



European Digital Industry Alliance

D1.1 High level analysis of the digital industry global value chain

DIA – European Digital Industry Alliance

Action number: 783390



This report (D1.1 High level analysis of the digital industry global value chain) was funded by the European Union's COSME Programme (2014-2020)

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Summary

The deliverable **D1.1-High level analysis of the digital industry global value chain** is a public document delivered in the context of **WP1 State of the art and basis for collaboration** for DIA project.

The objective of this deliverable is to:

- Analyse the **main trends in the digital industry global value chain** (technologies, use cases, main industrial areas, key actors, trends);

On the basis of the study of existing literature (reviews, magazines, white papers, consulting companies reports...) on the digital industry, an analysis of the technologies, use cases, main industrial areas, key actors, and market trends has been performed.

The objective has not be carry out an in-depth analysis of all technologies and use cases since the global value chain of the digital industry is immense, and concerns many sectors, from the automotive to the aerospace industry going through utilities and chemicals...However, this high level analysis has set the scene and provide each cluster of the consortium both with a contextual framework to carry out the following project activities as well as a benchmarking data to be able to position themselves within this global value chain.



1 Digital industry global value chain in Europe

Global value chain (GVC) is the concept that captures the accelerating process of globalisation and fragmentation of production. Numerous other terms are used in the literature to reflect on this process, referring to firm- level strategies, such as: “vertical specialisation, outsourcing, offshoring, internationalisation of production, international production sharing, disintegration of production, multistage production, intra-product specialisation, production relocation, slicing up the value chain, and international segmentation of production.

A value chain describes the full range of activities that companies engage in to bring a product (or a service) from its conception to its end use and beyond. This includes the entire sequence of value creation –from design, to supply with input materials, production, marketing, distribution, post -sales support for the final consumer and disposal after use activity, particularly in the context of green and sustainable growth.

Value chains contain fragmented, modularised activities across input-output markets, and describe interconnected industrial processes. They are typically presented as the sequence of: product (service) design, supply with input materials, production, marketing, distribution, post-sales services to consumers, and disposal after use.

The digital transformation of industry is creating tremendous opportunities for Europe – and confronting it with huge challenges. The possibilities opened up by connected, more efficient production and new business models are highly promising, yet the risks are equally dramatic. By 2025, Europe could see its manufacturing industry add gross value worth 1.25 trillion euros – or suffer the loss of 605 billion euros in foregone value added.

The digital transformation of industry is also driving a radical structural transition in Europe's economies. New data, connectivity, automation and the digital customer interface are challenging existing value chains. Companies must take a long, hard look at their products and skill sets. And they have to improve their digital maturity if they are to recognize new opportunities, develop suitable offerings and get them to market quickly.

The digital transformation of industry demands concerted action within Europe. The regulatory framework must be harmonized, with a new weighting given to relevant issues. At the same time, a powerful, no-gaps information and communications infrastructure is needed if European industry is to remain competitive. As standards are shaping our digital future, companies and governments need to get engaged seriously in their global definition.

The digital transformation is also permeating every link in the industrial value chain, from logistics through production to service provision. We understand the digital transformation as the seamless, end-to-end connectivity of all areas of the economy, and as the way in which the various players adapt to the new conditions that prevail in the digital economy. Decisions made in connected systems affect data exchange and analytics, the calculation and assessment of options, the initiation of actions and their consequences.

The key areas in which action is needed are these:



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DIGITAL MATURITY. Top priority must be given to raising awareness among companies and mobilizing them, because many firms see digitization primarily as a way to boost efficiency. To identify and realize these opportunities, companies need to become more digitally mature.

COMMON STANDARDS. The rules of the game in a given industry play a vital part if companies are to translate their specific capabilities into competitive advantages. European companies must therefore move quickly to define these standards, working together to create suitable platforms for the sharing of ideas, knowledge and experience.

POWERFUL INFRASTRUCTURE. A robust infrastructure forms the backbone of a connected economy. The success of the digital transformation hinges on no-gaps broadband networks and the guarantee of a high quality of service for mission-critical applications. Plant and machinery must be connected as extensively and securely as possible.

PAN-EUROPEAN COORDINATION. Success in the digital economy is equally dependent on cross-border collaboration. As part of a harmonized EU-wide approach, the aim is for a European economic alliance to encourage the development of clusters, cooperative ventures and syndicates or associations, bringing the skills and capabilities that are spread across Europe. This kind of European cooperation would interconnect all relevant developers and providers of digital solutions, from start-ups to global players, from garage firms to high-tech laboratories, thereby concentrating the stimulus needed to drive new developments and innovative business models.

There are two fundamental principles associated with value chains. First, this is the specialisation and division of labour between firms, and second – this is the interconnected capabilities across firms that link flows of resources and value added across boundaries. Division of labour is an old and classical concept used by economists to model optimisation of manufacturing and production process. The theory of the firm has acknowledged that internal specialisation and organisational structuring of activities within the firm enhances performance and maximises efficiency of resource utilisation.

The same notion of specialisation and organisational structuring of activities stands also in the foundations of value-chains. In the same way as economists sought greater efficiency and maximisation of resource utilisation, strategists are now seeking optimisation of value-added processes and flows inside and across firms. Value chain theory explains the internal structuring of activities inside firms in two main dimensions – primary activities, or essential and interlinked operations that enable a firm to process inputs into outputs, and secondary activities, or organisational services that support the primary process. The value system concept refers to cross-sectoral and inter-industry connectivity in the economy, where inter-related activities and business-to-business (B2B) markets dominate the landscape.

Value chains are determined by the production technologies, the manufacturing processes and the final products and services targeted for market realisation. Hence, value chains correspond both with market segments and product-based industry segments.

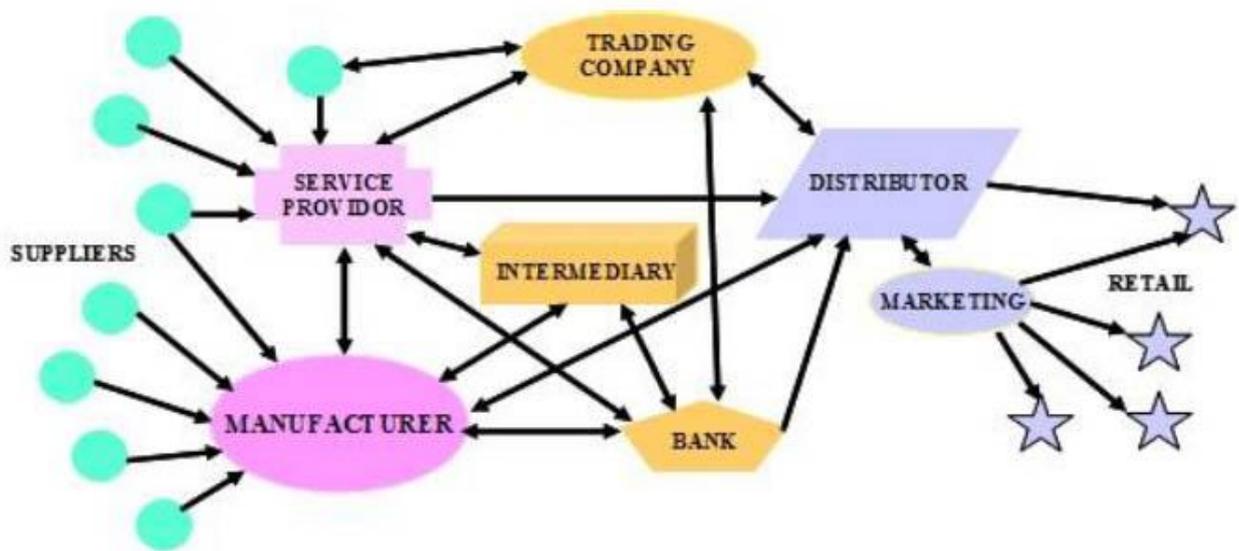


Value chains emerge out of strategic choices by economic actors for specialisation, diversification or integration. For each product or service group the corporation makes strategic choices and decisions which activities to be performed in-house, and which parts of the chain to be externalised under the control of other firms. These decisions lead on one hand to specialisation and investment in product / service specific capabilities, and on the other – to a fragmentation of the value chain, where multiple supply chains enter and exit the firm and multiple value chains cross through the corporation at different stages.

Value chains have multiple backward and forward (or upstream and downstream) linkages and resemble strategic alliance structures with complex logistics, pulled by the market with buyer-driven orders, and pushed by technology driven products and services.

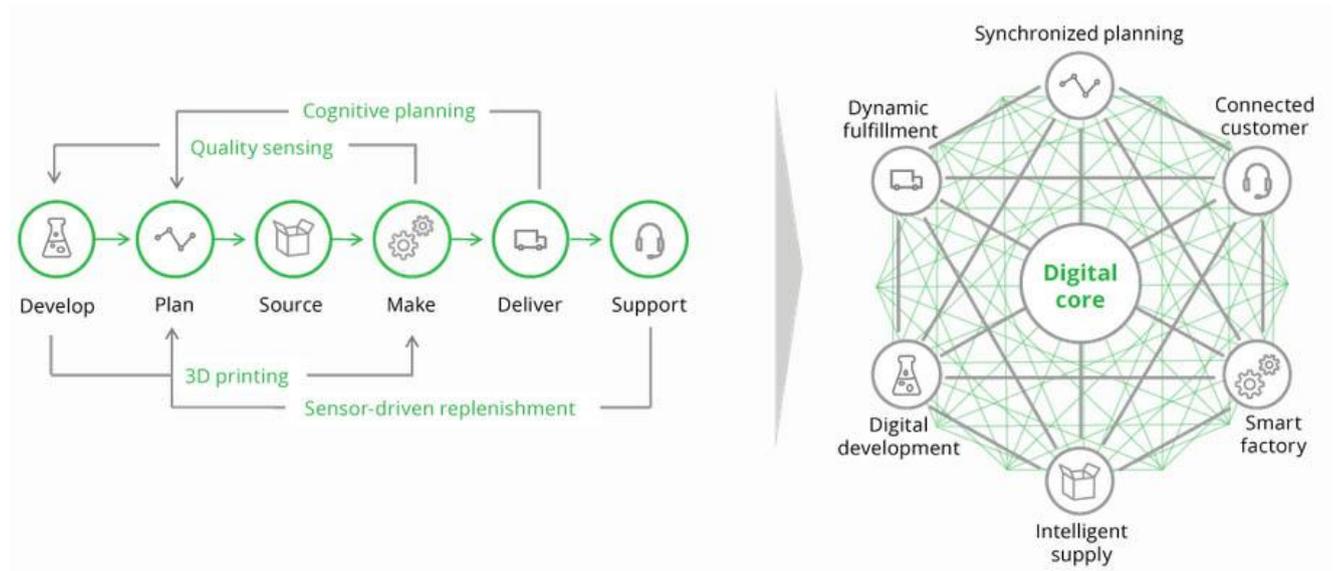
The globalisation of commodity chains has stimulated complex cross-border economies of scale and scope that have fostered a wave of strategic linkages between firms across geographic and industrial boundaries. Both concepts of supply chains and global commodity chains represent the same type of network relationship which is based on a sequence of value-added activities across input-output markets.

Inter-regional cooperation for European value chain integration requires an actor and network approach, mapping firms, technologies, innovators, and broadly mapping innovation capabilities for digital transformation at regional and country level.



Source: Adopted from Todeva (2006). *Global value chains, commodity chains and production networks*





Source: Deloitte Analysis. Shift from traditional supply chain to digital supply network

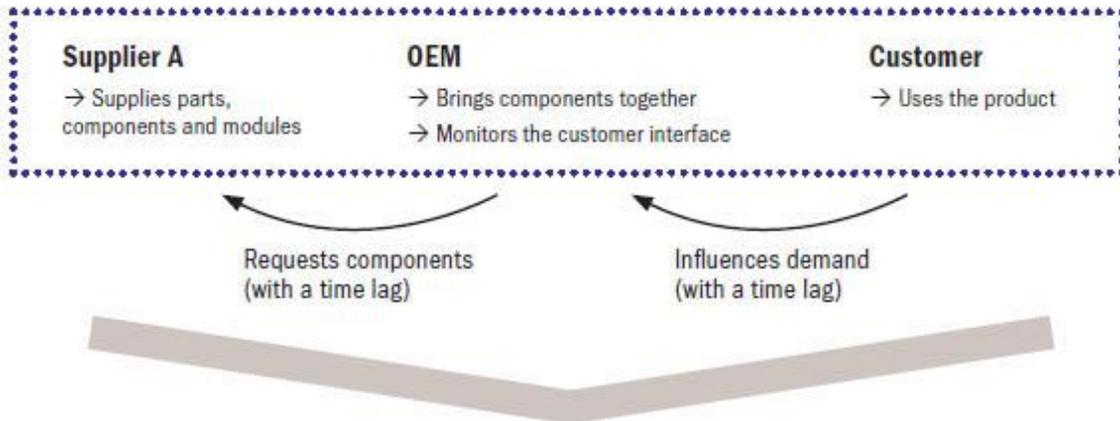
1.1 The need of digital transformation

It is a fact that the possibilities opened up by digital media will bring dramatic change to our companies – to their strategies, processes, structures and products, but also to their cultures. In the future, people, machines and resources will communicate with each other directly and in real time. Rigid value chains will become dynamic value-added networks because value will no longer be added sequentially and subject to time lags, but within a network of units that constantly communicate with each other, respond flexibly to each other and largely organize themselves.

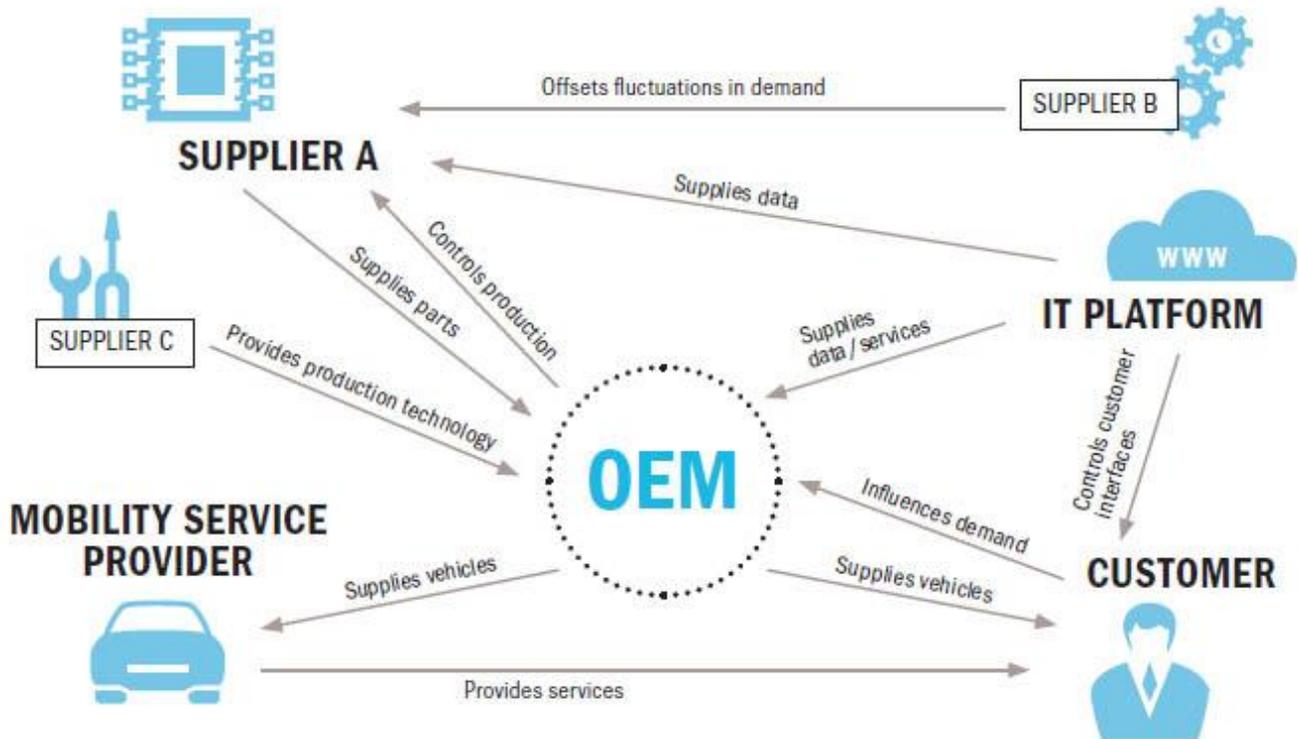
The fragmentation of production and the international outsourcing of tasks and dispersion of activities across countries have led to the emergence of complex and borderless production systems, driven by MNEs (multinational enterprises), where states and global corporations are entangled in complex scenarios for long-term growth. Most manufacturing exports require services for their production and almost half of value added (46%) in exports is contributed by services-sector activities. Services are intrinsic part of global value chains, and yet, there is very little known about the patterns of value added in services.



From rigid value chains...



... to dynamic value-added networks



Source: Roland Berger. *Impact of the digital transformation on the automotive industry*

The digital transformation takes effect via four levers:



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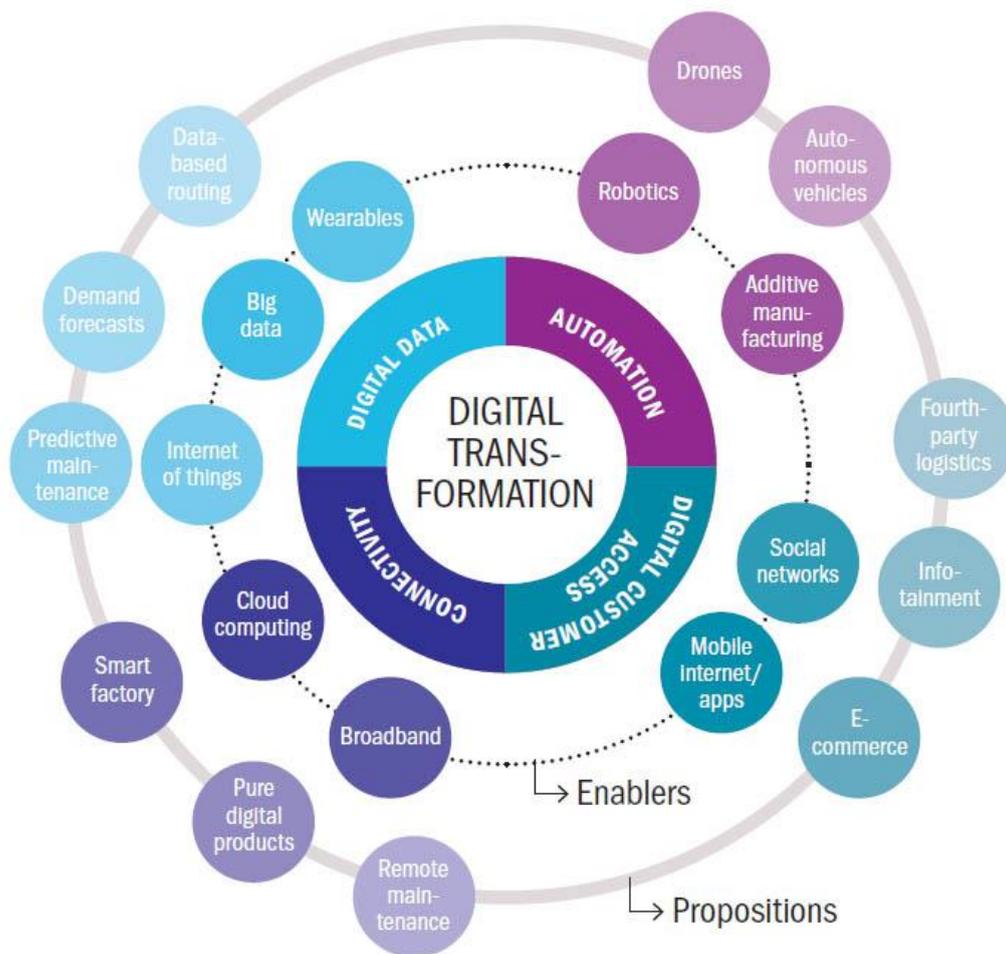
DIGITAL DATA. Capturing, processing and analyzing digital data allows better predictions and decisions to be made.

AUTOMATION. Combining traditional technologies with artificial intelligence is increasingly giving rise to systems that work autonomously and organize themselves. This reduces error rates, adds speed and cuts operating costs.

CONNECTIVITY. Interconnecting the entire value chain via mobile or fixed-line high-bandwidth telecom networks synchronizes supply chains and shortens both production lead times and innovation cycles.

DIGITAL CUSTOMER ACCESS. The (mobile) internet gives new intermediaries direct access to customers to whom they can offer full transparency and new kinds of services.

The availability of digital data, the automation of production processes, the interconnection of value chains and the creation of digital customer interfaces is transforming business models and reorganizing entire industries.



Source. Roland Berger. Drivers of digitalization.



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Given seamless connectivity, disruptors can break value chains down into their smallest elements and then, thanks to low transaction costs, reassemble them. However, this atomization will also lower or even eliminate the barriers to market entry. New players from other industries can leverage innovative business models to acquire a substantial level of value added.

The competitive battle is often won not by the most convincing concept, but by the companies that are quickest to connect up their customer base.

Entire value chains are thus running into digital disruptions as innovative companies start out from existing business models and move into adjacent areas.

1.2 Importance of Global Value Chains (GVC)

The evolution of global value chains in diverse sectors, such as commodities, apparel, electronics, tourism and business service outsourcing has significant implications in terms of global trade, production and employment and how developing country firms, producers and workers integrate into the global economy.

The GVC framework allows one to understand how global industries are organized by examining the structure and dynamics of different actors involved in a given industry.

In today's globalized economy with very complex industry interactions, the GVC analysis is a useful tool to trace the shifting patterns of global production, link geographically dispersed activities and actors within a single industry, and determine the roles they play in developed and developing countries alike. The GVC framework focuses on the sequences of value added within an industry, from conception to production and end use. It examines the job descriptions, technologies, standards, regulations, products, processes, and markets in specific industries and places, thus providing a holistic view of global industries both from the top down and the bottom up.

1.3 Dimensions of Global Value Chains

There are six basic dimensions that GVC analysis explores that are divided in global (top-down) and local elements (bottom-up). The first set of dimensions refers to international elements, determined by the dynamics of the industry at a global level. The second set of dimensions explains how individual countries participate in GVCs.

These six dimensions are:

(1) an **input-output structure**, which describes the process of transforming raw materials into final products;



(2) the **geographic scope**, which explain how the industry is globally dispersed and in what countries the different GVC activities are carried out;

(3) a **governance structure**, which explains how the value chain is controlled by firms. The local dimensions are:

(4) **upgrading**, which describes the dynamic movement within the value chain by examining how producers shift between different stages of the chain

(5) an **institutional context** in which the industry value chain is embedded in local economic and social elements (Gereffi, (1995); and

(6) **industry stakeholders**, which describes how the different local actors of the value chain interact to achieve industry upgrading

1.3.1 Input-output structure

a. Identify the main activities/segments in a global value chain.

A chain represents the entire input-output process that brings a product or service from initial conception to the consumer's hands. The main segments in the chain vary by industry, but typically include: research and design, inputs, production, distribution and marketing, and sales, and in some cases the recycling of products after use. This input-output structure involves goods and services, as well as a range of supporting industries. The input-output structure is typically represented as a set of value chain boxes connected by arrows that show the flows of tangible and intangible goods and services, which are critical to mapping the value added at different stages in the chain, and to layering in information of particular interest to the researcher (e.g., jobs, wages, gender, and the firms participating at diverse stages of the chain).

In order to understand the entire chain, it is crucial to study the evolution of the industry, the trends that have shaped it, and its organization. Based on general knowledge about the industry, segments of the chain can be identified and differentiated by the value they add to the product or service.

b. Identify the dynamic and structure of companies under each segment of the value chain.

Each of the segments identified in the previous step have specific characteristics and dynamics, such as particular sourcing practices or preferred suppliers.

It is important to identify the type of companies involved in the industry and their key characteristics: global or domestic; state-owned or private; large, medium, or small; etc. Identifying the firms that participate in the chain will help to understand its governance structure.



1.3.2 Geographic scope

The globalization of industries has been facilitated by improvement in transportation and telecommunications infrastructure and driven by demand for the most competitive inputs in each segment of the value chain. Today, supply chains are globally dispersed and different activities are usually carried out in different parts of the world.

Geographical analysis is first based on the analysis of global supply and demand. One of the main contributions of GVC analysis has been to map the shifts in the geographic scope of global industries. However, GVCs operate at different geographic scales (local, national, regional, and global) and they continue to evolve. New evidence suggests there may be a trend toward a regionalization of GVCs in response to a variety of factors, including the growing importance of large emerging economies and regional trade agreements.

1.3.3 Governance structure

Governance analysis allows one to understand how a chain is controlled and coordinated when certain actors in the chain have more power than others.

Understanding governance and how a value chain is controlled facilitates firm entry and development within global industries. In practice, governance analysis requires identification of the lead firms in the sector, their location, how they interact with their supply base and their source of influence and power over them (e.g. standards compliance).

1.3.4 Upgrading

Economic upgrading is defined as firms, countries or regions moving to higher value activities in GVCs in order to increase the benefits (e.g. security, profits, value-added, capabilities) from participating in global production

Diverse mixes of government policies, institutions, corporate strategies, technologies, and worker skills are associated with upgrading success.

Upgrading patterns differ by both industry and country based on the input-output structure of the value chain and the institutional context of each country.

1.3.5 Institutional context

The local institutional framework identifies how local, national and international conditions and policies shape a country's participation in each stage of the value chain.

GVCs are embedded within local economic, social and institutional dynamics. Insertion in GVCs depends significantly on these local conditions.

Economic conditions include the availability of key inputs: labor costs, available infrastructure and access to other resources such as finance; social context governs the availability of labor and its skill level, such as female participation



in the labor force and access to education; and finally institutions includes tax and labor regulation, subsidies, and education and innovation policy that can promote or hinder industry growth and development.

1.3.6 Industry stakeholders

Analysis of the local dynamics in which a value chain is embedded requires examination of the stakeholders involved. All the industry actors are mapped in the value chain and their main role in the chain is explained. The most common stakeholders in the value chain are: companies, industry associations, workers, educational institutions, government agencies including export promotion and investment attraction departments, Ministries of foreign trade, economy and education amongst others.

In addition, it is important to consider how relations between these actors are governed at the local level and which institutions are in a position to drive change. Thus, this type of analysis is critical to identify the key players in the value chain. It became especially relevant for industry upgrading recommendations and the development of an industry growth strategy in which each stakeholder plays a role to contribute in the development of the sector.

2 Key pillars for incorporation of SMEs in GVC

Based on a global value chain analysis, we can consider four key “pillars” that address the major constraints that small- and medium sized producers face:

(1) Access to market; it refers specifically to the presence of value chain linkages between producers and buyers and how they can be established.

(2) access to training;

(3) collaboration and cooperation building; Coordination and collaboration building should occur at two levels. First, horizontal coordination amongst companies facilitates the formation of associations, not only to reach needed economies of scale but also to provide opportunities to add value to their products (upgrading). Second, vertical coordination and collaboration involves interactions with other actors of the chain to establish linkages, find synergies and share information in order to improve the performance of the chain as a whole.

(4) access to finance. Entry into the value chain requires certain investments to cover infrastructure, equipment and obtaining certifications.





Source: *Fernandez-Stark et al., 2012.*

3 What needs to be done now

Europe's industrial companies must become more digitally mature if they are to take advantage of the opportunities afforded by the digital transformation. Company managers themselves must recognize and tackle the challenges, although industry associations, too, assume an important coordination function. Beyond that, industry must also cooperate (more) closely with the scientific community; and it needs a regulatory framework, carefully defined incentives and a no-gaps, high-performance information and communications infrastructure.

3.1 What companies need to do

Europe's companies have a very good chance of benefiting from the digital transformation. To do so, however, they must put a series of conditions in place and up the tempo of change. Here are just a few of the most urgent imperatives:

Top management must focus its strategy on achieving digital maturity. Digitization is a job that belongs on the boss's desk. Top management should therefore concern itself with the opportunities arising from new developments, involving all levels of the company in this process.



The CEO must explain how important digitization is to the business system in a language people can understand. He or she must also calm people's fears, build up the appropriate skills and drive the transformation forward.

Middle management now has the opportunity to prove that it can deal with new challenges and develop distinctive new business models.

Experts should foster a digital culture and pay more attention to the incremental and disruptive possibilities opened up by digital developments.

Technicians – including those in the IT departments – must be further enabled to the digital future. In many cases, they are the people who are trained to maintain and improve existing systems, and they should seize the opportunity to discover new ways forward.

Customers and suppliers should familiarize themselves with the opportunities afforded by the digital economy and learn to see them as potential assets.

Companies need a digital strategy and good communicators who can raise awareness of the opportunities inherent in these new developments.

The **chief strategist** must analyze how digital disruptors think and see the company's home industry through their eyes.

The **CFO (chief financial officer)** must find a way to invest in the company's digital maturity without putting ongoing operations at risk.

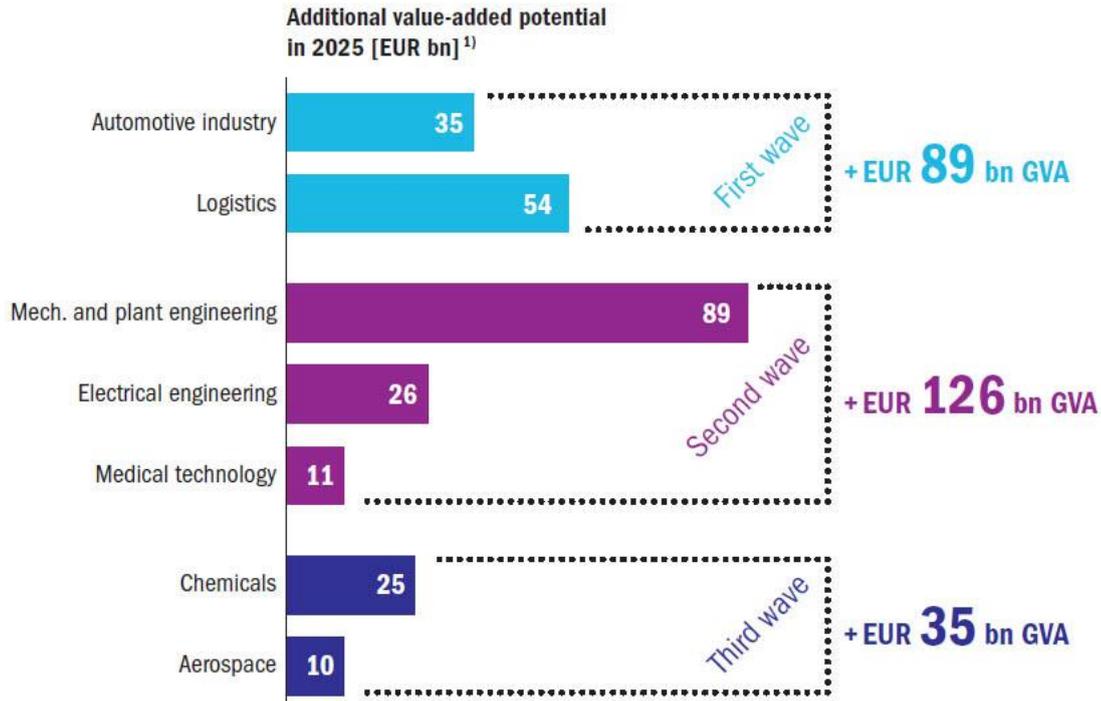
The **COO (chief operating officer)** must rigorously commit to implementing the digital transformation, i.e. by adapting products, processes and business models, and must foster a digital culture within the company.

Companies themselves are primarily responsible for improving their own digital maturity. That said, achieving pan-European transparency about the capabilities of companies and scientific institutions in this area would be important not only to take stock of where individual industries and companies currently stand, but also for the purpose of political control.

Compiling an atlas of Europe's digital maturity would lay a valuable foundation for the next steps in research, industrial and economic policy.

The digital transformation is giving European industry a chance to add 250 billion euros of extra value per annum



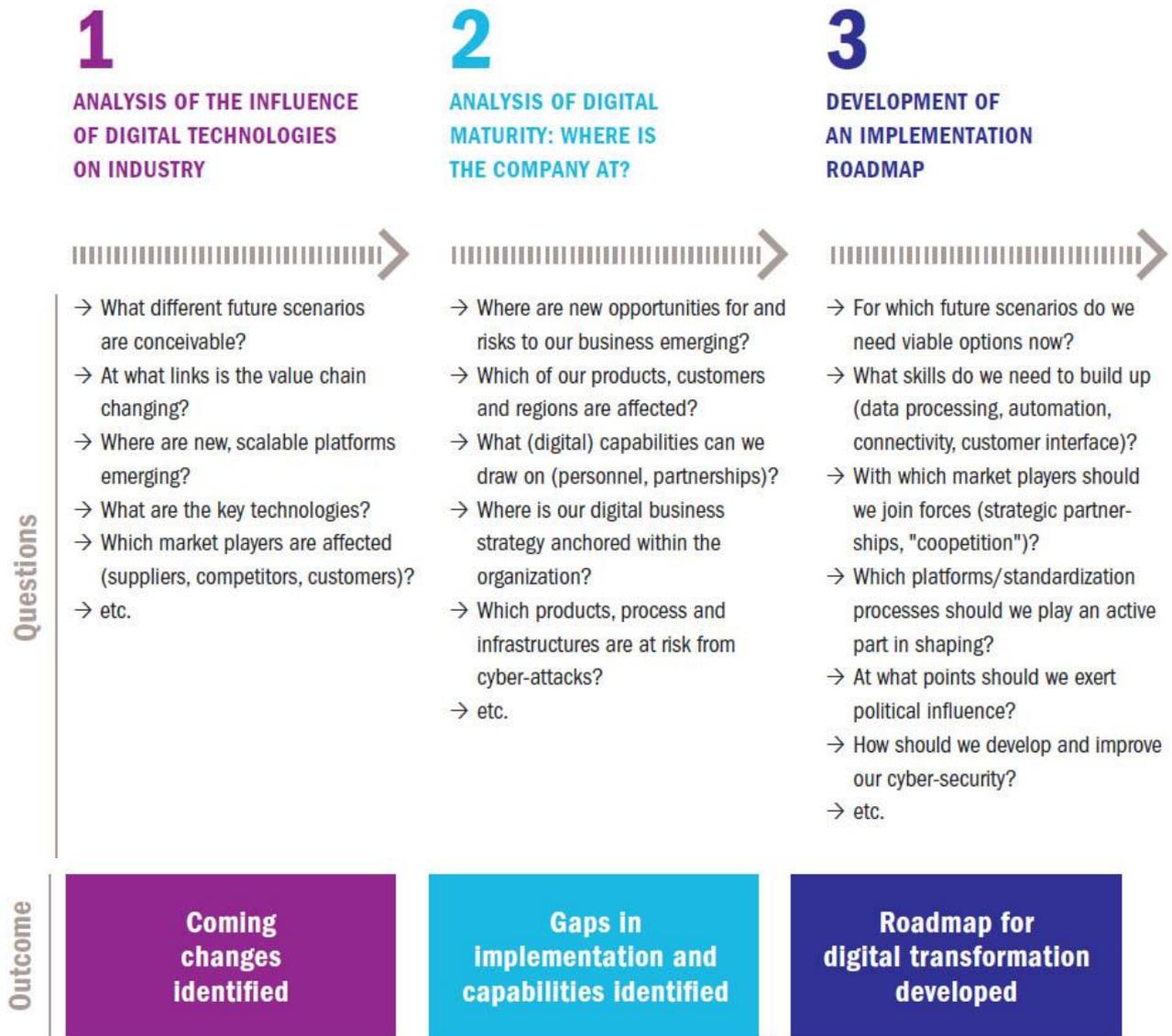


Source: Roland Berger. Overview of industries



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Source: Roland Berger. **THREE STEPS TO GET COMPANIES IN SHAPE FOR THE DIGITAL FUTURE. Digital transformation master plan**

3.2 What governments need to do

A regulatory framework is needed that allows Europe's diversity and its industrial capabilities to be translated into competitive advantages. It is also important to coordinate European activities and speak with one voice when representing Europe's common interests on the international stage.



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To these ends, governments should help Europe to pool its strengths and resources, improve the digital maturity of its companies, prevent a form of standardization that undermines manufacturing skills, encourage investment in the digital economy, and create points of access and platforms that can be shared by companies, research institutions and other organizations.



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