Disruptive technologies in business
Session 1 – Introduction to course
Prof. Josip Marić, PhD

Rules

- **RESPECT the security measures – keep social distance, wear masks and wash hands regularly.**
- **RESPECT others – do not disturb the class!**
- **NO entertainment content / social media & communication on your computers.**
- **Pause (10-15min) each full hour.**
- **ONLINE PRESENCE - turn camera on (without exception).**
- **Be on time.**

About me…

Josip Marić, PhD
Professor at EM Normandie

jmaric@em-normandie.fr

Background

- PhD in Management Science (MIS) at the University of Montpellier
    - Master of Science (MSc) in Computer science
    - Master of Arts (MA) in European studies and international relations

Academic experience

- Professor at SKEMA Business School and IESEG Business School in Paris (France)

- Visiting researcher at the University of Wollongong (Australia)

- Research assistant at Montpellier Business School (France)

About you…

(For classroom lectures)

Take a piece of paper – Fold it in half – Write your first name – Place the paper in front of you on the desk (!)

Short introduction covering the following:

- **What is your academic background?**
  - (Which programs and which university/campus?)
- **What are the course expectations?**
- **Career objectives and aims.**

Tip: Communication with your supervisors/professors

Be aware that your questions/e-mail can't be all replied immediately.

Prepare ahead of your meetings with topics and questions to be covered, as well as suitable deadlines to be discussed.
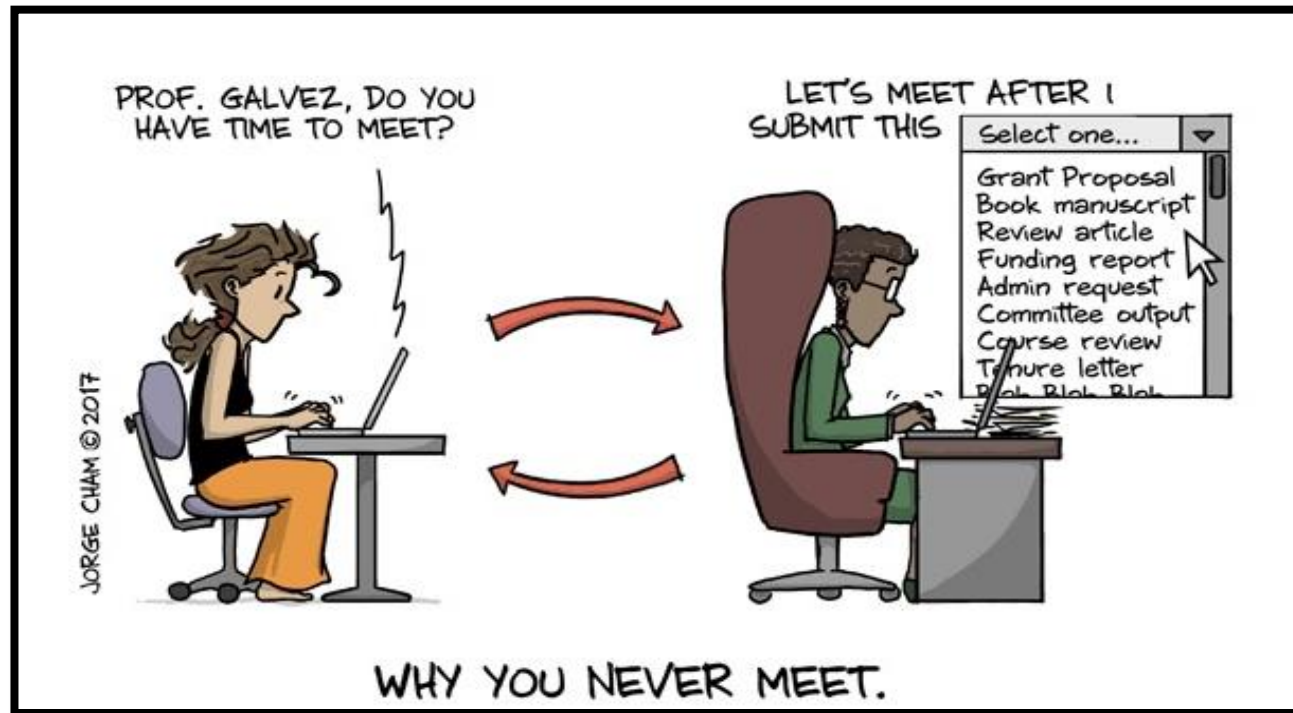
Course sessions and content

Session number	Day	Topic	Time slot (French Time)	Lecturer Format course	Student work
1	Monday 5 June 2023	Introduction to the course	10h-13h	Room 404	
2	Monday 5 June 2023	Disruptive innovation and Industry 4.0	14.30h-16.30h	Room 404	
3	Monday 5 June 2023	Emerging technologies of Industry 4.0 (I)	16.30h-18.30h	Room 404	Group presentations – team work
4	Wednesday 7 June 2023	Emerging technologies of Industry 4.0 (II)	10h-13h	Room 404	Group presentations – emerging technology
5	Wednesday 7 June 2023	Disruptive technologies – case of 3D printing	14.30h-16.30h	Room 404	Student work and simulation
6	Wednesday 7 June 2023	Disruptive technologies – case of AR/VR	16.30h-18.30h	Room 404	Student work and simulation

Course evaluation

Continuous Assessment (40%)	• Test (MCQ/Open end questions)	20%
	• Course Participation Mark	20%
Final Project (60%)	• Final Presentation (Session 4 "Emerging technologies of I4.0")	60%
Total		**100%**

Continuous assessment – Course participation mark

- **20% of the final grade**

- Your individual engagement in the course – classroom activities, teamwork, engagement with the tasks, etc.

- Available via your program direction/administration

Continuous assessment – Test

- **20% of the final grade**

- **10-20min**

- **5-15** (MCQ or Open-end) questions

- Everything covered during the lectures – slides, industry examples, etc.

- Available via Moodle/Upward platform – immediate results

Final project – presentations (session 4)

Student presentations (60%)

- Scheduled for **Session 4** (and Session 5) during our lectures

- Team-work divided into **five (5) student teams** (random allocation of members - teams will be available via course page on Moodle/Upward)

- **Five (5) team** presentations per session

- **Choose one of the topics/emerging technologies to work upon as a team**

  - *First Come First Served policy* – first team who contacts me with the chosen technology for your presentations will have immediate allocation of that topic

  - Choose at least two technologies you wish to work upon as team (one back-up topic in the case your preferred topic is already chosen by another team)

  - Mention two technology choices and add your teammates in the CC of your e-mail (if e-mail communication)

Emerging technologies to chose for your presentations
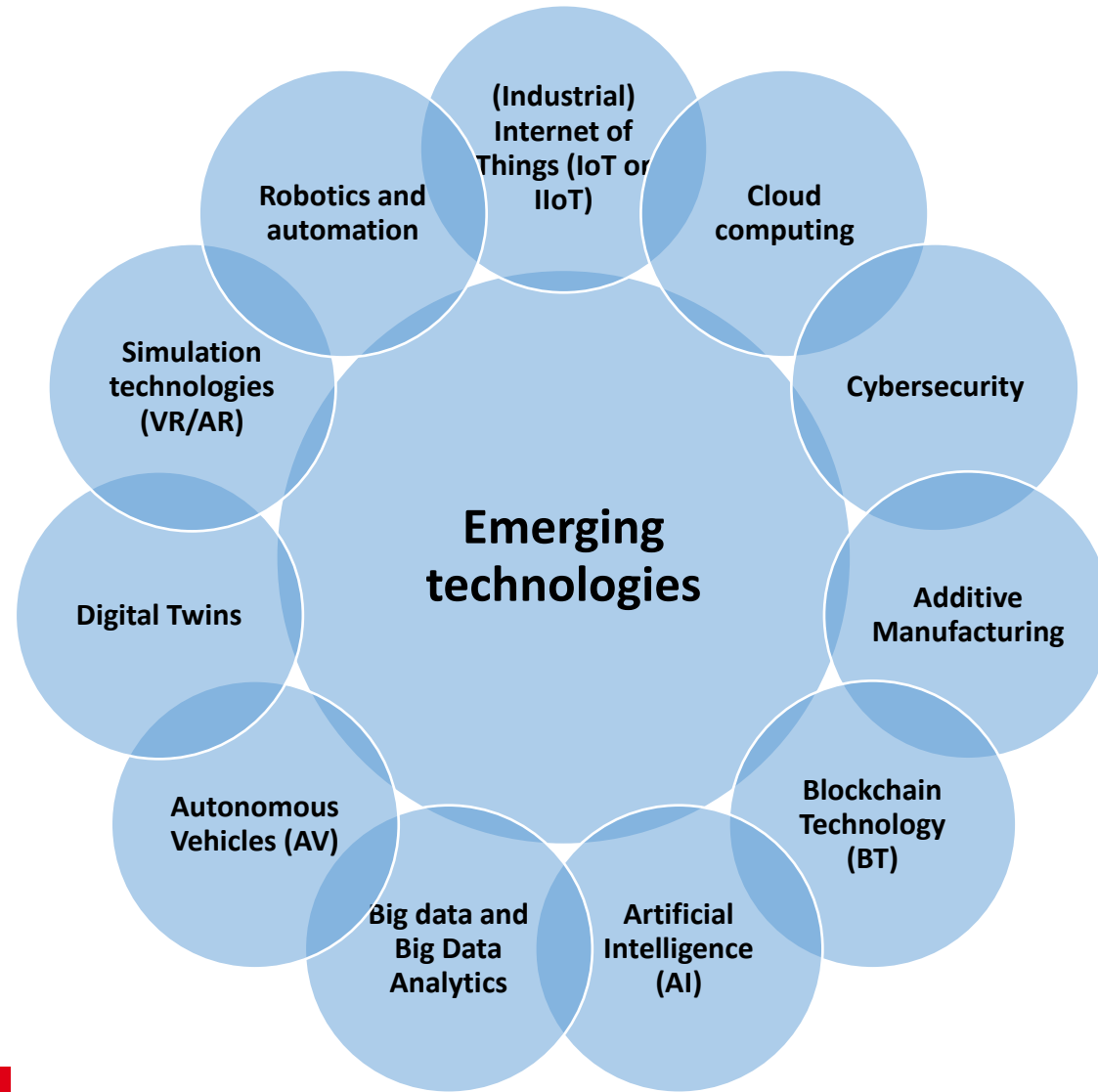
Final project – presentations (session 4)

- **It is solely your responsibility to enable communication and organize a balanced workload within each team**

	Team 1	Team 2	Team 3	Team 4	Team 5
Students	Madam Andreeva Angelina andreevaa.angelina@gmail.com Mr N'KOMA Enzo enzo.nkoma26@em-normandie.fr Mr SEKAR BABU SHRAVAN KUMAR shravankumar.sekar@gmail.com	Madam Joseph Kamal Raj Julie Jynette juliejynettejoseph@gmail.com Mr de la Espriella Eduardo eddieespriella@gmail.com Mr Joseph Antony John Britto Silvestor jaybee11sky@gmail.com	Madam Nassif Yara yara.nassif1@gmail.com Madam DOINEL Chloé chloe.doinel23@em-normandie.fr Mr Tang Haozhe haozhe.tang@epita.fr	Madam Liu Yuanyuan yuanyuan.liu@epita.fr Mr GARCIA-PELAYO Henri henri.garciapelayo27@em-normandie.fr Mr Ravish Ruthvik ruthvik-.ravish@epita.fr	Madam Cerne Ines ines.cerne@epita.fr Mr DOAN Van Thanh doanuyenminhanhhcm@gmail.com Mr Zannad Malek malek.zannad@epita.fr
Student number:	3	3	3	3	3
Tech choice:	**Robotics**	**AR/VR**	**AV**	**AI**	**BT**

Presentation guidelines

- Plan 15-20 minutes (at most) for your presentation + 10 minutes for discussion (Q&A)
  - ➢ Rule of thumb - 2min per slide, i.e. 20min/2min = (app.) 10 slides of content
  - ➢ Be concise – practice time-boxing! (Be careful with time in the case of multiple speakers)
  - ➢ Ending earlier is sometimes better than running over time
- Avoid large chunks of text – stick to keywords
- Aim to develop presentation structure based on the suggested guidelines (next slide)
- Creativity in using presentation tools is welcomed (PowerPoint, Prezi, Canvas, other graphical tools)
- Use of additional media is welcomed (audio-visual content & links)
- Be aware of text size for your slides (recommended **min. size for your text is 18-20**)
- Highlight used references for your presentation directly on your slides and on the last slide
- Prepare one or two questions/topics/open issues that would follow your presentation(s)
- Find inspiration for your presentation styles on open tutorials online or via platforms such as TED talks or YouTube (i.e. Links) https://www.ted.com/playlists/574/how_to_make_a_great_presentation https://www.youtube.com/watch?v=2-ntLGOyHw4 or https://www.youtube.com/watch?v=MjcO2ExtHso

Presentations content (suggested guidelines)

- What is this specific technology? How does it work? (Any simulation or demonstration for the course).

- What is the current state of this technology maturity? Industrial sector maturity?

- What is the current economic perspective of that technology (market share, future market tendencies, forecasts, investments)?

- Who are the major market or development proponents?

- Who are the developers, users, or innovators in the field?

- What are current development trends?

- What are possible applications and future functionalities?

- What are social, political, legal or ethical questions related to this technology?

- **Prepare few open questions that you would consider interesting for course debate.**

Presentations evaluation

- **Objective**: understand implications and tendencies of emerging technologies

- **Evaluation**: accent on research skills, context analysis, analytical thinking, creativity, teamwork, justification of your presented data through validated references, writing style and text formatting, images and graphs quality…

- **Evaluation characteristics**: max. grade for presentation 15/20 – additional 5/20 can be achieved only on the basis of engagement with other presentations/discussion/questions

- **TIP**: *You can search additional information in the reports of consulting agencies and research entities like World Economic Forum (WEF), OECD, EU agencies (IT oriented, i.e. DESI), World Bank, UNIDO, UN, Eurostat, Statista, CES conference, Reuters, Forbes, etc.*

⚠️ **Note**: **Academic fraud will not be tolerated**

Final project – presentations schedule

- **It is solely your responsibility to enable communication and organize a balanced workload within each team**

	Presentation 1	Presentation 2	Presentation 3	Presentation 4	Presentation 5
Team	Team	Team	Team	Team	Team
Tech choice:					

Recommended textbooks
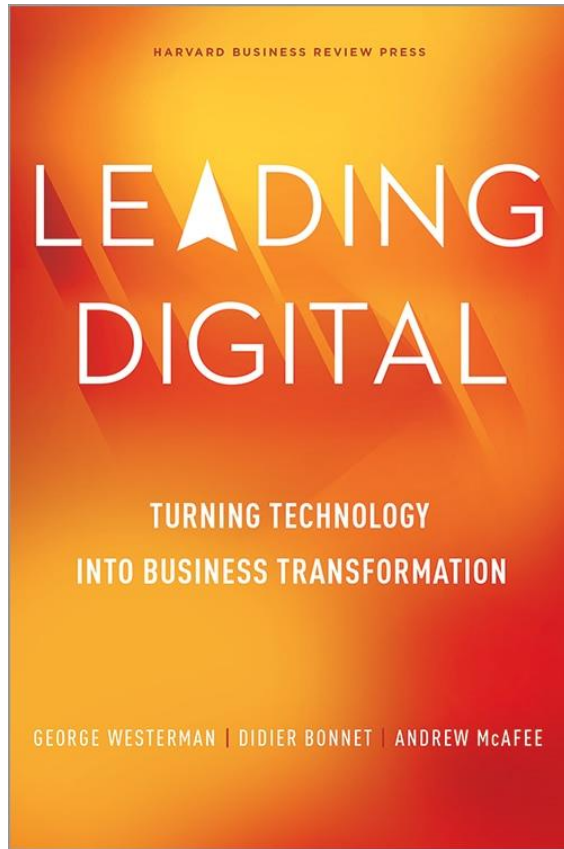
George Westerman, Didier Bonnet, & Andrew McAfee (2014). *Leading digital: turning technology into business transformation*. Harvard Business Review Press
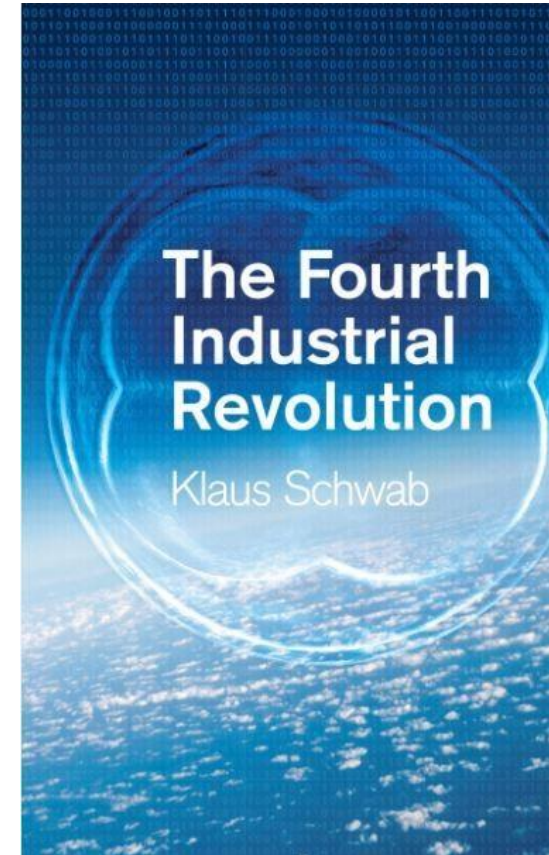
Klaus Schwab (2017). *The Fourth Industrial Revolution*. WEF, ISBN-10: 9781524758868.

Session 1 (S1)

Introduction

Session 1 (S1)

- ► General course introduction
  - ► Course assessment and course tasks
- ► Understanding global business environment

Understanding global business environment

Understanding business environment

The business environment includes **the actors and forces within and outside the company** that affect the ability to develop business solutions and maintain successful relationships with target customers.

The business environment:

- *Macroenvironment*

- *Microenvironment*

Interactive session – Can you name some of the contemporary global factors influencing business environment?

Macroenvironment

Macroenvironment consists of the larger societal forces that affect the microenvironment: **demographic, economic, natural, technological, political, historical, and cultural forces**.
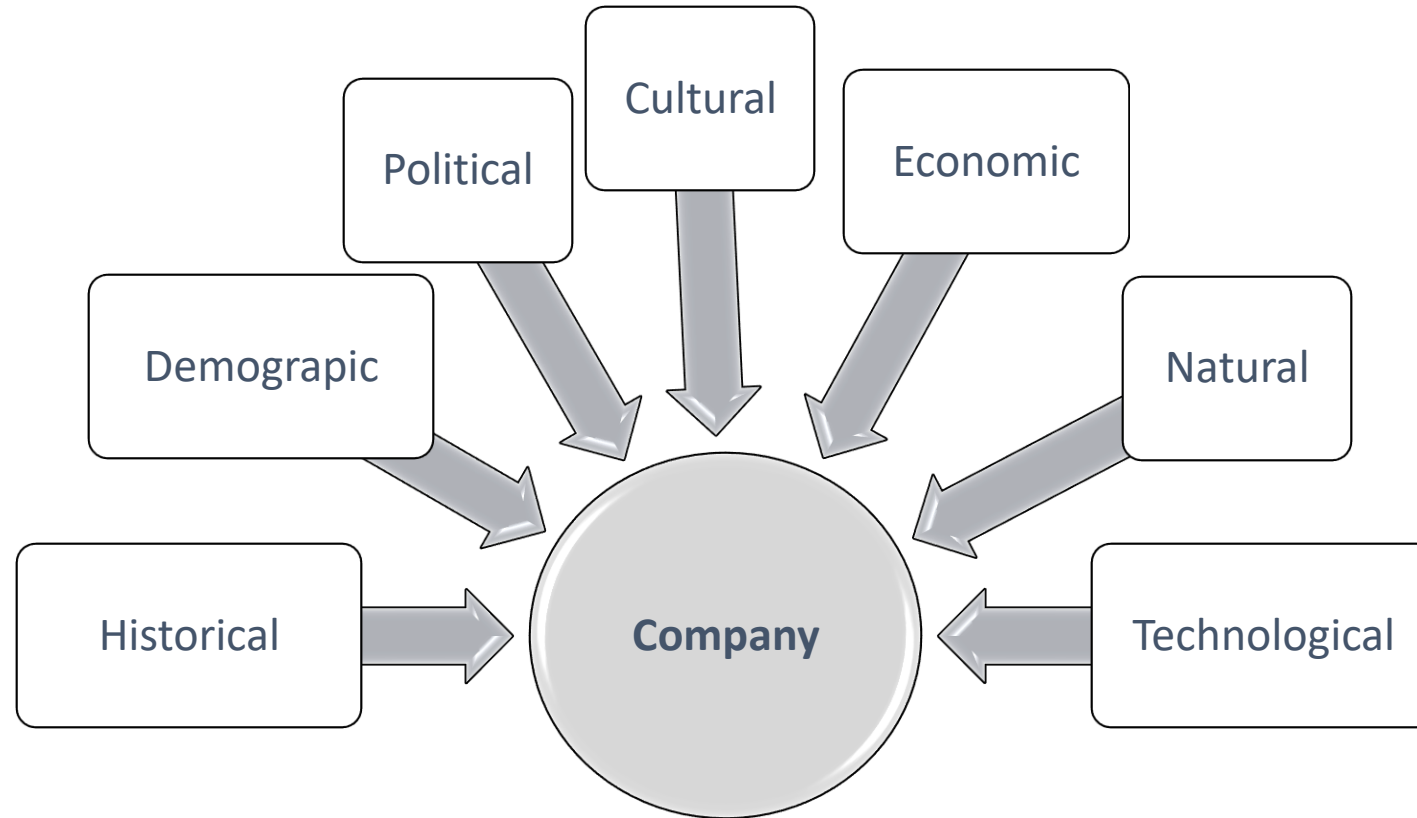
Historical factors: globalization

Globalization

- **Post World War Two - fastest increase in the human population fueling demand for products and services around the world**

- Growth of international trade - positive impact on per capita income in many parts of the world

- Three defined globalizations:
  - Globalization 1: between 1492 and 1800s
  - Globalization 2: between 1800 and 2000s
  - Globalization 3: from 2000s onwards

Historical factors: globalization

Globalization

Internet and global communications have greatly changed how and where business is done

- Challenges and opportunities
- Drastic reduction of operational costs and transactions
- Competition for jobs, markets, resources, ideas
- Growing interdependence of global economies
- Requires new understandings of skills, markets, opportunities
- Offshore revenue generation
- Information systems enable globalization of commerce

Interactive session – Who can name stages of industrial development?

Historical factors: industrial development

- Generally accepted that there have been **four industrial revolutions**

- These revolutions have not taken place simultaneously in all countries

  There are countries in development/developing countries where the second or the third industrial revolution have not yet occurred

- Industry 4.0 holds a promise for these developing countries to leapfrog in development and progress
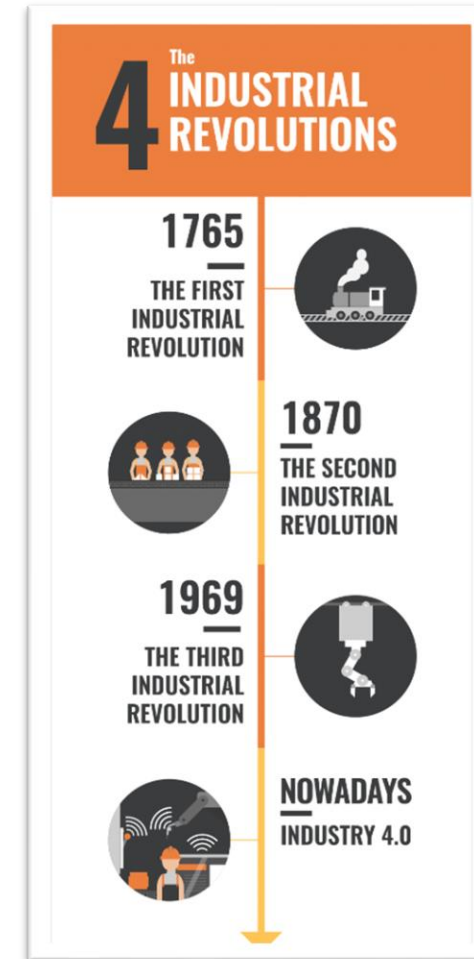
Source: Sentryo - The 4 Industrial Revolutions

Historical factors: industrial development

Human history is characterized by continuous innovation and technological progress since the early ages.

First Industrial Revolution: triggered by water and steam power, which helped to move from human labour to mechanical manufacturing. Emergence of railroads and advancement in material exchanges and demographic movements.

Second Industrial Revolution: built on electric power, to enable mass production. Gas and oil came into mass utilization. The combustion engine, the telegraph and the telephone revolutionized the transportation and communication methods.
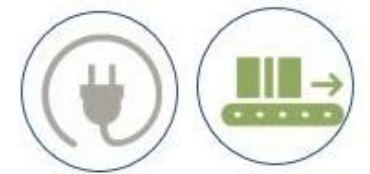
Historical factors: industrial development

Third Industrial Revolution: characterized by the introduction and rise of electronics, information and communication technology, and computers, leading to high-level automation in production. Nuclear energy, space research and biotechnology are also elements to consider.

Fourth Industrial Revolution : refers to the current trend of automation and data exchange in manufacturing technologies. Digital technologies allow for **new business models** and **value-producing opportunities**.

Technologically speaking, Industry 4.0 is based on technologies that have been around since the 3rd Industrial Revolution, however, when compared with previous industrial revolutions, the **Fourth is evolving at an exponential rather than a linear pace.**

Demographic factors

Demographic Environment

- **Demography** is the study of human populations - size, density, location, age, gender, race, occupation, and other statistics.

- **Demographic environment** involves people, and people make up markets.

- **Demographic trends** include changing age and family structures, geographic population shifts, educational characteristics, and population diversity.

Demographic factors

Demographic Environment

Baby Boomers - born 1946 to 1964

Generation X - born between 1965 and 1976

Millennials - born between 1977 and 2000

Generation Z - born after 2000

Demographic factors

Demographic Environment

Generational marketing is important in segmenting people by lifestyle or life stage instead of age.

- *Changes in the workforce*
- *Geographic population shifts*
- *Working styles (remote working & digital nomads)*
- *Lifestyles*

Demographic factors

Demographic Environment

Generational marketing is important in segmenting people by lifestyle or life stage instead of age.
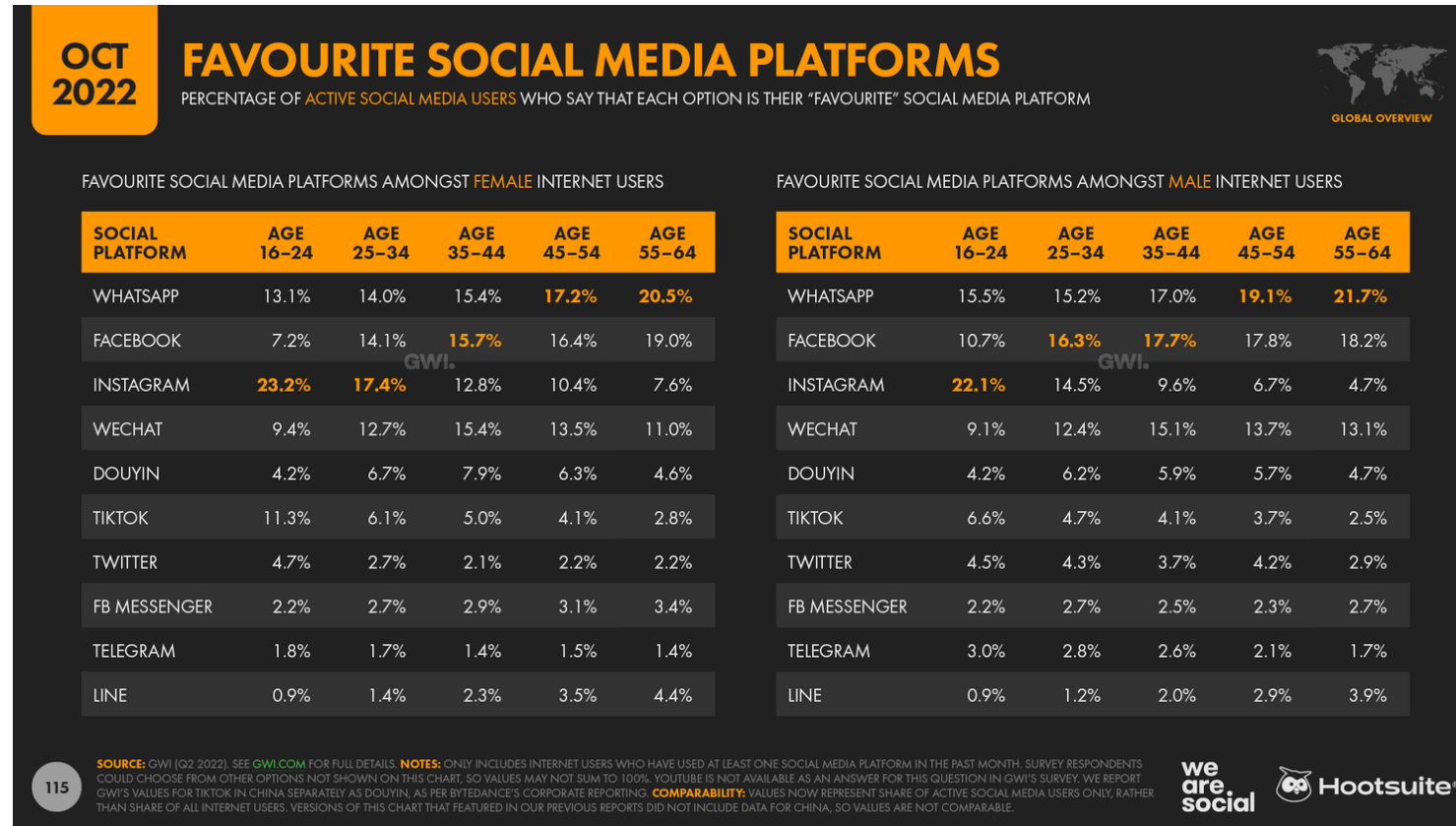
Source: Data Reportal

Demographic factors

Demographic Environment

Markets are becoming more diverse:

- International
- National

Diversity also includes:

- Ethnicity
- Gay and lesbian
- Disabled

Source: https://www.weforum.org/agenda/2021/02/nike-hands-free-shoe-disability-inclusive-clothing/

Political and social factors

Political and Social Environment

Legislation regulating business is intended to protect:

- companies from each other
- consumers from unfair business practices
- the interests of society against unrestrained business behavior

Interactive session – Can you name an example of a business change imposed by political and social factors in France/EU?

Political and social factors

EU - GDPR

- European Union's **General Data Protection Regulation (GDPR)**, which organizations must adhere to since 2018

- Personal data protection is considered by the European institutions as a fundamental human right.

- It imposes obligations onto organizations anywhere, whenever they target or collect data related to people in the EU

- With the GDPR, Europe is signaling its firm stance on data privacy and security at a time when more people are entrusting their personal data with cloud services and breaches are a daily occurrence

- The GDPR will levy harsh fines against those who violate its privacy and security standards

Political and social factors

EU – DMA and DSA (2022)

- Digital Markets Act
- Digital Services Act

Cultural factors

Cultural Environment

The **cultural environment** consists of institutions and other forces that affect society's basic values, perceptions, and behaviors.

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Cultural factors

Cultural Environment

The Persistence of Cultural Values

Core beliefs and values are persistent and are passed on from parents to children and are reinforced by schools, religion, businesses, and government.

Secondary beliefs and values are more open to change and include people's views of themselves, others, organizations, society, nature, and the universe.

Interactive session – Can you name an example of different cultural values in France and other countries which defines business environment?

Economic factors

Economic Environment

The **economic environment** consists of macroeconomic factors that affect consumer purchasing power and spending patterns.

- Industrial economies are richer markets.
- Subsistence economies consume most of their own agriculture and industrial output.
- Developing economies also offer outstanding business opportunities.

Economic factors

Economic growth imperative

- Estimations about economic growth & development

Source: IMF, https://www.imf.org/en/Publications/WEO/Issues/2022/10/11/world-economic-outlook-october-2022
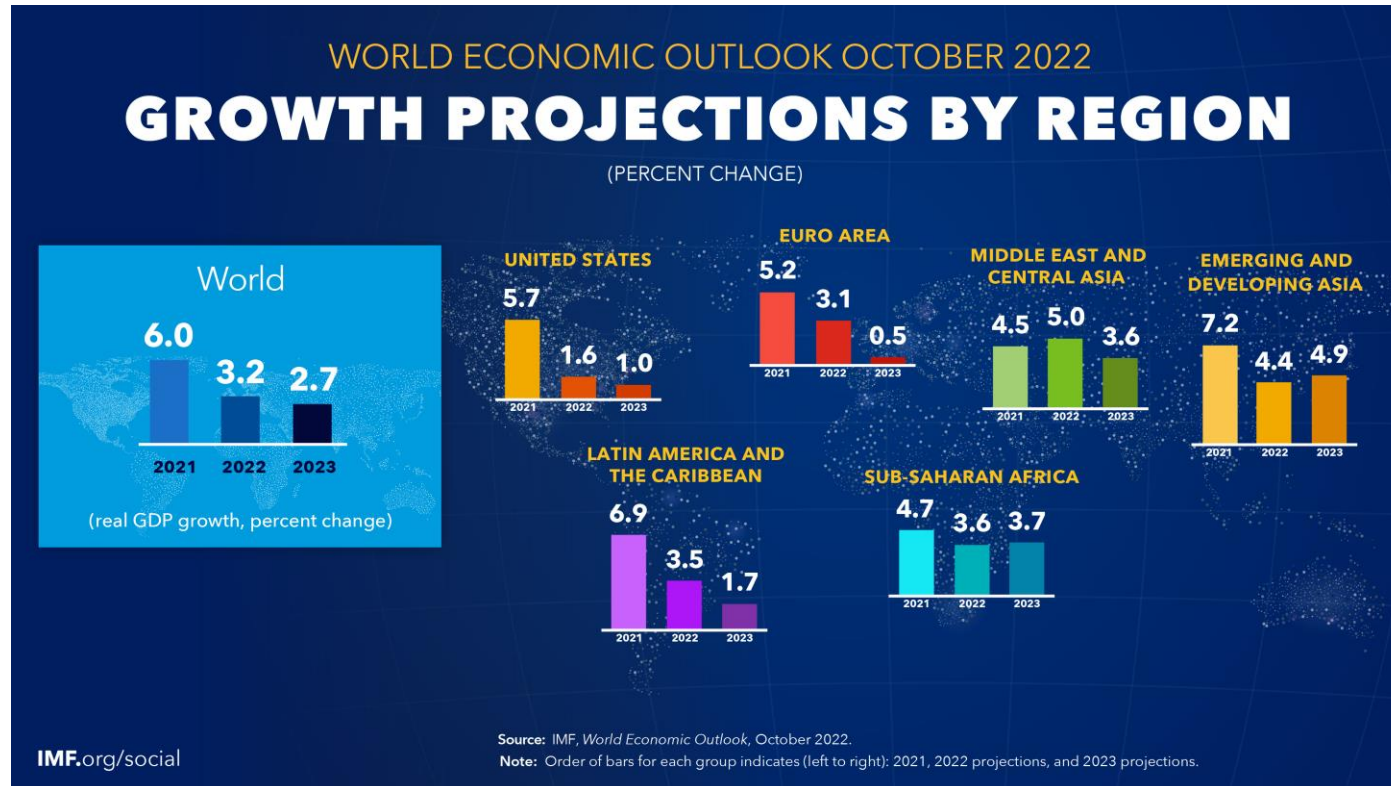
Economic factors

Economic growth imperative

- Estimations about economic growth & development for 2050 (PwC)[1]

- Lacks *Human Development Index (HDI)* – based on per capita income (PPP or PCI), education, life expectancy

- Lacks *UN - The World Happiness Report*

1 PwC – World in 2050 report (2017). URL: https://www.pwc.com/world2050?utm_source=Klix.ba&utm_medium=Clanak#keyprojections

Emerging markets will dominate the world's top 10 economies in 2050 (GDP at PPPs)

	2016	2050	
China	1	1	China
US	2	2	India
India	3	3	US
Japan	4	4	Indonesia
Germany	5	5	Brazil
Russia	6	6	Russia
Brazil	7	7	Mexico
Indonesia	8	8	Japan
UK	9	9	Germany
France	10	10	UK

E7 economies   G7 economies

Sources: IMF for 2016 estimates, PwC analysis for projections to 2050

Economic factors

Income Distribution

Over the past several decades, the rich have grown richer, the middle class has shrunk, and the poor have remained poor.
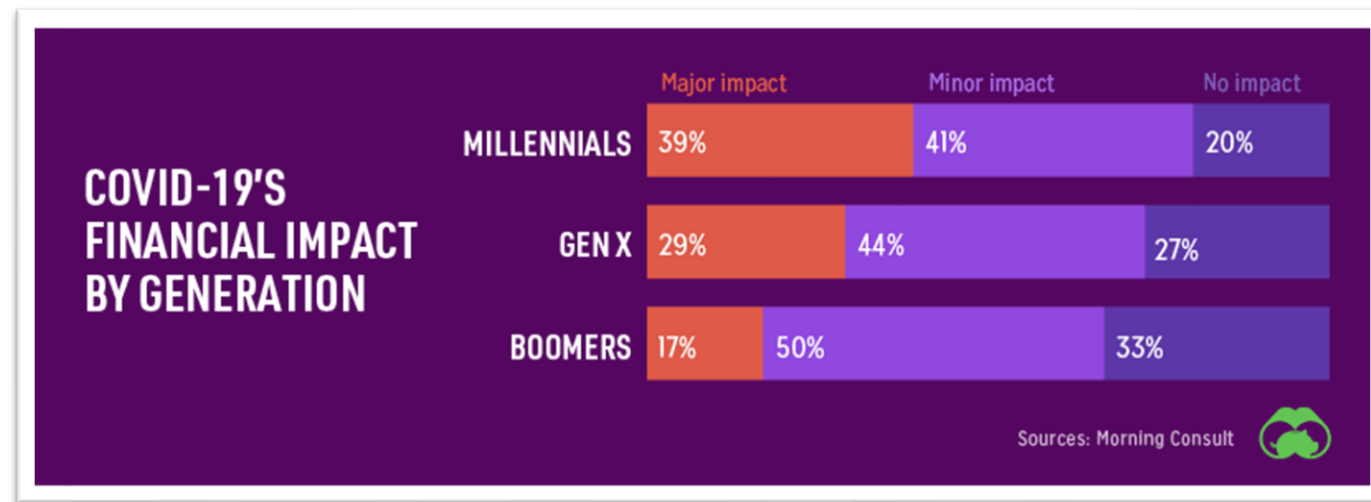
Example of a study covering age groups during COVID-19 era, URL: https://www.weforum.org/agenda/2020/12/covid19-trends-rapid-acceleration-digital-ecommerce?utm_source=twitter&utm_medium=social_scheduler&utm_term=COVID-19&utm_content=07%2F12%2F2020+13%3A00

Economic factors

- Estimations about **inflation**

Inflation Baseline Forecast 2019-2023 %
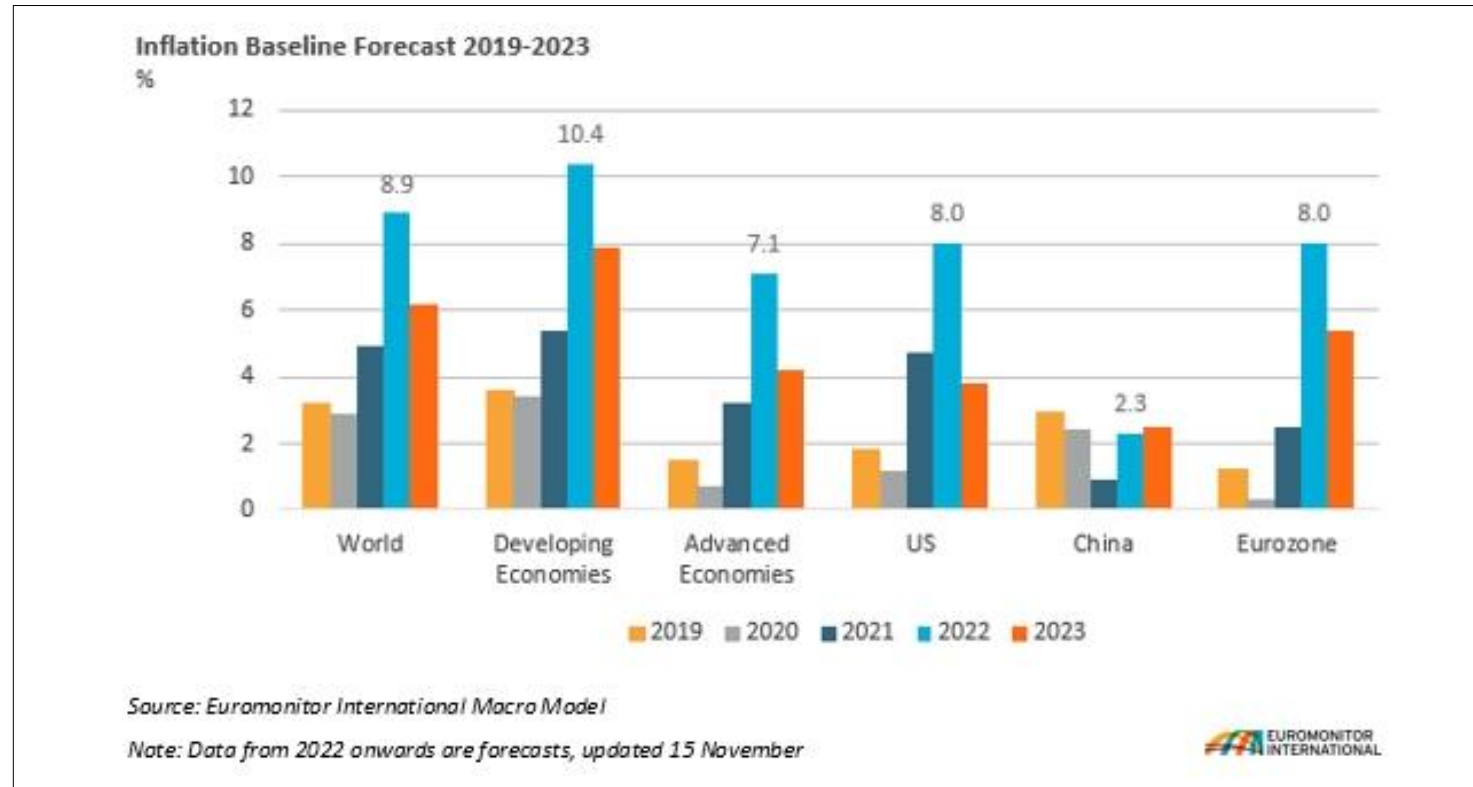
Source: Euromonitor, https://www.euromonitor.com/article/global-inflation-tracker-q4-2022-inflation-forecast-to-stabilise-in-2023-although-key-risks-remain#:~:text=Under%20the%20baseline%20scenario%2C%20global,helping%20to%20cap%20inflation%20growth.

Economic factors

- Estimations about **inflation**

Flash estimate - December 2022
Euro area annual inflation down to 9.2%

Euro area annual inflation is expected to be 9.2% in December 2022, down from 10.1% in November according to a flash estimate from **Eurostat, the statistical office of the European Union**.

Looking at the main components of euro area inflation, energy is expected to have the highest annual rate in December (25.7%, compared with 34.9% in November), followed by food, alcohol & tobacco (13.8%, compared with 13.6% in November), non-energy industrial goods (6.4%, compared with 6.1% in November) and services (4.4%, compared with 4.2% in November).

Euro area annual inflation, December 2022, %

Economic factors

- Estimations about **inflation**

Natural factors

The Natural Environment

The **natural environment** is the physical environment and the natural resources that are needed as inputs by marketers or that are affected by business activities.

Natural factors

Anthropocene era & sustainable development

- Mass pollution, depletion of natural resources, harmful implications for wildlife and biodiversity[1][2]

- Climate change and global warming (CO_2 emissions)[3]

- Need for a more **sustainable means of human development**

1 Barnosky, A., Matzke, N., Tomiya, S. *et al.* Has the Earth's sixth mass extinction already arrived?. *Nature* 471, 51–57 (2011). https://doi.org/10.1038/nature09678

2 Elhacham, E., Ben-Uri, L., Grozovski, J. et al. Global human-made mass exceeds all living biomass. Nature 588, 442–444 (2020). https://doi.org/10.1038/s41586-020-3010-5

3 Le Quéré, C., Jackson, R.B., Jones, M.W. et al. Temporary reduction in daily global CO2 emissions during the COVID-19 forced confinement. Nat. Clim. Chang. 10, 647–653 (2020). https://doi.org/10.1038/s41558-020-0797-x URL: https://www.globalcarbonproject.org/news/TemporaryReductionInCO2EmissionsDuringCOVID-19.html

Natural factors

Natural Environment

Trends in the Natural Environment:

- Growing shortages of raw materials & climate changes

- Increased pollution

- Increased government intervention

- Developing strategies that support environmental sustainability (i.e. COP21 in Paris 2015; COP28 in Dubai 2023)

Natural factors

Natural Environment

Environmental sustainability involves developing strategies and practices that create a world economy that the planet can support indefinitely.

Natural factors

COVID-19 disruption

"COVID-19 prove that a reset of our economic and social foundations is possible.", in WEF: *Now is the time for a 'great reset'*[1]

EU – [NextGenerationEU plan](#) - €750 billion recovery fund

- **Green Europe (carbon emissions)**
- **Digital Europe (digital transition)**
- **Resilient Europe**

1 URL: https://www.weforum.org/agenda/2020/06/now-is-the-time-for-a-great-reset/

Schwab K. & Malleret T. (2020). COVID-19: The Great Reset. WEF.
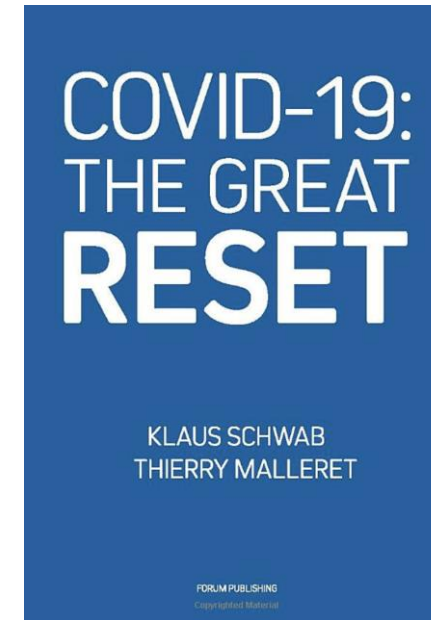
Natural factors

COVID-19 disruption for businesses

- NBC News: '*Wall Street minted 56 new billionaires since the pandemic began — but many families are left behind*'.[1]

- **IT sector** - ZOOM – revenue quadrupled and profit increased 90-fold, worth $129 billion (CNBC, September 2020)[2]

- **Pharmaceutical sector** - Moderna Inc. market value topped $35 billion (Forbes, May & November 2020)[3]

1 https://www.nbcnews.com/business/business-news/wall-street-s-best-year-ever-why-pandemic-has-been-n1252512

2 https://www.cnbc.com/2020/09/01/here-are-incredible-stats-about-zoom-following-its-blowout-earnings-report.html

3 https://www.forbes.com/sites/chuckjones/2020/05/23/buyer-beware-covid-19-vaccine-maker-moderna-is-valued-in-the-stratosphere/?sh=5b091bd46c60

Natural factors

COVID-19 disruption for businesses
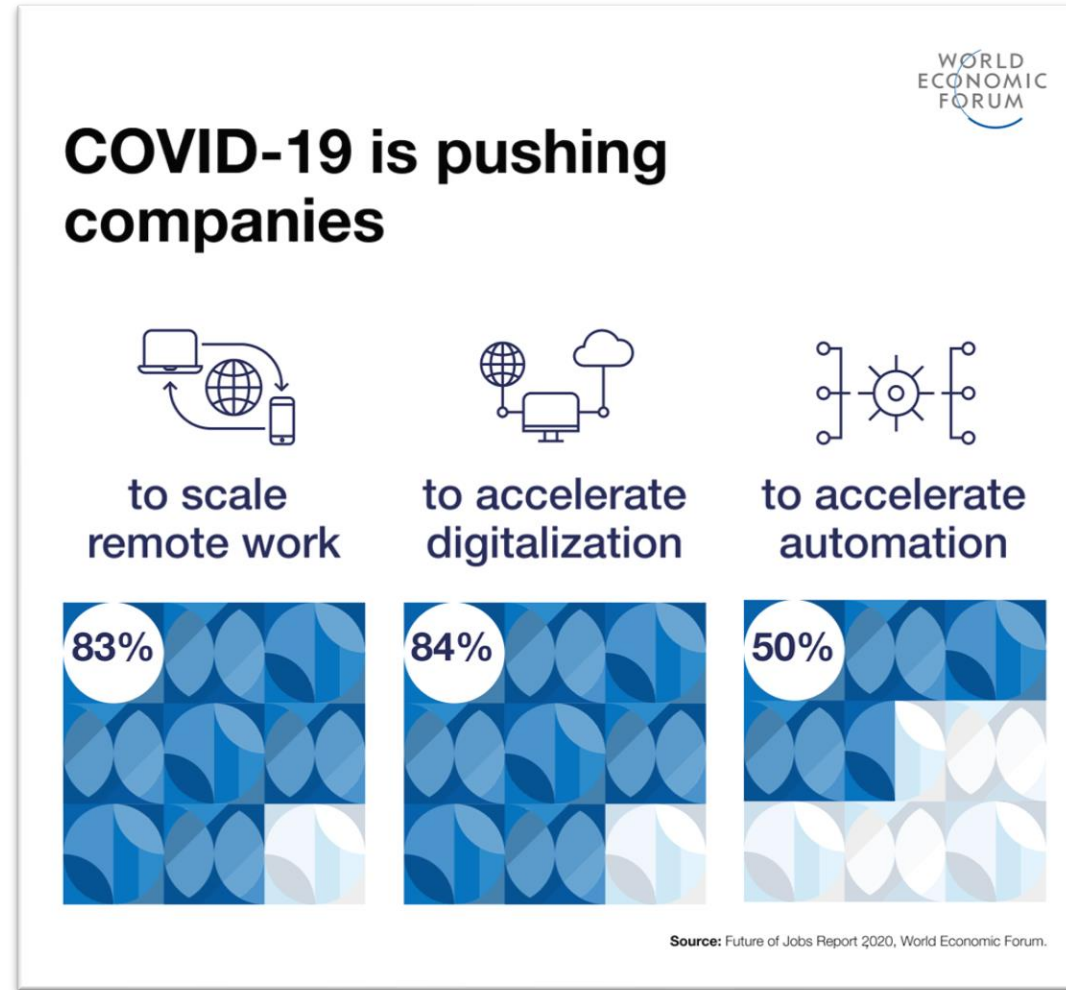
Technological factors

Technological Environment

- Most dramatic force in changing the marketplace

- New products, opportunities

- Concern for the safety of new products, data privacy, legislation
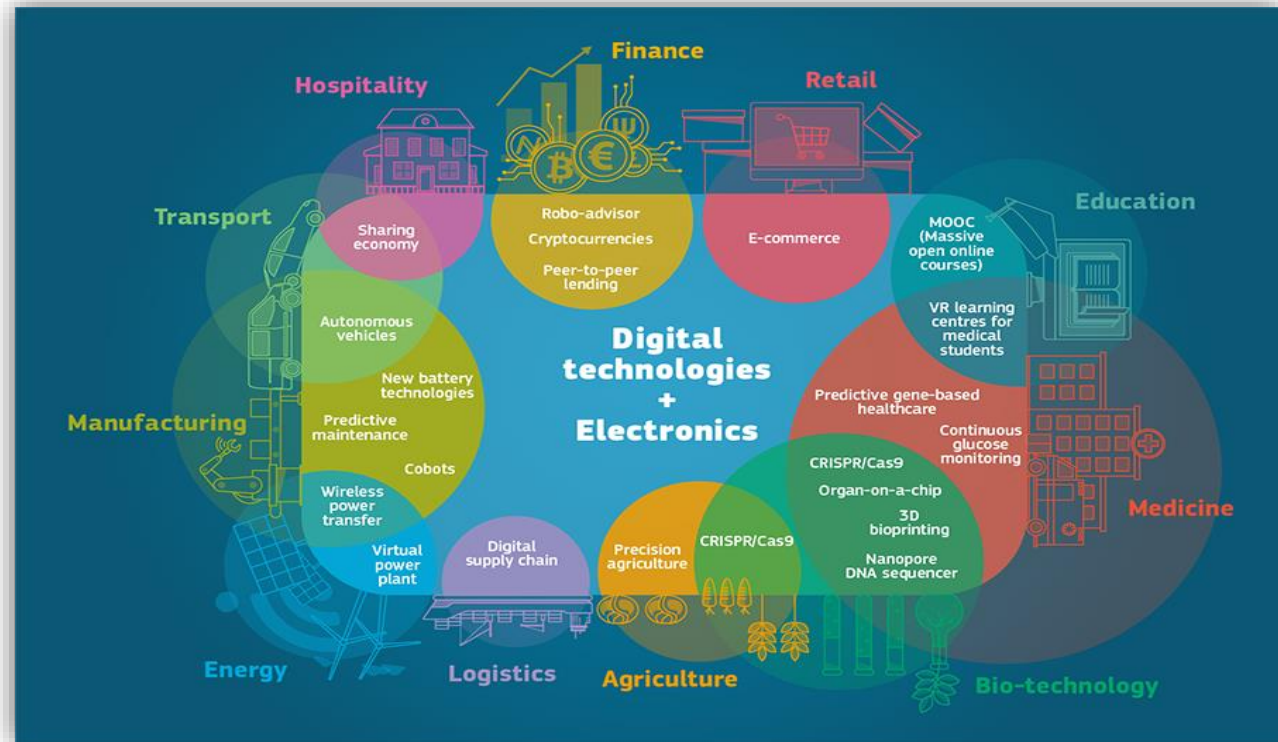
Technological factors

Digitalization and digital era

- *Integration of emerging digital technologies in every aspect of our societies and everyday activities*

- **Digitalization** is the **use of digital technologies** to **change a business model** and provide new revenue and **value-producing opportunities**
  - It is the process of moving to a digital business (Gartner 'Digitalization')

- Digital technologies allow for new business models and value-producing opportunities

- Rapid development & innovation in other fields

Technological factors: e-commerce in 2020

Adapted from Statista

Technological factors: World's most valuable industrial sectors in 2022 (December)

Rank	Sector	Combined Market Value	Number of Companies	Biggest Company in Sector
1	👩‍💻 Technology	$9.2T	20	Apple
2	🚗 Consumer Discretionary	$4.7T	17	Amazon
3	🩺 Health Care	$4.3T	17	UnitedHealth Group
4	🔋 Energy	$3.4T	8	Saudi Aramco
5	💵 Financials	$3.0T	14	Berkshire Hathaway
6	🏭 Industrials	$1.8T	9	Visa
7	🥫 Consumer Staples	$1.8T	7	Procter & Gamble
8	📞 Telecommunications	$841B	5	Cisco
9	⛏ Basic Materials	$326B	2	Linde
10	🔌 Utilities	$127B	1	Nextera Energy

*Companies are classified according to the FTSE Russell Industry Classification Benchmark. *As of Dec 12, 2022.*

Adapted from Visual Capitalist

Technological factors: World's most valuable companies in 2022 (September)

Rank		Name	Market Cap	Price	Today	Price (30 days)	Country
1		Apple AAPL	$2.425 T	$152.40	▼ 1.87%		🇺🇸 USA
2		Saudi Aramco 2222.SR	$2.138 T	$9.72	▼ 1.35%		S. Arabia
3		Microsoft MSFT	$1.829 T	$245.58	▼ 2.63%		🇺🇸 USA
4		Alphabet (Google) GOOG	$1.341 T	$103.88	▼ 1.88%		🇺🇸 USA
5		Amazon AMZN	$1.290 T	$126.72	▼ 1.42%		🇺🇸 USA
6		Tesla TSLA	$943.36 B	$303.24	▲ 0.21%		🇺🇸 USA
7		Berkshire Hathaway BRK-B	$613.18 B	$277.81	▼ 0.22%		🇺🇸 USA
8		UnitedHealth UNH	$487.20 B	$520.86	▲ 2.18%		🇺🇸 USA
9		Johnson & Johnson JNJ	$433.68 B	$164.95	▲ 0.18%		🇺🇸 USA
10		Visa V	$411.95 B	$195.48	▼ 1.97%		🇺🇸 USA
⌃2 11		TSMC TSM	$404.80 B	$77.98	▼ 1.56%		Taiwan
⌄1 12		Meta Platforms (Facebook) META	$402.03 B	$149.59	▼ 1.24%		🇺🇸 USA

Adapted from CompaniesMarketCap.com

Technological factors: World's most valuable companies in 1995

Adapted from American Business History Centre

Technological factors: World's most valuable brands in 2022

THE WORLD'S TOP 10 MOST VALUABLE BRANDS 2022

1	2	3	4	5
Apple	amazon	Google	Microsoft	Walmart
$355.1bn	$350.3bn	$263.4bn	$184.2bn	$111.9bn

6	7	8	9	10
SAMSUNG	facebook	ICBC	HUAWEI	verizon
$107.3bn	$101.2bn	$75.1bn	$71.2bn	$69.6bn

Brand Finance® — Source: Brand Finance Global 500 2022 — brandirectory.com/global

Adapted from Brand Finance Global 500

Technological factors: World's wealthiest people in 2022 (December)

Forbes

1.	Elon Musk	$219 B ▲	50	United States	Tesla, SpaceX	Automotive
2.	Jeff Bezos	$171 B ▼	58	United States	Amazon	Technology
3.	Bernard Arnault & family	$158 B ▲	73	France	LVMH	Fashion & Retail
4.	Bill Gates	$129 B ▲	66	United States	Microsoft	Technology
5.	Warren Buffett	$118 B ▲	91	United States	Berkshire Hathaway	Finance & Investment
6.	Larry Page	$111 B ▲	49	United States	Google	Technology
7.	Sergey Brin	$107 B ▲	48	United States	Google	Technology
8.	Larry Ellison	$106 B ▲	77	United States	software	Technology
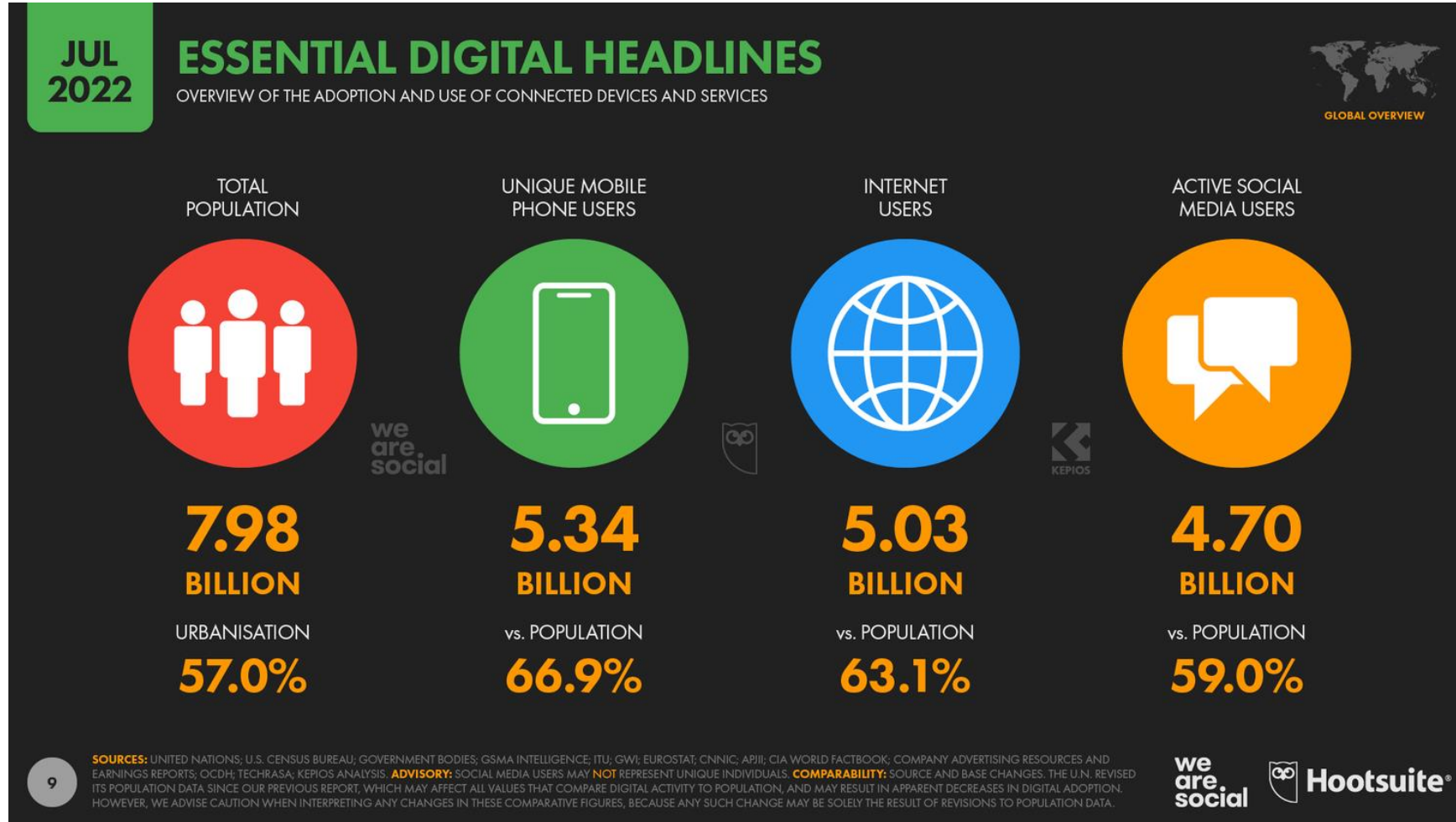
Technological factors: Digital reality

Source: Data Reportal
URL: https://datareportal.com/global-digital-overview

Technological factors: Digital reality

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URL: https://datareportal.com/global-digital-overview
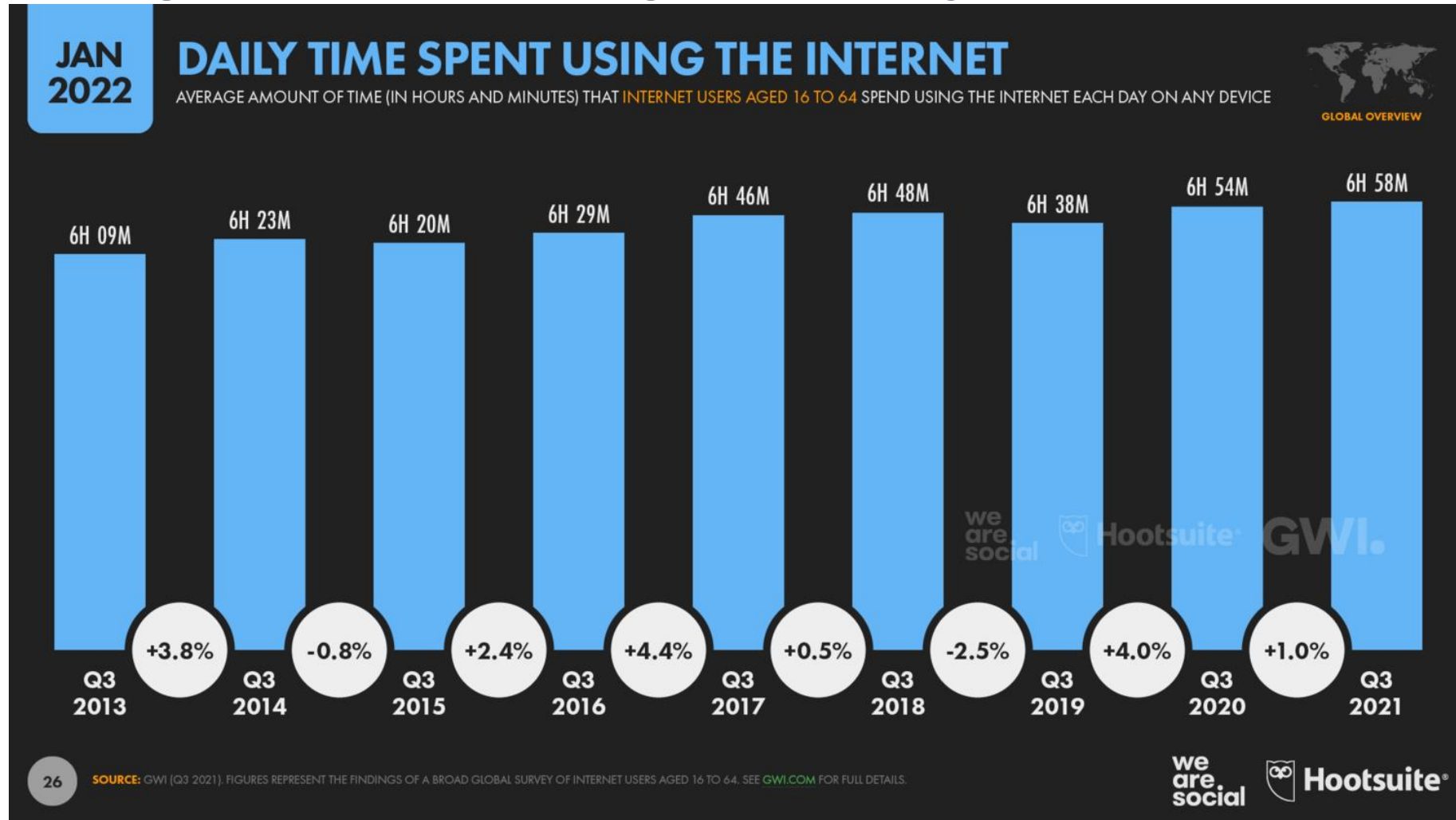
Technological factors: Digital reality and data expansion

Source: Data Reportal https://datareportal.com/social-media-users
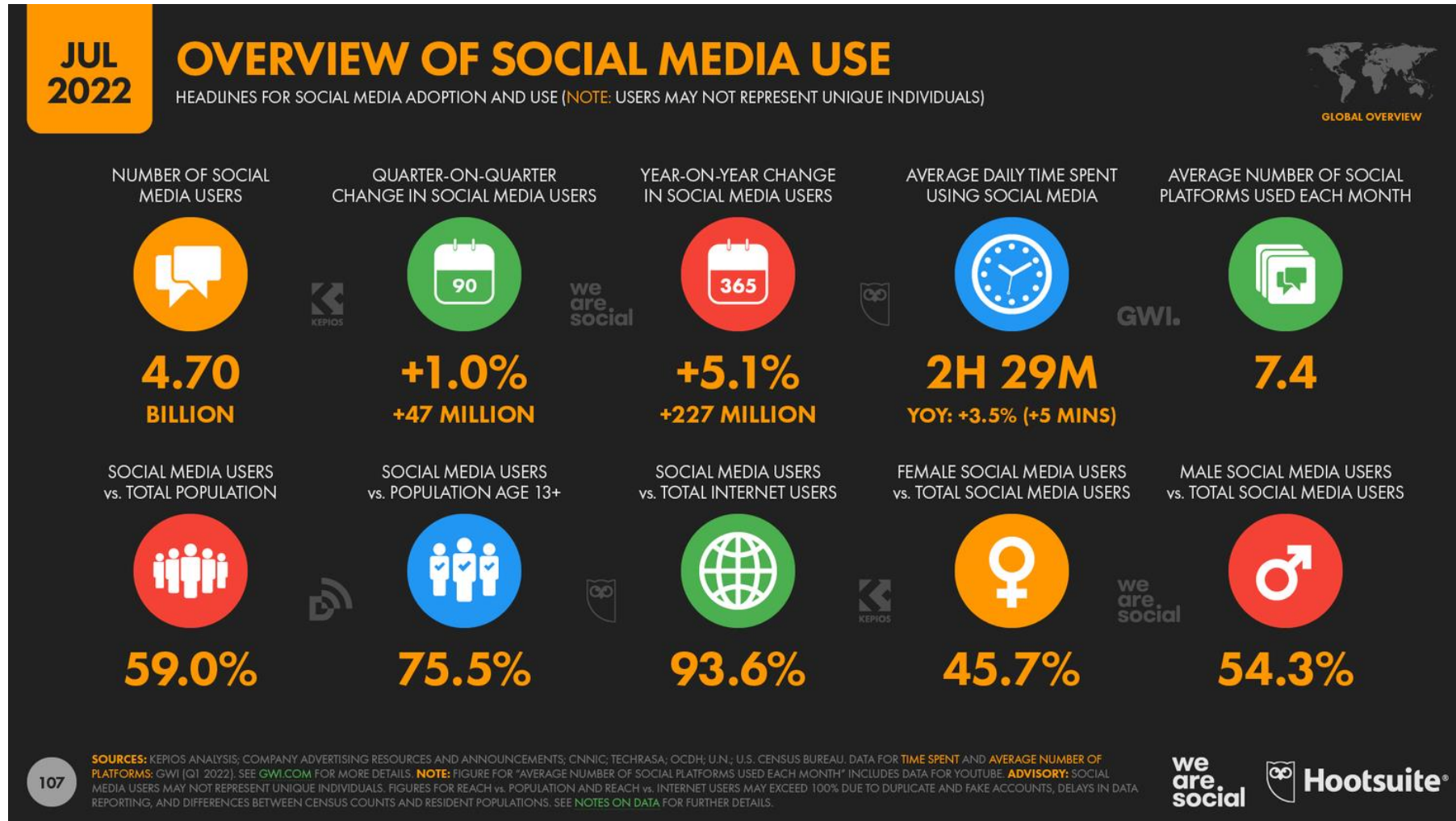
Technological factors: Digital reality and data expansion

- **5.03 billion Internet users worldwide** (63% of population / 92% of smartphone users)

- **4.7 billion social media users worldwide** (59% of the population / 94% of Internet users)

- **2 billion websites worldwide** (400 million in use – ap. 17-20% active use)

- **333.2 billion emails are sent per day / over 3.5 million sent per second**

- Google processes over **5.6 billion searches in 2022** (3.5 billion searches per day in 2020)

- **42 billion IoT connected devices in 2022**

- **44 Zetabytes (ZB) of data in 2020** (10^{21}) / Expected to have **94 ZB** by the end of 2022

Technological factors: Digital reality and data expansion

Source: Finances online / Adapted from IDC & Statista. URL:
https://financesonline.com/how-much-data-is-created-every-day/

3 Important Statistics About How Much Data Is Created Every Day — FinancesOnline REVIEWS FOR BUSINESS

1 How much data is generated every minute? (Source: Domo)
- 41,666,667 messages shared by WhatsApp users
- 1,388,889 video / voice calls made by people worldwide
- 404,444 hours of video streamed by Netflix users
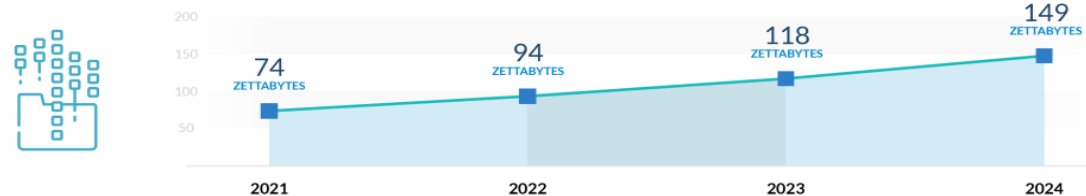- 347,222 stories posted by Instagram users
- 150,000 messages shared by Facebook users
- 147,000 photos shared by Facebook users

2 Estimated Data Consumption from 2021 to 2024 (Source: IDC / Statista)
- 74 ZETTABYTES (2021)
- 94 ZETTABYTES (2022)
- 118 ZETTABYTES (2023)
- 149 ZETTABYTES (2024)

3 Data Growth in 2021 (Sources: TechJury, Internet Live Stats, Cisco, PurpleSec)
- 2 TRILLION searches on Google by the end of 2021
- 1.134 TRILLION MB volume of data created every day
- 3,026,626 emails sent every second, 67% of which are spam
- 278,108 PETABYTES global IP data per month by the end of 2021
- 230,000 new malware versions created every day
- 82% share of video in total global internet traffic at the end of 2021

Interactive session – How much is 44 ZB (in 2020) in bits (binary system, i.e. 0 and 1)?

Interactive session – Any final questions?