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Digital Transformation in the European Union Countries Member of G7 - An Analytical Study-

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Abstract

This study aims to determine the status of digital transformation in the European Union (EU) countries that are members of the Group of Seven (G7). This study focuses on analyzing statistical data issued by a European statistical agency (Eurostat). To detail the aspects of the study, we use the deductive method to describe the theoretical concepts related to digital transformation in addition to the inductive method to explain the data related to digital transformation in the EU countries that are members of the G7. The study found that Germany is ahead of France and Italy in all digital transformation technologies as well as allocating more budgets and training programs for employee training than France and Italy.

Key words: Digital Transformation, European Union, Members G7.

JEL Classification Codes: L86, O39, O52, O57.

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1. Introduction

The technological developments currently taking place in the world have obliged all governments worldwide to adopt and integrate them into all their companies to ensure the sustainability of their operations and increase production efficiency.

For products to become more competitive, various technologies must be incorporated into their production and distribution processes, or what is currently called digital transformation in companies.

Digital transformation has now become a goal that all companies seek to adopt, and they strive to develop employee skills in the various tools used in digital transformation.

The European Union countries, including the G7 member states (Germany, France, and Italy), are among the countries seeking to develop their digital transformation capabilities by investing in technological infrastructure and developing the skills of their employees by allocating significant budgets for this purpose.

Through the above, we pose the problem of the study:

What is the reality of digital transformation in the European Union countries that are members of the G7?

To answer the study's problem, we propose the following hypotheses:

- **H_1:** Individuals in the EU countries that are members of the G7 have basic or highly advanced skills in digital transformation technologies;
- H_2: Companies in the EU countries that are members of the G7 are developing employee skills on digital transformation tools;
- **H_3:** Companies in the EU countries that are members of the G7 are using cloud computing and artificial intelligence in their operations.

This study is inspired its importance of the benefits that digital transformation offers to companies by providing fast and accurate solutions that contribute to enhancing the competitiveness of the products and services offered by companies, as well as reducing various production costs.

2. Theoretical Background of the Study

2.1. Digital Transformation Overview

Digital technology development started in the 1960s when modern management concepts spread throughout some businesses, especially the International Business Machine (IBM), which created and supplied the Sabre Global Distribution System, which made it possible to automate hotel and airline reservations. The second phase of the development of digitalization spanned the years 1980–1990, during which time numerous academics started to investigate the potential applications of information

technology in organizational structures and assess its effects on the subjects' performance in the future(Abdullayev et al., 2024).

The term "Industry 4.0" refers to the digital transformation of the manufacturing industry, which was initially conceived in 2011 at the Hannover Industrial Fair in Germany(X. Liu et al., 2025).

Digital transformation is defined as the process of using digital technology to create value more efficiently(Méndez-Suárez & Danvila-del-Valle, 2023). Another definition of digital transformation is the process of reimagining business models to use new technology in response to client needs(Çini et al., 2023).

2.2. Advantages of Digital Transformation

The advantages offered by digital transformation are:

- Organizational digital transformation entails incorporating digital technologies into every facet of the business, radically altering how it functions and provides value to its stakeholders(Norling, 2025);
- Digital transformation can create new professions that expand access to the labour market and incorporate previously under-represented groups in public policy, such as women, people with handicaps, immigrants, and indigenous communities(Adam et al., 2025);
- In order to increase flexibility, interoperability, and competence, digital transformation is a continual improvement process that involves governance and transformation activities in addition to project or plan formulation(Özkan Alakaş, 2024);
- In the current business climate, digital transformation is of incalculable importance to organisations. It affects businesses' ability to survive and compete, but it's also a crucial avenue for promoting ongoing innovation, increasing productivity, and improving consumer satisfaction(Feng et al., 2024);
- Businesses now have more chances to access new markets because to digital transformation. Additionally, it facilitates quicker product and service launches that align with local market features and helps businesses adjust to changes in the market(Wen et al., 2024) ;
- In market-oriented companies, digital transformation strengthens client interactions and promotes operational transparency, which improves financial and operational results(Luu-Xuan & Long, 2025);
- Digital transformation helps businesses anticipate, make decisions, and enhance operations, which helps them better handle negative shocks and lowers risk sharing among the group of businesses(S. Liu et al., 2024) ;

- Digital transformation is becoming increasingly crucial to creating a long-lasting and prosperous company(Sklavos et al., 2022).

2.3. Tools of Digital Transformation

There are many tools used in digital transformation, we try to discuss the most commonly used tools.

2.3.1. Artificial Intelligence

According to John McCarthy (1990), artificial intelligence is "the science and engineering of making intelligent machines, especially intelligent computer programs"(Idrissi et al., 2024). Artificial intelligence (AI) tools include predictive analytics, natural language processing (NLP), machine learning algorithms(Borgi & Alessa, 2023), and robotic process automation (RPA)(Kokina et al., 2025).

2.3.2. Block chain

Block chain is a distributed and decentralised ledger system that safely and openly logs transactions over a network of computers(Rathnayake et al., 2025). Every transaction is contained in a block, which is then appended to a series of earlier blocks to create a chronological and impenetrable record of every transaction. A central authority is not necessary because block chain functions within a peer-to-peer network. This decentralised approach allows several users, commonly referred to as nodes, to view and verify the same data. A dispersed structure is promoted by this cooperative strategy, guaranteeing that no one organisation has complete control over the network(Kumar et al., 2024). In addition to extending the firm-centric perspective and enabling cross-organizational workflow management, this solution promotes trustworthy collaboration(Saari et al., 2025).

2.3.3. Internet of Things (IoT)

The term "Internet-of-things" (IoT) refers to tangible items that are linked to the Internet using data transmission technologies(Ivens et al., 2024), combining billions of internet-based sensors, smartphones, wearable technology, and other smart gadgets that communicate online, using their data and capabilities to provide innovative smart services and facilities that improve our community(Salim et al., 2025).

2.3.4. Cloud Computing

Services offered by cloud computing have become an essential tool for professional storage of data and accessibility. They provide firms with more flexibility, which saves money and time, reduced upfront costs for local servers, and improved environmental sustainability via efficiency of resources. The market for these kinds of services has increased significantly, with a 2023 estimate of USD 596 billion and a 2028 anticipated value of nearly USD 1000 billion(Terpoorten et al., 2024).

Thus, "a computing service model that relies on a collection of computer resources that may be used on-demand, elastically, and with minimal administration effort" is

among the two definitions of cloud computing that are most commonly used, according to the Berkeley RAD Lab and the U.S. National Institute of Standards and Technology (NIST) (Duso & Schiersch, 2025).

2.3.5. Big Data

The term "Big Data" is widely used, lacks a clear definition, and is frequently named after particular, frequently ambiguous properties. Big Data is unquestionably linked to massive data sets that need sophisticated data storage and retrieval capabilities. It is made up of both structured (with a well-defined data type and meaning) and unstructured (e.g., texts with different lengths, lacking context) data. Big Data can be gathered from internal sources or generated by a variety of external and internal sources, including social media and macroeconomic data. Enterprise Resource Planning (ERP) systems, verbal and nonverbal human interactions, mobile device usage, and data automatically produced by Internet of Things (IoT) machines and devices are a few examples of such internal sources(Leitner-Hanetseder & Lehner, 2023).

3. Methodology

3.1. Study Sample

The study community consists of the member countries of the G7 economic group, which includes the USA, Canada, Japan, UK, Germany, France and Italy(Owolabi et al., 2024). The study sample consists of the European Union countries member of this group, namely Italy, France and Germany.

3.2. Approach to the Study

In the theoretical aspect, we use the deductive method to explain the various theoretical concepts related to the study, while in the applied aspect, we use the inductive method to analyse the data related to the variables and sample of our study.

4. Results & Discussion

We use the periodic statistics provided by Eurostat for the years 2025, 2024 and 2023 related to digital transformation in EU countries, focusing our study on Italy, France and Germany to suit the variables of our study.

4.1. Individuals with Fundamental or Advanced Digital Capabilities

In order to know the percentages of individuals who have fundamental or advanced capabilities in the digital field in (France, Germany and Italy), the table below displays the following details:

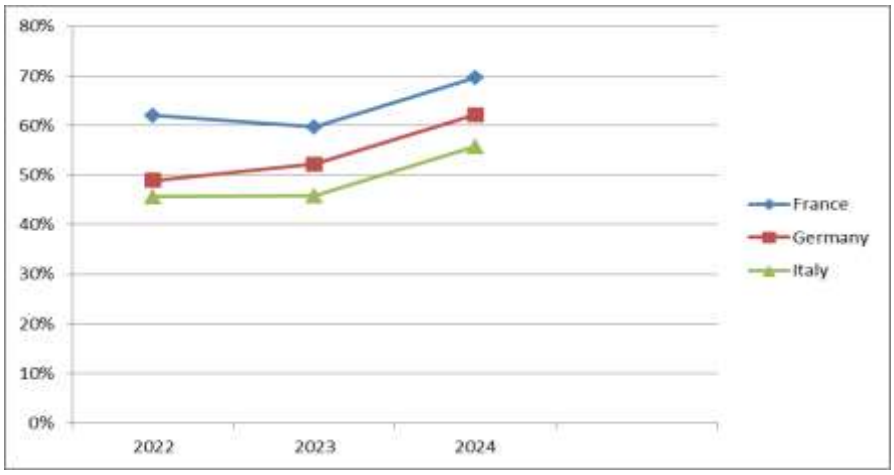
Table (1): Percentages of Individuals with Fundamental or Advanced Digital Capabilities

Countries	2022	2023	2024
France	62%	59.7%	69.7%
Germany	48.9%	52.2%	62.2%
Italy	45.6%	45.8%	55.8%

Source: https://ec.europa.eu/eurostat/

In order to understand the evolution of the percentages over the three years in the three countries, the following figure illustrates the following:

Figure (1): Evolution of Individuals with Fundamental or Advanced Digital Capabilities



Source: Prepared by the authors based on data from Table 1

Through the data in Table 1 and Figure 1, we notice that France ranks first in terms of the percentage of individuals with fundamental or advanced capabilities in the digital field, followed by Germany in second place and Italy in third place. The reason for France's superiority is due to the presence of a significant percentage of the youth compared to Germany and Italy, so that this category is considered the most capable of digital technologies compared to other age categories.

4.2. Employed ICT Experts

The table below provides the following information to determine the percentages of employed ICT experts in the digital field in France, Germany, and Italy:

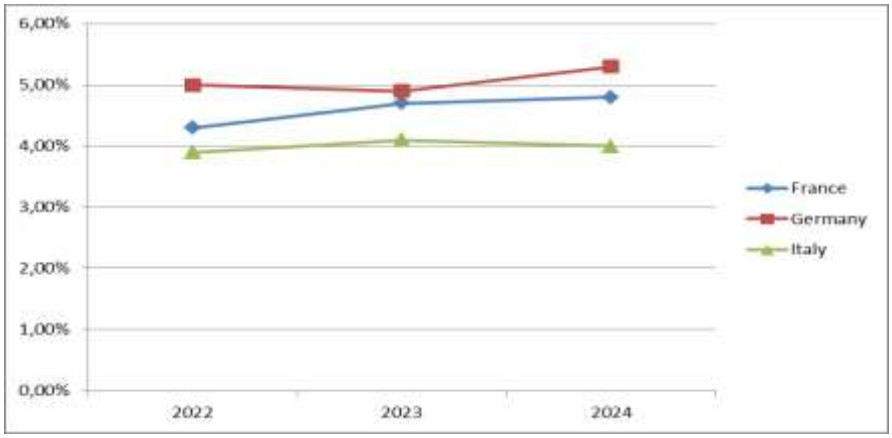
Table (2): Percentages of Employed ICT Experts

Countries	2022	2023	2024
France	4.3%	4.7%	4.8%
Germany	5.0%	4.9%	5.3%
Italy	3.9%	4.1%	4.0%

Source: https://ec.europa.eu/eurostat/

To comprehend how the percentages changed over the course of three years in each of the three countries, the accompanying figure shows the following:

Figure (2): Evolution of Employed ICT Experts



Source: Prepared by the authors according to the data from Table 2

Table 2 shows that Germany employed more ICT experts in economic institutions and public bodies during the three years, followed by France and Italy. This ranking corresponds to the ranking of these countries in GDP, which indicates that more productive countries need more experts in the field of ICT to increase their effectiveness in management.

4.3. Companies that Train their Employees in ICT

The table below provides the following information to determine the percentages of companies that train their employees in ICT in France, Germany, and Italy:

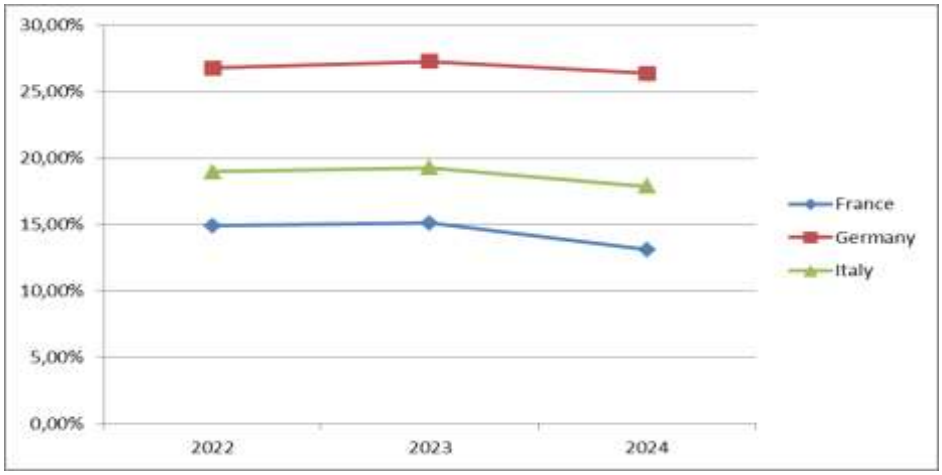
Table (3): Percentages of Companies that Train their Employees in ICT

Countries	2022	2023	2024
France	14.9%	15.1%	13.1%
Germany	26.8%	27.3%	26.4%
Italy	19%	19.3%	17.9%

Source: https://ec.europa.eu/eurostat/

To understand how the percentages changed in each of the three countries over a three-year period, the accompanying figure displays the following:

Figure (3): Evolution of Companies that Train their Employees in ICT



Source: Prepared by the authors according to the data from Table 3

We note that companies in Germany have the highest levels of employee training, followed by Italy in second place, and France in third place. Germany's superiority over Italy and France stems from the fact that Germany was the first to adopt digital transformation before both Italy and France, allocating substantial budgets compared to Italy and France.

4.4. Companies that Purchase Cloud Computing Services

To determine the percentages of companies that purchase cloud computing services in France, Germany and Italy, the table below displays the following details:

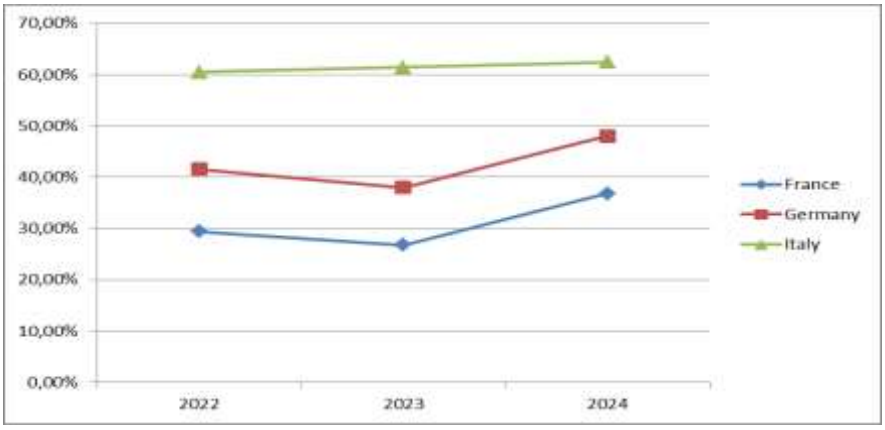
Table (4): Percentages of Companies that Purchase Cloud Computing Services

Countries	2022	2023	2024
France	29.4%	26.8%	36.8%
Germany	41.6%	38%	48%
Italy	60.5%	61.4%	62.4%

Source: https://ec.europa.eu/eurostat/

The accompanying figure illustrates the changes in percentages over a three-year period in each of the three countries:

Figure (4): Evolution of Companies that Purchase Cloud Computing Services



Source: Created by the authors using the information in Table 4

From Figure 4, we can see that Italian companies purchased more cloud computing services than German and French companies, because when the Italian government adopted digital transformation, it focused on the use of cloud computing compared to other tools used in digital transformation.

4.5. Companies Using AI Technologies

The table below provides the following information to determine the percentages of companies using AI technologies in France, Germany, and Italy:

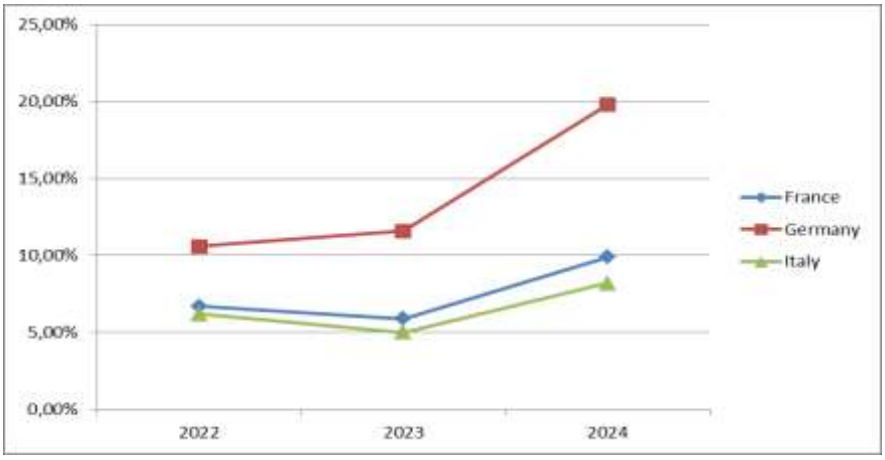
Table (5): Percentages of Companies Using AI Technologies

Countries	2022	2023	2024
France	6.7%	5.9%	9.9%
Germany	10.6%	11.6%	19.8%
Italy	6.2%	5%	8.2%

Source: https://ec.europa.eu/eurostat/

The following figure provides insight into how the percentages changed over the course of three years in each of the three countries:

Figure (5): Evolution of Companies Using AI Technologies



Source: Created by the authors using the information in Table 5

From Figure 5, we can see that German companies are the most frequent users of AI compared to French and Italian companies, because German companies spend huge budgets on training their staff in addition to the strength of the German industry, which obliges German companies to use AI so that the quality of German products remains at the forefront of products at the European and international level.

Conclusion

From the above, we can draw the following conclusions:

- Digital transformation is the use of modern technological tools, such as Artificial Intelligence, Cloud Computing, Block Chain, Big Data, and the Internet of Things;
- Digital transformation has become imperative for all organizations worldwide in order to keep pace with modern technological innovations;
- Germany is considered a leading country among the European Union member states of the G7 in digital transformation compared to other countries (France and Italy), because its budget allocated to digital transformation is much larger than those of France and Italy;
- A significant percentage of individuals in Germany, France, and Italy possess basic or advanced skills in the field of digital transformation. Therefore, we accept Hypothesis H_1;
- There are significant percentages of companies in (Germany, France and Italy) that program training courses to develop their employees' skills in the field of digital transformation. Therefore, we accept hypothesis H_2;
- There are significant percentages of companies in (Germany, France and Italy) that use artificial intelligence and cloud computing in their various operational processes. Therefore, we accept hypothesis H_3.

As future studies, it is recommended to study digital transformation in the Scandinavian countries because they are very advanced in the field of digital transformation compared to Germany, France and Italy, in addition to another study, which is a comparison between the United States of America and China in the field of digital transformation as two prominent poles in the world.

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