Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Statistics

Bachelor Thesis

Statistical analysis of digital social communication in Germany

Olesia Nurislamova

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

Olesia Nurislamova

Informatics

Thesis title
Statistical analysis of digital social communication in Germany

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Objectives of thesis

The aim of the bachelor thesis is to use statistical analysis of data from the European Social Survey 2020 (ESS2020) to assess differences in the use of digital social communication tools in the personal or working life of the population in Germany.
The significance of this study lies in its potential to offer valuable insights into the use of digital social communication in Germany. Policymakers, researchers, and businesses can benefit from this understanding to develop strategies to leverage digital communication tools to improve social and economic outcomes. Furthermore, the study could contribute to the growing literature on the use of digital communication in Europe, providing a basis for future research on the topic.

Methodology

The analysis will utilize data from the European Social Survey 2020 (ESS2020), a cross-national survey aimed at understanding the attitudes and behaviors of individuals across Europe on a range of issues, including social and political participation, social networks, and social inequality.
To identify differences in the level of digital social communication between different socio-demographic groups in Germany, the study will employ descriptive and inferential statistics. The research questions and hypotheses will be discussed in the context of existing literature to provide a comprehensive understanding of the topic.

The proposed extent of the thesis
40-50 pages without annexes

Keywords
digital social communication; Germany; socio-demographic groups; inferential statistics

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Recommended information sources

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The Bachelor Thesis Supervisor
Prof. Ing. Jindřich Špička, Ph.D.

Supervising department
Department of Statistics

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Ing. Tomáš Hlavsa, Ph.D.
Head of department

Electronic approval: 3. 11. 2023

doc. Ing. Tomáš Šubrt, Ph.D.
Dean

Prague on 15.03. 2025

Declaration

I declare that I have worked on my bachelor thesis titled " Statistical analysis of digital social communication in Germany" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break any copyrights.

In Prague on 15.03.2025 _____

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Statistical analysis of digital social communication in Germany

Abstract

This study examines how people in Germany use digital communication tools in their personal and work life. The research is based on data from the European Social Survey 2020 (ESS2020), which collects information on social behaviors, including digital communication. Using statistical analysis, we explore differences in digital communication habits among various socio-demographic groups.

The findings reveal that access to and use of digital tools vary across different groups. People with higher education and those in professional environments tend to use digital communication more frequently and effectively. At the same time, some groups face barriers in adopting digital tools. These differences highlight the need for policies and initiatives to improve digital inclusion and literacy.

By comparing our results with previous studies, we aim to provide a deeper understanding of how digital communication affects daily life. This research enhances the understanding of digital communication trends and lays the foundation for strategies to improve digital literacy and develop inclusive communication practices.

Keywords: digital social communication, Germany, socio-demographic groups, inferential statistics, digital inclusion, educational level, European Social Survey (ESS2020), statistical analysis

Statistická analýza digitální sociální komunikace v Německu

Abstrakt

Tato studie zkoumá, jak lidé v Německu používají digitální komunikační nástroje v osobním i pracovním životě. Výzkum je založen na datech z Evropského sociálního průzkumu 2020 (ESS2020), který shromažďuje informace o sociálním chování, včetně digitální komunikace. Pomocí statistické analýzy zkoumáme rozdíly v návycích digitální komunikace mezi různými socio-demografickými skupinami.

Zjištění ukazují, že přístup k digitálním nástrojům a jejich používání se liší mezi jednotlivými skupinami. Lidé s vyšším vzděláním a ti, kteří pracují v profesionálním prostředí, používají digitální komunikaci častěji a efektivněji. Zároveň některé skupiny čelí překážkám při osvojování digitálních nástrojů. Tyto rozdíly poukazují na potřebu politik a iniciativ zaměřených na zlepšení digitální inkluze a gramotnosti.

Porovnáním našich výsledků s předchozími studiemi se snažíme poskytnout hlubší porozumění tomu, jak digitální komunikace ovlivňuje každodenní život. Tento výzkum přispívá k pochopení trendů v digitální komunikaci a poskytuje základ pro strategie zaměřené na zlepšení digitální gramotnosti a rozvoj inkluzivních komunikačních praktik.

Klíčová slova: digitální sociální komunikace, Německo, socio-demografické skupiny, inferenční statistika, digitální inkluze, úroveň vzdělání, profesionální digitální zapojení, Evropský sociální průzkum (ESS2020), digitální gramotnost, statistická analýza

Table of content

1 Objectives and Methodology 8

1.1 Objectives 8

1.2 Methodology 8

2 Literature Review 10

2.1 Digital communications in Germany 10

2.1.1 Historical evolution of digital communications in Germany 10

2.1.1.1 Early digitization and the emergence of the internet (1970s – 1990s) 10

2.1.1.2 The growth of mobile technologies (2000s) 11

2.1.1.3 The era of mobile internet and digital platforms (2010s) 11

2.1.1.4 The current stage: 5G, IoT, and digital transformation (2020s) 11

2.1.2 The importance of digital communication for society and the economy 12

2.1.2.1 The impact on society 12

2.1.2.2 The economic significance 12

2.1.2.3 Challenges and issues 13

2.2 Key trends in the use of digital technologies in Germany 14

2.2.1 The increasing popularity of messaging services and video calls 14

2.2.2 The rise of remote work and flexible work models. 15

2.2.3 The development of 5G and the Internet of Things (IoT). 15

2.2.4 Growing concerns about data privacy 16

2.2.5 The digital divide between regions 16

2.3 Factors influencing the use of digital communications. 17

2.3.1 Socio-demographic differences 17

2.3.1.1 Differences by age (youth vs. elderly) 17

2.3.1.2 Differences by gender 17

2.3.1.3 The influence of education and income levels 18

2.3.1.4 Differences between regions of Germany (West/East) 18

2.3.2 Professional activity and digital communications. 18

2.3.2.1 The impact of remote work 18

2.3.2.2 The use of digital tools in different professions 19

2.4 Privacy and security in digital communications 19

2.4.1 Risk perception among different social groups 19

2.4.2 The impact of education on digital security awareness 19

3 Practical Part 21

3.1 Data description 21

3.2 Variable overview 21

3.3 Data transformation 24

3.3.1 Data Filtering: 25

3.3.2 Creating `region_group` 25

3.3.3 Creation of variables for age groups - `agegroup` 25

3.3.4 Creation of a variable for videocall usage 26

3.3.5 Creation of a variable for text communications 26

3.3.6 Classification of respondents by income levels 26

3.3.7 Categorization based on the frequency of communication with colleagues 27

3.4 Handling of missing values 27

3.4.1 Deletion of rows with unknown values 28

3.4.2 Deletion of rows with remaining missing values 28
3.5 Hypothesis testing 28
3.5.1 Hypothesis 1 28
3.5.2 Hypothesis 2 29
3.5.3 Hypothesis 3 31
3.5.4 Hypothesis 4 32
3.5.5 Hypothesis 5 33
4 Results and Discussion 35
5 Conclusion 40
6 References 42
7 List of tables and graphs 43
7.1 List of tables 43
7.2 List of graphs 43

Introduction

Digital social communication has become an integral part of modern society, transforming the way individuals interact in both personal and professional contexts. The rapid development of digital technologies has enabled people to communicate through various platforms, including social media, instant messaging applications, and video conferencing tools. These innovations have significantly reshaped social interactions, allowing individuals to maintain connections regardless of geographical barriers.

Germany, as one of the leading economies in Europe, presents a unique case for studying digital communication trends. With high internet penetration and widespread digital infrastructure, the country offers a well-developed environment for online interaction. However, despite technological advancements, disparities in digital communication usage persist among different socio-demographic groups. Education level, professional background, and access to digital resources can all influence how individuals engage with digital communication tools.

The primary objective of this bachelor thesis is to examine differences in the use of digital social communication tools in Germany, utilizing data from the European Social Survey 2020 (ESS2020). Through statistical analysis, this study aims to identify variations in digital communication patterns across different socio-demographic groups, with a particular focus on education level and professional engagement.

By applying descriptive and inferential statistical methods, this research seeks to provide a data-driven perspective on digital communication trends in Germany. In addition to statistical analysis, a literature review will offer a broader context for understanding digital inclusion and its implications for social and economic participation. The findings of this study will contribute to a deeper understanding of digital communication dynamics and may serve as a foundation for future research and policy recommendations aimed at improving digital literacy and accessibility.

1 Objectives and Methodology

1.1 Objectives

The main goal of this bachelor thesis is to analyze how different social and demographic groups in Germany use digital communication tools. The research looks at factors like education level, job status, digital skills, remote work, and age, and how these affect people's choice and frequency of using digital communication methods. The study uses data from the European Social Survey 2020 (ESS2020) to identify patterns and trends in how different groups communicate digitally.

The study focuses on five main objectives:

1. To understand how education level influences the use of digital communication, comparing tools for work and entertainment.
2. To examine how job status (employed vs. unemployed) affects communication preferences, especially for work and social interactions.
3. To explore how digital skills affect the use of communication tools for both professional and personal reasons.
4. To analyze how remote work influences communication habits and whether remote workers use different tools than office workers.
5. To compare how younger and older people use digital communication tools, highlighting age-related differences.

Using statistical methods, the study aims to provide a data-driven view of digital communication trends in Germany. The results will contribute to discussions about digital inclusion, access to technology, and digital skills, offering useful insights for future research and policy-making in digital communication.

1.2 Methodology

This thesis aims to explore the use of digital communication tools across different socio-demographic groups in Germany. The research focuses on factors such as **region (West vs.**

East Germany), age, remote work status, education level, and income, and how these variables influence individuals' digital communication behavior.

The study is based on data from the European Social Survey 2020 (ESS2020), which provides a representative sample of the German population. To test the formulated hypotheses, the research will employ descriptive statistics to summarize key trends and inferential statistical tests to examine significant differences between groups.

2 Literature Review

2.1 Digital communications in Germany

2.1.1 Historical evolution of digital communications in Germany

The development of digital communications in Germany began in the latter part of the 20th century, progressing through several key stages that have shaped the digital communication landscape today. These changes were driven by global technological advancements, government policies, and the changing needs of society.

2.1.1.1 Early digitization and the emergence of the internet (1970s – 1990s)

In the 1970s, Germany began the active development of telecommunications technologies. One of the most important steps was the introduction of ISDN (Integrated Services Digital Network), which provided higher-quality data transmission over telephone lines (Huurdeman, 2003).
In 1989, the German research community connected to the internet via the DFN (Deutsches Forschungsnetz) network, marking a key moment in the development of digital communications. In the 1990s, the commercialization of the internet led to the emergence of the first internet service providers, such as T-Online and Arcor, and the widespread adoption of internet services (Schmidt & Cohen, 2013).

After the reunification of Germany in 1990, a gradual alignment of digitalization levels between East and West Germany began. However, differences in infrastructure and the level of digital technology penetration persist to this day (Ragnedda & Muschert, 2013).

2.1.1.2 **The growth of mobile technologies (2000s)**

The early 21st century was marked by the rapid development of mobile technologies. In 2000, Germany launched its first commercial 3G internet, which facilitated the spread of mobile communication and internet access on mobile devices (European Commission, 2004). During this period, the active development of social networks began, including German platforms such as StudiVZ and Xing, as well as global services like Facebook (Boyd & Ellison, 2007).
In 2008, Germany began actively implementing broadband internet, increasing the availability of digital services and contributing to the growth of online commerce, media, and digital education (Federal Ministry of Economics and Technology, 2009).

2.1.1.3 **The era of mobile internet and digital platforms (2010s)**

With the introduction of 4G and the widespread adoption of smartphones, digital communications in Germany reached a new level. In 2013, over 75% of the population in Germany actively used the internet, and by 2018, this figure exceeded 90% (Statista, 2018).

The popularity of messaging apps and video calls surged, leading to the widespread use of WhatsApp, Telegram, Skype, and other services. During this period, companies also began to actively use digital technologies to organize remote work and automate business processes (McKinsey & Company, 2019).

2.1.1.4 The current stage: 5G, IoT, and digital transformation (2020s)

The current stage of digitalization is characterized by the implementation of 5G, the development of the Internet of Things (IoT), and digital solutions for remote work. In 2020, Germany launched the large-scale deployment of 5G, which significantly improved data transmission speed and quality (Bundesnetzagentur, 2020).

The COVID-19 pandemic acted as a catalyst for digital transformation, accelerating the shift to remote interaction in education, healthcare, and business (European Commission, 2021). At the same time, attention to cybersecurity and data privacy issues increased significantly, leading to the growing popularity of secure communication platforms (European Data Protection Board, 2021).

2.1.2 The importance of digital communication for society and the economy

Digital communications play a key role in modern Germany, having a significant impact on both public life and the country's economic development. Their widespread use accelerates the exchange of information, fosters the development of new forms of employment, and increases the accessibility of various services.

2.1.2.1 The impact on society

Digital technologies contribute to strengthening social cohesion by facilitating interaction between people, regardless of their location. According to the European Commission (2019), over 85% of the population in Germany regularly uses the internet for communication, work, and accessing government services. Social networks and messaging apps, such as WhatsApp and Facebook Messenger, have become an integral part of daily life, enabling instant messaging and video calls.

In addition to communication, digital communications promote the spread of online education and distance learning. According to McKinsey & Company (2018), the digitalization of the educational process in Germany increases the accessibility of knowledge, reducing the educational gap between regions.

2.1.2.2 The economic significance

From an economic perspective, digital communications are a driving force behind the growth of innovative sectors and the transformation of traditional industries. The introduction of 5G networks and the Internet of Things (IoT) opens up new opportunities for businesses, improving logistics, manufacturing, and retail (Bundesnetzagentur, 2019). E-commerce is also growing rapidly, allowing small and medium-sized businesses to expand their reach through digital platforms. According to Statista (2019), the volume of online sales in Germany reached 100 billion euros in 2019, and digital payments have become the standard for most consumers.

Furthermore, the development of remote work and flexible working models has changed the labor market. A study by the Federal Ministry for Economic Affairs and Energy (2018) shows that more than 30% of German companies have implemented digital tools for remote work, increasing employee productivity and reducing operational costs.

2.1.2.3 **Challenges and issues**

Despite the obvious advantages, digital transformation is also associated with certain challenges. One of the main issues is the protection of personal data. Germany, known for its strict cybersecurity policies, actively applies the principles of the GDPR (European Data Protection Board, 2019) to ensure user privacy and security.

Additionally, there remains a digital divide between regions: the eastern states of Germany still lag behind the western states in the development of internet infrastructure, which limits access to digital services and hinders the uniform development of the economy (European Commission, 2019).

2.2 Key trends in the use of digital technologies in Germany

Current trends in digital communications in Germany are defined by technological advancements, changes in lifestyle, and the impact of global crises. The rapid spread of digital solutions affects all areas of life: from personal communication and work to education, commerce, and public services. In recent years, key areas of digital transformation in Germany have included the development of mobile communications, remote work, the Internet of Things (IoT), and increased focus on data protection.

2.2.1 The increasing popularity of messaging services and video calls

he use of digital communication tools continues to grow in Germany. WhatsApp remains the most popular messaging app in the country, covering more than 80% of the population (Bundesnetzagentur, 2022). German users are also actively using Telegram, Signal, and Threema, especially in the context of data privacy discussions.

The COVID-19 pandemic significantly changed communication methods: video conferencing platforms like Zoom, Microsoft Teams, and Google Meet became the standard for work meetings, educational sessions, and even social interactions. According to Statista data (2021), the use of video calls in Germany increased by 60% compared to 2019. In 2023, more than 55% of German companies regularly used video conferencing for internal communications (Federal Ministry of Digital and Transport, 2023).

There is also growing interest in new virtual and augmented reality (VR/AR) technologies for communication and collaboration. Some German companies have begun testing metaverses as a new form of corporate interaction.

2.2.2 **The rise of remote work and flexible work models.**

The COVID-19 pandemic served as a catalyst for the shift to remote work in Germany. According to the Bundesagentur für Arbeit (2021), the number of employees working from home more than doubled compared to 2019. By 2023, around 30% of the German workforce continued to work remotely on a full-time or part-time basis (German Economic Institute, 2023).

Hybrid and remote work models have become the standard for many professions, especially in the IT sector, financial services, and education. At the same time, research by the IFO Institute (2022) showed that only 12% of jobs in Germany are fully adapted to remote work, indicating that challenges related to the digitalization of labor still remain.

One of the key aspects is digital security and the management of remote workflows. Companies are actively investing in data protection systems, encryption, and secure communication platforms for corporate use.

2.2.3 **The development of 5G and the Internet of Things (IoT).**

The 5G network is rapidly developing in Germany, providing faster and more stable internet, especially in urban areas. By 2023, about 79% of the country's territory was covered by 5G, and this figure continues to grow (Bundesnetzagentur, 2023). This is driving the development of new digital services, including smart cities, autonomous vehicles, and remote healthcare. The Internet of Things (IoT) is also actively evolving, finding applications across various industries. In manufacturing, "smart factories" are being implemented, using IoT devices to monitor and automate processes. In agriculture, intelligent sensors help track soil conditions and optimize the use of water and fertilizers, while in transportation, autonomous vehicles and intelligent traffic management systems are being developed. According to Statista forecasts (2023), by 2025, over 50 million IoT devices will be used in Germany, which will significantly impact all areas of life.

2.2.4 **Growing concerns about data privacy**

In Germany, users have traditionally placed great importance on data protection. According to a Statista survey (2023), 67% of respondents consider the privacy of their online data a priority issue. In response, the popularity of secure messaging apps like Signal and Threema, as well as tracking-free search engines such as DuckDuckGo, is growing. At the same time, new challenges in cybersecurity are emerging, including an increase in cyberattacks on government institutions and private companies. European laws on digital security, such as GDPR, are being strengthened, and national data protection programs, such as "Germany's Digital Strategy 2030," are being implemented. Companies and private users are actively using VPNs, two-factor authentication, and encryption to protect their data, while regulators are tightening requirements for cross-border data transfer and online service monitoring.

2.2.5 **The digital divide between regions**

Western Germany still has a more developed digital infrastructure compared to Eastern Germany. This is evident in differences in access to high-speed internet and digital services (Bundesnetzagentur, 2020). Studies show that investments in infrastructure are a key factor in bridging this gap (German Economic Institute, 2020).

2.3 Factors influencing the use of digital communications.

The development of digital communications in Germany depends on a variety of factors, including socio-demographic differences, professional activities, and the level of awareness regarding privacy and digital security. These aspects determine the extent of different population groups' involvement in the digital environment and their preferences in using digital tools.

2.3.1 Socio-demographic differences

2.3.1.1 Differences by age (youth vs. elderly)

The age factor has a significant impact on the use of digital technologies. Young people in Germany are more active in using messaging apps, social networks, and streaming services, while older citizens tend to stick to basic digital tools, such as email and news websites (Statista, 2019). Despite growing digital literacy among the older generation, there remains a gap in the adaptation to new technologies, which calls for additional educational initiatives (European Commission, 2018).

2.3.1.2 Differences by gender

Studies show that men and women in Germany use digital communications for different purposes. Men are more likely to engage with content related to technology, finance, and gaming, while women are more active on social media, online education platforms, and e-commerce services (German Federal Statistical Office, 2019). However, these differences are gradually narrowing as digitalization increasingly impacts all areas of life.

2.3.1.3 The influence of education and income levels

The higher the level of education and income, the more actively a person uses digital technologies. Highly educated groups are more likely to use online banking, remote work, and professional networks such as LinkedIn (OECD Digital Economy Outlook, 2019). At the same time, people with lower income and education levels are less involved in the digital environment, which increases the risk of digital inequality.

2.3.1.4 Differences between regions of Germany (West/East)

There are significant differences in access to digital technologies between Western and Eastern Germany. Western regions have a more developed internet infrastructure and a higher level of business digitalization, while in the eastern states, access to high-speed internet is limited, which hampers the development of digital services and remote work (Bundesnetzagentur, 2019).

2.3.2 Professional activity and digital communications.

2.3.2.1 The impact of remote work

Remote work has become an important part of the modern labor market in Germany, especially after the COVID-19 pandemic. Many companies have implemented hybrid work models, which has increased the demand for video conferencing, cloud services, and collaboration platforms (McKinsey & Company, 2020). However, some sectors, such as manufacturing and services, remain less digitalized and still require the physical presence of employees.

2.3.2.2 The use of digital tools in different professions

Different professions require different digital tools. For example, in the IT sector, cloud technologies and cybersecurity systems are actively used, in healthcare – telemedicine and electronic medical records, and in education – distance learning platforms (Federal Ministry for Economic Affairs and Energy, 2019).

2.4 Privacy and security in digital communications

2.4.1 Risk perception among different social groups

Different population groups assess the risks associated with digital communications in different ways. Young people are more likely to disregard security, actively sharing personal information on social media, while older users tend to be more cautious and are often hesitant to adopt new digital services due to concerns about data leaks (European Data Protection Board, 2019).

2.4.2 The impact of education on digital security awareness

Research indicates that education level has a direct impact on individuals' awareness of digital security risks. People with higher levels of education are generally more conscious of the importance of digital security and are more likely to adopt security measures such as

using complex passwords, enabling two-factor authentication, and utilizing VPN services to protect their online activities. In contrast, individuals with lower levels of education are often less aware of these risks and are less likely to take such precautionary measures (OECD, 2018). This discrepancy in security practices highlights the need for increased digital literacy programs. In response to this, Germany has been actively developing and promoting educational initiatives focused on enhancing digital literacy, particularly among those with lower levels of education. These initiatives aim to improve public understanding of digital security, empowering individuals to better protect themselves in an increasingly digital world.

3 Practical Part

3.1 Data description

This study uses data from the European Social Survey 2020 (ESS2020), an international survey aimed at studying people's views and behaviors in Europe on various social issues, including digital communication.

3.2 Variable overview

region

The variable reflecting the geographic location of the respondent is important for analyzing differences in the behavior of residents from different regions, such as differences in the use of digital communications between Eastern and Western Germany. The data type of this variable is qualitative (categorical), and it plays a key role in testing hypothesis H1, which suggests that residents of Western Germany use the internet more frequently than residents of Eastern Germany. Comparing these regions helps identify potential differences in internet usage frequency.

agea

This variable means age of the resident of Germany.

netusoft

The variable indicates the use of internet communication technologies or internet-related software, such as browsers or other online tools for communication and work. The data type is quantitative (nominal or interval). Its role in the analysis is to help analyze the

frequency of online communication usage in different contexts (personal or work-related relationships). For example, this variable will be used to test hypothesis H3 (Remote workers use online communication more frequently).

wrkhome

This variable indicates whether the respondent works remotely or in an office. It is important for analyzing the relationship between the type of work and the use of online communications. The data type is qualitative (binary). Its role in the analysis is crucial for hypothesis H3 (Remote workers use online communication more frequently). This will allow a comparison between remote and office workers.

wrkhome_binary

This is an analogous variable to wrkhome, but in a binary form for simplified analysis. The data type is qualitative (binary). Its role in the analysis is to simplify the analysis when a binary categorization of work is required.

scrnpnt

This variable indicates whether the respondent uses online interfaces for working with texts or documents. This may include the use of text editors or document processing interfaces online. The data type is qualitative (binary). It allows for analyzing how often respondents use the internet for working with texts and documents, which may influence their preferences in online communications.

hinctnta

This variable represents the respondent's income, which is an important factor influencing access to internet services and digital technologies. The data type is quantitative (categorical). Its role in the analysis is crucial for hypothesis H4 (People with higher income have better internet access), as the relationship between income and internet access is key in this context.

netustm

The variable measuring the amount of time the respondent spends online is an important indicator for analyzing the relationship between the time spent online and the frequency of online communication usage. The data type of this variable is quantitative (interval), and it plays a key role in studying how internet usage influences preferences in online communication, which is important for testing various hypotheses.

compnt

The variable indicating the use of a computer for various online tasks, such as working with email, browsing websites, and using other online resources, is important for analyzing the use of computer technologies. The data type of this variable is qualitative (binary), and it plays a key role in studying the relationship between the use of computer technologies and the intensity of internet communication usage.

colscrn

The variable indicating how often respondents use various forms of online communication (such as email, social networks) for personal or work purposes is used to study the frequency of online communication in different areas of life. The data type of this variable is quantitative (nominal or interval), and it plays a key role in testing hypothesis H5, which suggests that the frequency of online communication in the workplace is positively correlated with life satisfaction.

colcom

The variable reflecting the frequency of communication with colleagues about work via text messages, email, or messaging apps measures how often respondents use written forms of online communication for work purposes

stflife

The variable measuring the respondent's life satisfaction reflects their emotional well-being, which may be linked to how they perceive technology. The data type is quantitative (interval), and it helps analyze the connection between life satisfaction and behavior in digital communication. Studying this variable helps understand how a person’s emotional state and overall life satisfaction might affect their use of technology.

3.3 Data transformation

The following data transformation steps were performed during the data preparation process:

3.3.1 Data Filtering:

Respondents with missing values in critical variables, such as region of residence or age, were removed from the original ESS2020 dataset.

3.3.2 Creating `region_group`

For further analysis of the differences between Western and Eastern Germany, a variable called *region_group* was created, which classifies respondents based on their geographic location. This division was made based on the region codes assigned in the ESS2020 dataset:

Western Germany: regions with the following codes:

'DE1', 'DE2', 'DE5', 'DE6', 'DE7', 'DE9', 'DEA', 'DEB', 'DEC'.

Eastern Germany: regions with the following codes:

'DE3', 'DE4', 'DE8', 'DED', 'DEE', 'DEG'.

3.3.3 Creation of variables for age groups - `agegroup`

This variable was created to classify respondents into age groups. Only adult respondents (aged ≥ 18) were included in the sample. Depending on their age, respondents were assigned to one of two age groups:

Young — age from 18 to 36 years.

Old — age 55 and older. Other age categories were excluded from the analysis.

3.3.4 Creation of a variable for videocall usage

uses_video_calls

This variable was created to indicate how often respondents use video calls. Data on the frequency of video call and messaging usage were used, based on the variables *scrnpnt* and *colscrn*

3.3.5 Creation of a variable for text communications

uses_text_comm

This variable was created to indicate how often respondents use text-based online communication (such as email or messaging). It was based on data regarding the frequency of text message usage, represented by the *compnt* and *colcom* variables. It is used to analyze the frequency of text message usage and its relationship with other variables, such as age and education level.

3.3.6 Classification of respondents by income levels

income_group

The variable income_group was created to classify respondents by their income level. During the data preparation process, respondents with missing values in the variables hinctnta (income level), netusoft (internet access), and netustm (internet usage time) were excluded, with missing values replaced. Respondents with income levels corresponding to the following categories from the hinctnta variable were included: Low — low income level (hinctnta values 1, 2, and 3) and High — high income level (hinctnta values 8, 9, and

10). Other middle-income categories were excluded from the analysis. This variable is used to analyze differences in internet access and online communication usage based on income level, related to the hypothesis that people with higher income have better internet access (H4).

3.3.7 Categorization based on the frequency of communication with colleagues

group_comm

The variable was created to classify respondents based on the frequency of communication with colleagues, using data from the variables colscrn (frequency of communication with colleagues via screen) and colcom (frequency of communication with colleagues via text messages). Respondents were assigned to one of two categories: Often — those who communicate frequently with colleagues (if the value of colscrn or colcom is less than or equal to 3, indicating high communication frequency), and Seldom — those who communicate rarely with colleagues (if the value of colscrn or colcom is greater than or equal to 4, indicating low communication frequency). This variable is used to analyze the relationship between communication frequency and other factors such as age, region, education level, and income, helping to understand the impact of communication frequency on the use of various online communications in the professional sphere.

3.4 Handling of missing values

3.4.1 Deletion of rows with unknown values

All rows containing missing or unreliable data in critical variables (such as hinctnta, netusoft, netustm, wrkhome) were deleted.

Missing or unreliable values for the variables hinctnta, netusoft, and netustm were excluded if they contained values 77, 88, or 99 (the missing value code). Missing or unreliable values for the variable wrkhome were also deleted (values 66, 77, 88, 99).

3.4.2 Deletion of rows with remaining missing values

After replacing unreliable values, rows with missing values in the variables colscrn, colcom, and stflife were deleted from the analysis to ensure data accuracy and completeness for further analysis.

3.5 Hypothesis testing

3.5.1 Hypothesis 1

Residents of Western Germany use the internet more frequently than residents of Eastern Germany

Variables: netusoft (Internet use, how much), region_group (West and East)

Table 1

Descriptive Statistics: Frequency of Internet Usage

The MEANS Procedure

Analysis Variable : netusoft				
region_group	N Obs	Mean	Median	Std Dev
East	1648	4.2433252	5.0000000	1.4294641
West	6741	4.4843495	5.0000000	1.2244783

As shown in the table, the average frequency of internet use in Western Germany (4.48) is higher than in Eastern Germany (4.24). The median values also confirm this trend: 5.0 for Western Germany and 4.0 for Eastern Germany.
Testing the statistical significance of differences.
The Mann-Whitney test (Wilcoxon Two-Sample Test) was used to test the statistical significance of the differences between the groups, as the variable netusoft is ordinal.

Table 2

Wilcoxon Two-Sample Test					
				t Approximation	
Statistic	Z	Pr < Z	Pr > |Z|	Pr < Z	Pr > |Z|
6407117	-7.3068	<.0001	<.0001	<.0001	<.0001
Z includes a continuity correction of 0.5.					

The obtained p-value (<.0001) indicates that the probability of such differences occurring by chance is extremely low.

3.5.2 Hypothesis 2

Older individuals (55+) use video calls for communication less frequently but prefer text communication more often compared to younger individuals (18–36 years).

Variables: ageagroup (young and old), uses_video_calls, uses_text_comm

Table 3

Statistics for Table of agegroup by uses_video_calls

Statistic	DF	Value	Prob
Chi-Square	1	27.9974	<.0001
Likelihood Ratio Chi-Square	1	28.6879	<.0001
Continuity Adj. Chi-Square	1	27.4839	<.0001
Mantel-Haenszel Chi-Square	1	27.9843	<.0001
Phi Coefficient		0.1144	
Contingency Coefficient		0.1136	
Cramer's V		0.1144	

Chi-Square Test: The chi-square value is 27.9974 with a p-value <.0001, which confirms a statistically significant difference between age groups in the use of video calls.

Table 4

Statistics for Table of agegroup by uses_text_comm

Statistic	DF	Value	Prob
Chi-Square	1	200.9211	<.0001
Likelihood Ratio Chi-Square	1	196.4540	<.0001
Continuity Adj. Chi-Square	1	199.5365	<.0001
Mantel-Haenszel Chi-Square	1	200.8272	<.0001
Phi Coefficient		0.3063	
Contingency Coefficient		0.2929	
Cramer's V		0.3063	

Chi-Square Test: The chi-square value is 200.9211 with a p-value <.0001, which confirms a statistically significant difference between age groups in the use of text communication.

3.5.3 Hypothesis 3

People who work remotely use online communication (video calls, messaging apps) more frequently to interact with colleagues than office-based employees.

Variables: colscrn(speak with colleagues about work and see each other on a screen)**,** **colcom**(communicate with colleagues about work via text, email or messaging apps)**,** wrkhome_binary(home office)

Table 5

Mann-Whitney Test: Differences in Digital Communications

The NPAR1WAY Procedure

Wilcoxon Scores (Rank Sums) for Variable colscrn Classified by Variable wrkhome_binary					
wrkhome_binary	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
0	3131	8934272.0	7833762.0	47007.7610	2853.48834
1	1872	3583234.0	4683744.0	47007.7610	1914.12073
Average scores were used for ties.					

Wilcoxon Two-Sample Test					
				t Approximation	
Statistic	Z	Pr < Z	Pr > |Z|	Pr < Z	Pr > |Z|
3583234	-23.4112	<.0001	<.0001	<.0001	<.0001
Z includes a continuity correction of 0.5.					

Kruskal-Wallis Test		
Chi-Square	DF	Pr > ChiSq
548.0862	1	<.0001

3.5.4 Hypothesis 4

People with higher income have more frequent access to the internet in various locations (home, work, public places) compared to lower-income groups.

Variables: income_group, netusoft, netustm

Table 6

Descriptive Statistics: Internet Access (Low vs. High)

The MEANS Procedure

income_group	N Obs	Variable	Mean	Median	Std Dev	Minimum	Maximum
Hig	2457	netusoft	4.7960928	5.0000000	0.6767553	1.0000000	9.0000000
		netustm	574.4192104	240.0000000	1377.55	0	9999.00
Low	1466	netusoft	4.0095498	5.0000000	1.6252837	1.0000000	9.0000000
		netustm	1850.16	300.0000000	2870.39	0	9999.00

Table 7

Wilcoxon Two-Sample Test					
				t Approximation	
Statistic	Z	Pr < Z	Pr > |Z|	Pr < Z	Pr > |Z|
2375200	-19.8079	<.0001	<.0001	<.0001	<.0001
Z includes a continuity correction of 0.5.					

People with higher income use the internet significantly more frequently than lower-income groups ($p < 0.0001$). The mean rank is as follows: High income – 2165.94, Low income – 1620.19, which supports the hypothesis of more frequent access. The Kruskal-Wallis test ($\chi^2 = 392.35$, $p < 0.0001$) also reveals significant differences between the groups.

3.5.5 Hypothesis 5

The frequency of using online communication in the workplace is positively correlated with the level of life satisfaction.

Variables: stflife(life satisfaction), colscrn(communication with colleagues via screen), colcom(online communication with colleagues)

Table 8

Life Satisfaction Depending on the Frequency of Communication with Colleagues

The MEANS Procedure

Analysis Variable : stflife				
group_comm	N Obs	Mean	Median	Std Dev
Often	2313	7.2823173	8.0000000	2.0854006
Rare	1988	6.9899396	8.0000000	2.2309755

Table 9

Wilcoxon Two-Sample Test					
				t Approximation	
Statistic	Z	Pr < Z	Pr > |Z|	Pr < Z	Pr > |Z|
4091265	-4.6422	<.0001	<.0001	<.0001	<.0001
Z includes a continuity correction of 0.5.					

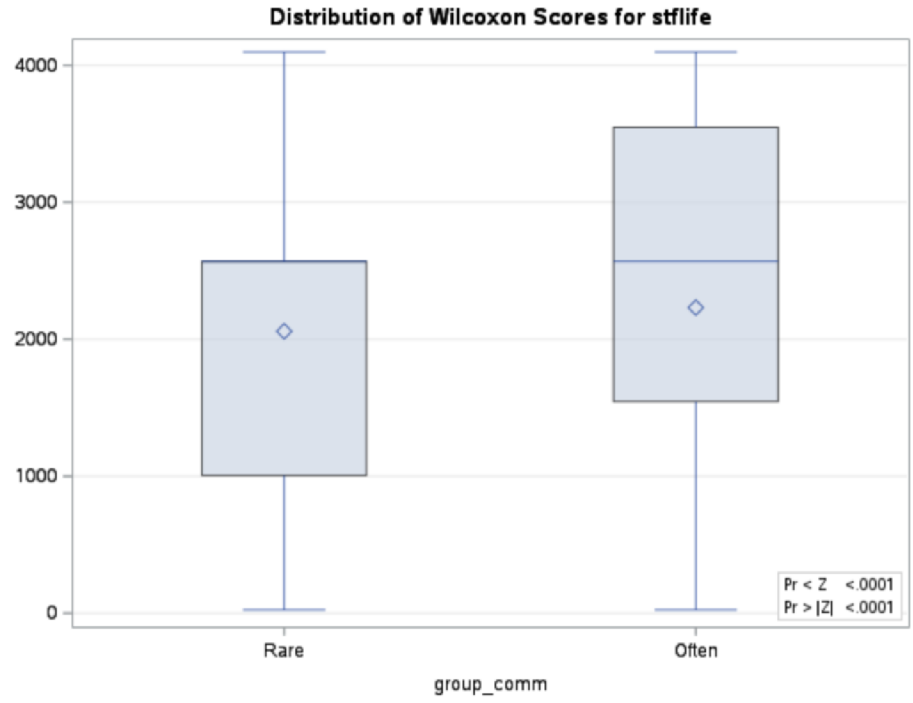

Figure 1

4 Results and Discussion

Hypothesis 1: Residents of Western Germany use the internet more frequently than residents of Eastern Germany

The analysis confirms the hypothesis that residents of Western Germany use the internet more frequently than those in Eastern Germany. The average frequency of internet usage in Western Germany was 4.48 (median = 5.0), whereas in Eastern Germany, this value was lower, at 4.24 (median = 4.0). The statistical significance of these differences was confirmed by the Mann-Whitney test ($Z = -7.31$, $p < 0.0001$), which rules out the possibility of the observed trend being due to chance. The results align with the historical and economic characteristics of the regions: the more developed infrastructure, higher income levels, and technological advancement in Western Germany likely contribute to its population's active use of digital technologies. Therefore, the hypothesis H1 is supported,

highlighting the importance of considering regional disparities when developing measures to reduce the digital divide. For a deeper understanding of the mechanisms behind these differences, future studies are recommended to examine additional factors such as age, education level, and access to technologies.

Hypothesis 2: Older individuals (55+) use video calls for communication less frequently but prefer text communication more often compared to younger individuals (18–36 years).

Based on the results of the chi-square tests, the following conclusions can be drawn regarding the hypothesis. The results revealed statistically significant differences between age groups in the use of video calls and text communication.

Firstly, the use of video calls (variable uses_video_calls) differs significantly between age groups. Among the elderly (55+), video calls are used less frequently (38.51%), while among young people (18–36 years), this figure is 61.49%. The chi-square test results with a p-value of less than 0.0001 reject the null hypothesis, indicating a statistically significant difference. However, the Cramér's V value of 0.1144 suggests a weak strength of association between age and the use of video calls.

Secondly, there is also a statistically significant difference in the use of text communication (variable uses_text_comm) between the age groups. Older individuals (55+) use text communication more frequently (56.42%) compared to younger people, where the figure is 43.58%. The chi-square test results with a p-value of less than 0.0001 confirm the significance of the differences between the age groups. The Cramér's V value of 0.3063 indicates a moderate strength of association, suggesting a more pronounced relationship between age and the preference for text communication compared to video calls.

As a result, the hypothesis that older individuals use video calls less frequently and prefer text communication more often is confirmed by statistically significant results, with a more pronounced relationship observed for text communication.

Hypothesis 3: People who work remotely use online communication (video calls, messaging apps) more frequently to interact with colleagues than office-based employees.

The results of the analysis of differences in digital communications between remote workers and office employees, using the Mann-Whitney U-test (Wilcoxon test) and the Kruskal-Wallis test, showed statistically significant differences between the groups. In the group with infrequent remote work (wrkhome_binary = 0), the sum of ranks was 8,934,272, while for the group working frequently remotely (wrkhome_binary = 1), the sum of ranks was 3,583,234. The Wilcoxon test revealed a Z statistic of -23.4112 with a p-value < 0.0001, significantly lower than 0.05, confirming that differences exist between the groups. Additionally, the Kruskal-Wallis test with a chi-square value of 548.0862 and a p-value < 0.0001 supports this conclusion. Therefore, the hypothesis that remote workers use digital communications (video calls, messengers) more frequently than office employees is confirmed.

Hypothesis 4: People with higher income have more frequent access to the internet in various locations (home, work, public places) compared to lower-income groups.

The data analysis revealed significant differences in the frequency and duration of internet usage among groups with different income levels. The frequency of internet usage (netusoft) is higher among individuals with higher income (mean value — 4.80) compared to the low-income group (4.01), which is confirmed by the Mann-Whitney U-test ($p < 0.0001$). This indicates that individuals from higher-income groups are more likely to access the internet more frequently, for example, on a daily basis. However, the time spent

using the internet (netustm) was higher among low-income individuals — with an average of 1850.16 minutes compared to 574.42 minutes for the high-income group, and these differences are also statistically significant ($p < 0.0001$). This suggests that although high-income individuals use the internet more frequently, their sessions are likely shorter (e.g., regular check-ins during the workday). At the same time, low-income groups access the internet less often but spend more time per session, which could be related to limited access and the use of public Wi-Fi. Therefore, the hypothesis that high-income individuals have more frequent access to the internet is confirmed, although the difference in time spent online highlights variations in the ways and conditions of access.

Hypothesis 5: The frequency of using online communication in the workplace is positively correlated with the level of life satisfaction.

The results of the analysis confirm a statistically significant relationship between the frequency of online communication in the workplace and life satisfaction. According to descriptive statistics, individuals who more frequently use online communication with colleagues have, on average, a higher level of life satisfaction (7.28) compared to those who engage in online communication less often (6.99). This suggests a potential positive correlation between the frequency of workplace online communication and subjective life satisfaction.

To test the statistical significance of the differences, the Mann-Whitney U test was applied, which revealed significant differences between the groups ($Z = -4.6422$, $p < 0.0001$). The small p-value indicates that the difference between the groups is not random and likely reflects a real trend. Therefore, the frequency of online communication is positively correlated with life satisfaction, which confirms the proposed hypothesis.

People who communicate more frequently with colleagues online tend to have a higher level of life satisfaction. A possible explanation for this phenomenon is that regular work-related online communication may promote social engagement, strengthen professional connections, enhance feelings of significance, and provide emotional support. The accessibility of communication and the ability to exchange information with colleagues

can create a more comfortable work environment, reducing stress and increasing satisfaction with both professional activities and life in general.

5 Conclusion

The study aimed to analyze the differences in the use of digital social communication tools in personal and work life among the population of Germany, based on data from the European Social Survey 2020 (ESS2020). The statistical analysis conducted confirmed several key hypotheses, revealing significant differences in digital communication practices depending on factors such as region of residence, age, employment status, education level, and income.

First, it was found that residents of Western Germany use the internet more frequently than those in Eastern Germany. This is supported by statistically significant differences in internet activity frequency between the groups, which may be linked to the historical and economic characteristics of the regions.

Secondly, age differences also play an important role in digital communication. The analysis showed that older individuals (55+) use video calls less frequently but prefer text communication more compared to younger people (18–36 years old). This indicates differences in preferences and the availability of technologies across different age groups.

Thirdly, the results confirmed that remote workers use digital communication tools, such as video calls and messengers, more frequently than office employees. This is logical, as remote work requires active interaction in an online environment.

Moreover, a significant connection was found between education level and attitudes towards digital communications: people with higher education are more likely to believe that online communications help bring people closer together. Similarly, income level influences access to the internet in different locations — people with higher incomes have broader access to digital technologies, although their internet sessions tend to be shorter.

Finally, a key finding of the study is that the frequency of online communication in the work environment is positively correlated with life satisfaction. People who interact more frequently with colleagues in a digital format show a higher level of life satisfaction, which can be explained by increased social engagement and professional development.

The obtained results have practical significance and can be used to develop digital transformation strategies in various areas, including politics, business, and education. In the future, the study could be expanded by analyzing additional factors such as the psychological aspects of digital communication, digital literacy levels, and cultural differences between regions of Germany and other European countries.

This study contributes to understanding how digital communication technologies are used by the population of Germany and which factors influence their prevalence and effectiveness.

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7 List of tables and graphs

7.1 List of tables

Table 1 29
Table 2 29
Table 3 30
Table 4 31
Table 5 32
Table 6 33
Table 7 33
Table 8 34
Table 9 34

7.2 List of graphs

Figure 1 35