 and 4 can receive funding for process digitization projects and consultancy associated with contracts. They can also purchase associated equipment and systems.	A I M
PAC Digital Transformation (Programa de Apoyo a la Competitividad - PAC)	Financing for projects that seek to implement the digital transformation of SME processes.	A I M
PAC Entrepreneurs Productive Reactivation (Programa de Apoyo a la Competitividad - PAC)	Financing for the reactivation of productive activity through the development and/or adoption of technological solutions. The PME also can use the funding to introduce equipment, tools, and innovations in the production process. The SME needs technical assistance from the entrepreneur through a Specialized Entrepreneurship Support Entity (EEAE).	A I M

Fit for Partnership	Over nine months, Mexican entrepreneurs complete approximately 200 hours of online training at German training centers, followed by two weeks in Germany for internships.	A I M
Prosoft Industry 4.0 MX	The program aims to provide specialized technical human capital and services based on Information Technology (IT) through Industrial Innovation Centers (CIIs) that rely on public and private investments for training, specialization, and certification of human capital and offering specialized services.	A I M
Business Coordination Council (Consejo de Coordinación Empresarial - CCE)	It is a seminar program entitled "Las PyMEs en la era digital," available on the CCE YouTube channel that disseminates knowledge for SME to compete in an increasingly digitized environment and help them grow and develop in national and international markets.	A I M

Caption: A Awareness I Implementation M Maintenance

Initiative	Description	Classification
SENAInnova –Productividad para las Empresas (Colombia Productiva)	Co-financing for developing projects that lead to innovation, technological development and/or sophistication of its processes, products and/or services through the incorporation and/or transfer of knowledge and technologies.	A I M
Capacitate (Colombia Productiva)	Colombia Productiva's free training service allows entrepreneurs to access more than 300 virtual training courses to help small businesses accelerate their digital transformation.	A I M
Softwhere (Colombia Productiva)	A platform that acts as a meeting point between companies that need technological solutions and the developers that offer them. In addition, it also provides an online self-diagnosis tool that helps adopting companies identify the path to digital transformation.	A I M

Caption: A Awareness I Implementation M Maintenance

4.1 AWARENESS A

Awareness plays a crucial role in the diffusion of digitalization among small firms. It encompasses the degree to which potential adopters are **knowledgeable about the existence of digital technologies** and their potential benefits. Within the framework of diffusion of innovation theory, awareness serves as the initial step in the adoption process. Before individuals or organizations can embrace digital technologies, they must first **become aware of their presence, comprehend its nature, and grasp its functionality**.

In this research, out of the 39 global initiatives examined, 32 were identified as efforts to enhance awareness among small companies regarding the adoption of digital technologies. The aim of the initiatives is to ensure that small companies are well-informed and equipped to embrace digitalization effectively. These initiatives encompass various activities such as:

- » providing training programs to enhance digital skills and knowledge,
- » offering workforce qualification programs tailored for working with technologies,
- » delivering consulting services,
- » organizing events to facilitate knowledge sharing and business skills development,
- » establishing dialogue platforms that connect SME with digital service providers, and
- » providing access to pertinent information related to Industry 4.0.

Small firms indeed face greater challenges in becoming aware of digitization compared to larger companies. Unlike large firms that often have dedicated departments or teams focused on technological innovation, small firms typically have limited resources and all employees involved in administrative and operational tasks. As a result, small firms may have limited time and capacity to stay updated on emerging technologies and their potential benefits. Recognizing these challenges, governments and policymakers around the world have made significant efforts to create awareness among decision-makers in small firms. Public policies and initiatives aim to bridge the information gap by providing targeted support, training programs, and access to resources that

can help small firms understand the importance of digitization and its potential impact on their performance and competitiveness. By increasing awareness and knowledge about digitization, policymakers seek to empower small firms to make informed decisions and embrace digital technologies to drive their growth and success.

However, the findings of this research indicate that the majority of the identified initiatives focused on raising awareness among small companies, highlighting an imbalance in the distribution of initiatives aimed at fostering digital transformation. This observation aligns with the argument put forth by Dedehayir et al. (2017)⁷⁷, suggesting that awareness-building activities tend to be more prevalent among innovators and early adopters, such as small companies. While it is crucial to invest in disseminating knowledge about Industry 4.0 and digitalization to support the development of SME, it is equally important to ensure a comprehensive diffusion of innovation. This entails planning initiatives with a long-term perspective that encompass all three elements of diffusion of innovation, namely awareness, implementation, and maintenance. By considering the complete diffusion process, initiatives can effectively drive the digital transformation of small companies and maximize their benefits.

4.2 IMPLEMENTATION I

Implementation plays a crucial role in the process of digitalization among small firms. It involves the actual adoption and utilization of digital technologies by these firms. Implementation marks the **transition from a theoretical concept to a practical reality**, where the focus is on integrating the technologies into the firms' existing systems and workflows. During the implementation phase, small firms need to **learn how to effectively and efficiently use the digital technologies** they have adopted. This entails acquiring the necessary knowledge and skills to leverage the technologies' functionalities and

⁷⁷ Dedehayir et al. (2017) - *Innovators and early adopters in the diffusion of innovations: a literature review* - <https://doi.org/10.1142/S1363919617400102>

benefits. Additionally, successful implementation requires seamlessly **integrating the technologies into the firms' daily routines**, ensuring that they become an integral part of their regular operations.

Again, small firms operate under different circumstances compared to medium or large firms. Unlike large firms, which often have dedicated automation departments staffed with expert technicians, small firms typically have limited resources, with at most one or two individuals responsible for maintenance tasks. This distinction necessitates a different approach when it comes to digital technologies for small firms. For them, it is crucial that digital technologies are designed to be simple and user-friendly. Ideally, these technologies should be plug-and-play solutions that can be easily integrated into existing equipment without requiring extensive installation or complex configurations. Small firms typically cannot afford expensive installations or invest in highly specialized technical expertise. Moreover, usability is crucial for small firms when it comes to digital technologies. Implementing new software or tools may necessitate employees to acquire new skills, modify work habits, or adjust to different communication methods. Complex technologies that are challenging to use can result in mistakes or even abandonment, particularly in cases where the workforce lacks digital proficiency. Thus, digital technologies designed for small firms should prioritize simplicity and user-friendliness.

This research has identified 17 noteworthy initiatives that are specifically designed to support small entrepreneurs in the adoption and utilization of digital technologies. These initiatives play a crucial role in providing valuable assistance to small businesses by offering various support mechanisms, such as:

- » Providing subsidies to help small firms acquire and implement technologies without the need for repayment.
- » Offering access to financing options with subsidized fees, making it more affordable for small businesses to invest in digital technologies.
- » Provide consultancy and training services on a free or subsidized basis and to facilitate the implementation process, usually through

Institutes of Science and Technology or associated institutions.

- » Offering promotional and facilitated values for small companies to invest in technology.

One significant observation is that the majority of the initiatives discovered in this research primarily operate in the realm of investment, financing, and subsidies. These programs aim to facilitate the acquisition and implementation of digital technologies, enabling small businesses to improve their operational processes, enhance the quality of their products or services, and ultimately boost their overall competitiveness.

By providing financial support and resources, these initiatives actively contribute to reducing the financial barriers that often hinder small businesses from fully embracing digital transformation. Moreover, the inclusion of training programs helps to address the knowledge and skills gaps that may exist within the workforce of these small firms, ensuring that employees are equipped with the necessary capabilities to effectively utilize and leverage digital technologies. Furthermore, these initiatives recognize the importance of providing access to the required infrastructure, such as high-speed internet connectivity and digital platforms, which are vital for small businesses to effectively adopt and integrate digital technologies into their day-to-day operations.

According to Ricci et al. (2021)⁷⁸, small companies encounter both managerial and financial challenges when it comes to adopting Industry 4.0 technologies. These challenges can include limited resources, lack of digital skills, and difficulties in integrating new technologies into existing processes. However, the research findings indicate that various initiatives have been established to address these limitations, showing that countries and organizations are taking steps to enable the implementation of these technologies in small firms. The existence of these implementation initiatives

⁷⁸ Ricci et al. (2021) - *External knowledge search, opportunity recognition and industry 4.0 adoption in SME* - <https://doi.org/10.1016/j.ijpe.2021.108234>

is an encouraging sign that small companies are starting to recognize the benefits of digital technologies and are taking proactive measures to acquire the necessary digital skills and resources. Participating in training programs, accessing subsidies and financing options, and receiving support in acquiring and implementing digital solutions can help small firms overcome barriers and initiate their digital transformation journey. However, to further advance and increase their digital maturity, SME should also focus on sharing information about these technologies with their partners, exploring new digital opportunities and trends, and consistently monitoring and evaluating the outcomes of their digital initiatives (Ricci et al., 2021; Müller, 2021⁷⁹).

4.3 MAINTENANCE M

Maintenance plays a crucial role in the diffusion of digital technologies after their implementation. It involves the **ongoing use** and **support** of the innovation by individuals or organizations. The maintenance phase is essential as it determines the long-term success and sustainability of the implemented digital technologies. During the maintenance phase, users continue to utilize the technologies and may provide valuable feedback on their performance, suggesting improvements or adjustments to better meet their specific needs.

Maintenance is particularly important for technologies requiring ongoing support or a long lifespan. For example, a software program may require regular updates and maintenance to address security vulnerabilities or to ensure compatibility with new hardware or operating systems. Thus, technology providers behind the technology also plays a role in ensuring its continuous functionality and relevance. This may involve providing regular updates, addressing technical issues, and offering ongoing technical support to users. Because of this, **digital technologies offered as-a-service** could be better solutions for small firms. By acquiring a subscription, small firms have the guarantee from technology providers that digital technologies remain effective, up-to-date, and aligned with evolving business requirements (Marcon et al., 2022⁸⁰).

Maintenance is indeed a crucial aspect of the diffusion of innovation process, as it ensures the sustained impact and success of the innovation over time. However, in the context of the countries analyzed in this research, it is notable that **there is a lack of specific initiatives focused on maintenance** in the diffusion of innovation process for small companies. This finding can be attributed to two main reasons. Firstly, the maturity stage of small companies in terms of digital technology adoption plays a role. **Small firms around the world may still be in the early stages of incorporating digital**

technologies into their operations, and the focus of policy makers may be primarily on the initial implementation and adoption of these technologies. As a result, the emphasis may not yet be placed on the long-term maintenance and support aspects. Secondly, there may be a **lack of follow-up on implementation initiatives**. While there are initiatives to support the adoption and implementation of digital technologies, the attention may shift away once the initial implementation is completed. The absence of dedicated initiatives for maintenance suggests that there may be a gap in ensuring the ongoing support and optimization of these technologies within small firms.

Studies such as Li (2022)⁸¹, Borštnar (2021)⁸², and Costa (2018)⁸³ highlight that many small companies are still in the early stages of digital transformation and would benefit from support and resources to advance their digital maturity. This low level of maturity can pose challenges, as **small firms may discontinue the use of adopted technologies** and fail to realize their benefits. Public policies can play a crucial role in supporting digital transformation in small companies. These policies typically focus on providing financial, technical, and regulatory support to help small firms overcome

barriers to digital transformation and achieve business growth, as discussed in studies by Chen (2021)⁸⁴; and Rupeika-Apoga (2022)⁸⁵. Based on our research findings, we propose that **implementation initiatives should be complemented by maintenance initiatives** to foster the effective and continued use of adopted technologies by small companies. Although two Brazilian initiatives contemplate the maintenance stage, they are still in the initial stages, and the results of the implementations are still not clearly perceived. Thus, while implementation initiatives support the initial adoption and integration of digital technologies, maintenance initiatives would ensure ongoing support, updates, and optimization of these technologies. By creating a comprehensive ecosystem of support, including both implementation and maintenance initiatives, small companies can overcome challenges related to their digital maturity, sustain the use of adopted technologies, and fully realize the benefits of digital transformation. This integrated approach would contribute to the long-term success and competitiveness of small firms in the digital era.

79 Müller et al. (2021) - The role of absorptive capacity and innovation strategy in the design of industry 4.0 business Models - A comparison between SME and large enterprises - <https://doi.org/10.1016/j.emj.2020.01.002>.

80 Marcon, É., Marcon, A., Ayala, N.F., Frank, A.G., Story, V., Burton, J., Raddats, C. and Zolkiewski, J., 2022. Capabilities supporting digital servitization: A multi-actor perspective. *Industrial Marketing Management*, 103, pp.97-116. <https://doi.org/10.1016/j.indmarman.2022.03.003>

81 Li (2022). Evaluation of Digital Transformation Maturity of Small and Medium-Sized Entrepreneurial Enterprises Based on Multicriteria Framework - <https://doi.org/10.1155/2022/7085322>

82 Borštnar (2021). Multi-Attribute Assessment of Digital Maturity of SME - <https://doi.org/10.3390/electronics10080885>

83 Costa (2018). A Proposed Framework to Identify Digital Transformation Maturity in Small Industries - <http://dx.doi.org/10.3384/ecp1815630>

84 Chen (2021). Role of Government to Enhance Digital Transformation in Small Service Business - <https://doi.org/10.3390/su13031028>

85 Rupeika-Apoga (2022). Digital Transformation of Small and Medium Enterprises: Aspects of Public Support - <https://doi.org/10.3390/jrfm15020045>





5 CONCLUSIONS AND DIRECTIONS

This document summarizes the benchmarking findings highlighting digitalization initiatives implemented in small companies across various regions, including the BRICS countries, Tunisia, Germany, the European Union, Argentina, Mexico, and Colombia. The results show that most digitization initiatives in small companies are still in the early stages of the diffusion of innovation process, which comprehends the awareness stage involving training in digital skills and knowledge, workforce qualification, consulting services, organization of events, and dialogue platforms. Furthermore, initiatives that have reached the implementation stage are more focused on investment, financing and subsidies for the acquisition and implementation of technology. Except for two initiatives in Brazil, it was observed that there is a lack of initiatives focused on the maintenance of digital technologies within small companies. These results can be attributed to the current stage of maturity of small companies in digital transformation. These companies are still learning about the technology and its benefits, so most initiatives focus on awareness. Initiatives focused on implementation often rely on funding as a means to overcome the barrier faced by decision-makers in small firms. Although digital technologies may not be inherently expensive, subsidies and funding provide the necessary support to facilitate initial implementation. The goal is to create a critical mass of early adopters,

which can then inspire other firms to follow suit without the need for government funding. By demonstrating the benefits and success of digital technologies, it is expected that a self-sustaining momentum will be created, driving wider adoption among small businesses.

Germany tops the list among countries that have successfully digitized their small businesses, with both awareness and implementation initiatives, which are well-structured and progressing well. Among the practices in Germany, we highlight the *Mittelstand-Digital 4.0* that achieves small companies using centers of excellence that offers information, guidance, and funding for small companies to develop their digital transformation. Another inspiring initiative is the *Digital Jetz Program* which provides funding and consultancy to small companies to build their digitization plan and initiate new investments in technology. Although these two initiatives are well structured and provide excellent support to small companies, they still do not contemplate the three stages of innovation diffusion. For these initiatives to fully meet the diffusion of innovation process in small companies, some practices must be aligned with the maintenance stage in which the small company that implemented the technology receives support and monitoring its results.

To ensure that small businesses make the most of these technologies, initiatives must cater to the three stages of innovation diffusion - awareness, implementation, and maintenance. In this way, initiatives that seek to develop small companies in their digitization process must follow their path from beginning to end (from awareness to maintenance). For this to happen, the same initiatives can be divided into three stages, where each stage develops a part of the innovation diffusion process. Through this strategy, it is possible to structure the development of small companies towards digitalization and make room for companies in different stages of maturity to benefit from the initiative. In addition, there must be a reference location for the initiatives that contemplate the three development stages, such as centers of excellence or hubs. Partnerships are also important for building an initiative encompassing the three stages, such as universities, consultancies, and technology providers.

In general, each of the stages of the initiative should contain the following elements:

- » Awareness: educating small companies about the benefits of the technology sharing knowledge through workshops, training sessions, demo centers, discussions, networking, disseminating information, and

- using practical examples on digitization.
- » Implementation: providing funding, subsidies, access to infrastructure, and consultancy for integration of technologies.
- » Maintenance: evaluation of results, and ongoing support for sustainable technology adoption.



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