Digital Connectivity Webinar Series

European Commission's Directorate-General for International Partnership (DG INTPA) Unit F5

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Webinar 3: Advantages and Disadvantages of Digital Connectivity

Today´s Webinar Outline:

Part 1: Benefits and risks of digital connectivity: the risks

- Types of digital divides (coverage gap, access gap, gender, geographical areas, socio economic, etc.)
- Threats and concerns expressed by society and action groups of a connected society:
  - Cybersecurity, mass surveillance, state control, artificial Intelligence cybersphere rights, privacy, democracy, health etc.)

Today´s Webinar Outline:

Part 2: Benefits and risks of digital connectivity: the benefits

- Potential benefits of digitalisation: productivity, democracy, and social capital
  - Societal and economic flourishing enabler
  - Benefits for the private sector
  - Impacts on local economies
- Opportunities in key economic activities and public services
  - Introducing 5G: from connecting people to connecting everything
  - Cloud computing, artificial intelligence, big data, and advanced computing for social and economic applications

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Learning outcomes:

- participants will be able to understand the different types of digital divides, as well as the expected benefits of digitalisation and associated risks it poses to the infrastructure integrity and to the society
- They will gain knowledge on the effects of digital connectivity to productivity and social inclusion, its impacts on local economies, the expected roll-out of the 5G mobile broadband technology, as well as the current opportunities on cloud computing, artificial intelligence, big data, and advanced computing for social and economic applications
- Furthermore, participants will understand the main threats and expressed concerns, also by action groups, of a more connected society ((cyber)security, privacy, mass surveillance, state control, health)

Part 1 - Advantages and Disadvantages of Digital Connectivity

Benefits and risks of digital connectivity: the risks

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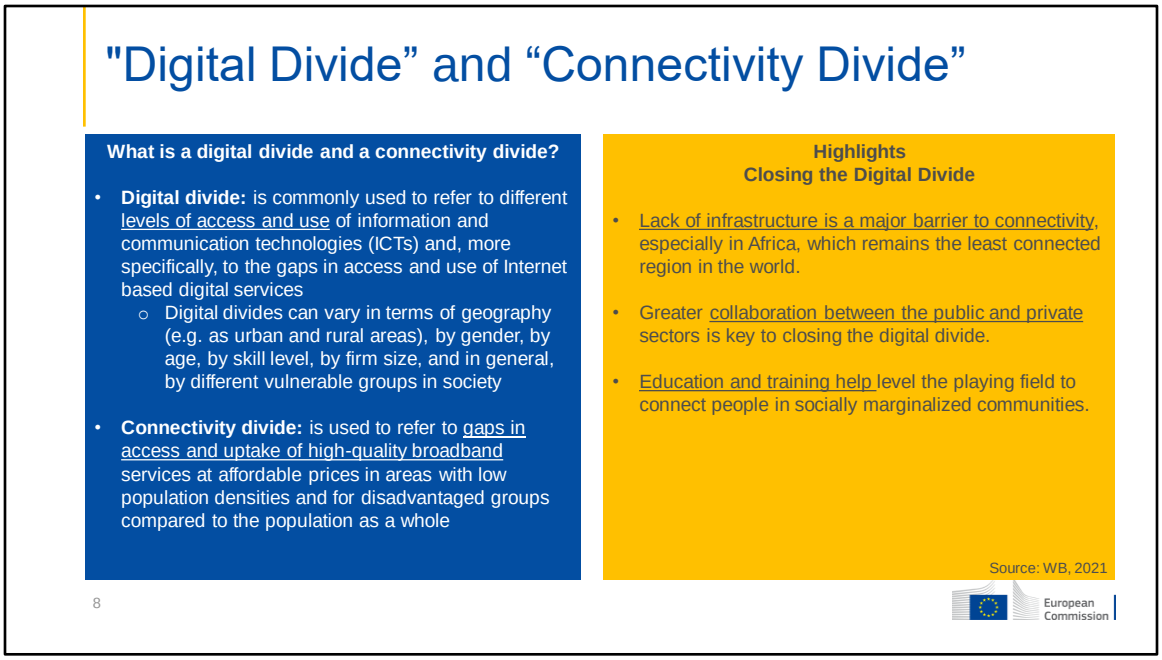
I. Digital Divide



https://www.worldbank.org/en/news/podcast/2021/03/24/can-we-bridge-the-digital-div

https://www.oecd-ilibrary.org/docserver/e38f5db7-en.pdf?expires=1649870556&id=id&accname=guest&checksum=4C8985A3458DB47EAA54C1B9F97EC30Bide

https://www.oecd.org/dac/Digital-Transformation-and-the-Futures-of-Civic-Space-to-2030.pdf

Types of Digital Divide

Gender Divide

- the internet gender gap is striking especially in developing countries.
- Though mobile connectivity is spreading drastically, it is not spreading equally. Women are still lagging.
  - Men in low-income countries are 90% more likely to own a mobile phone than women. This translates to 184 million women who lack access to mobile connectivity.

Social Divide

- Internet access creates relationships and social circles among people with shared interests.
- Social media platforms create online peer groups based on similar interests.
  - More than ever internet usage has influenced social stratification which is evident in societies among those that are connected to the internet and those that are not.

Geographic Divide

- The share of Internet users in urban areas is twice as high as in rural areas.
- While virtually all urban areas in the world are covered by a mobile broadband network, many gaps persist in rural areas.
  - Close to 30 per cent of Africa's rural population still lacks mobile broadband coverage.

Source: ITU, 2021

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http://www.digitaldividecouncil.com/what-is-the-digital-divide/

Causes of the Digital Divide

Education

- Education is a significant investment in bridging the digital divide.
- Low literacy levels are widening the digital inequality gap
  - College degree holders are perceived to be 10X more likely to tap into the full potential of the internet and computers in their day to day lives compared to individuals with high school education or lower.

Income Levels

- The income gap plays a considerable role in magnifying the digital divide.
  - High-income earners ($75,000) are 20X more likely to access the internet than low-income earners ($30,000).
  - Wealthy families are 10X more likely to own computers and at home high-speed internet connection than low-income families.

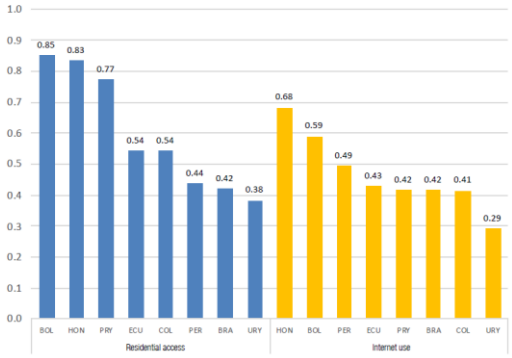
Geographical Restrictions

- economically developed countries have access to a wide variety of technology and high-speed broadband connection because of the richness of their economies.
  - Less economically developed countries lack the necessary technology and infrastructure to set up a high-speed internet connection.
  - In-country geographical restrictions also widen the digital divide.

http://www.digitaldividecouncil.com/what-is-the-digital-divide/

Causes of the Digital Divide: Inequality

Gini Coefficient for Residential Access Services and Internet Use (Latin America)



Source: UNESCO, 2020

Digital Literacy

- Developed nations have more comprehensive access to computers among other devices and high-speed internet connection.
- Students who attend schools with sufficient computers and learn the necessary digital skills have an upper advantage over students who are not exposed to these technologies at an early age.

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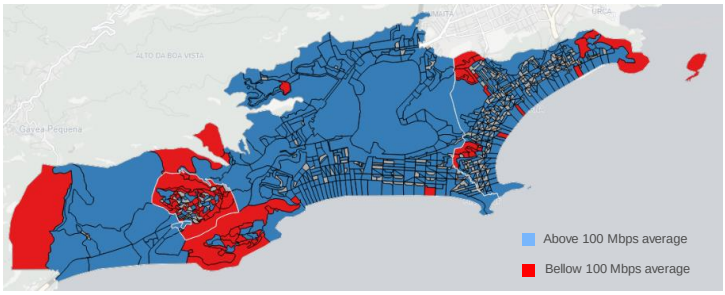
http://www.digitaldividecouncil.com/what-is-the-digital-divide/

https://unesdoc.unesco.org/ark:/48223/pf0000262860_eng

Zooming in the Digital Divide

Rio de Janeiro: The gap between Ipanema, Barra da Tijuca, and Rocinha



Source: Freitas et al., 2022

Highlights

- Ipanema and Barra da Tijuca are high income neighborhoods in Rio de Janeiro
  - The Rocinha is a low income neighborhood in between them
  - Download capacity in Rocinha is bellow the rate observed for richer neighborhoods

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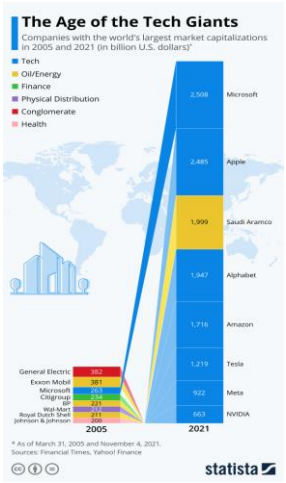
Discussion (10+10 min)

- The digital divides are mainly explained by demand-side (e.g., income, education, digital literacy) and supply-side (e.g., distance to IXPs, low population density, costs of passive infrastructure) factors.
- Governments have always to decide between providing incentives for the demand, and/or for the supply of digital connectivity.
- Question for discussion:
  - *Group 1: What instruments and initiatives are available for EC delegations to assist countries with **demand-side** incentives?*
  - *Group 2: What instruments and initiatives are available for EC delegations to assist countries with **supply-side** incentives?*

II. Tech dominance: concepts and references

Tech dominance



The Age of the Tech Giants

- In 2005, the list of the world's most valuable listed companies was rather diverse, with a few large oil companies, but also multinational conglomerates, distribution companies, as well as those in finance and healthcare.
- In 2021 tech giants dominate the rankings
- Apple and Microsoft surpassed the two trillion US$ market capitalization threshold since 2020.

Source: Statista, 2021

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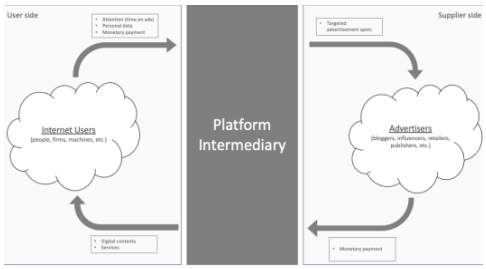
The market power of digital platforms

Two-sided business model for the provision of targeted ads



Source: Prado, 2021

Insights on measuring the market power of digital platforms

- The rise of big technology companies that act both as intermediary platforms and providers of services and goods in several markets has heightened concerns about potential economic harms brought by the concentrated structure of the digital economy.
- However, the operationalization of market power in the platform economy and the procedures to define which digital platforms and markets should be targeted by pro-competitive remedies, either under a competition policy framework or under a regulatory regime, remain highly contested.

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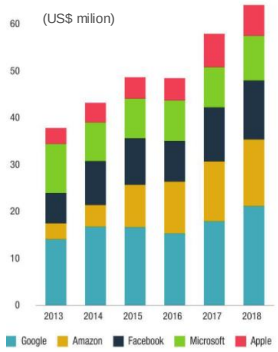
Engaging in global policymaking

Annual spending on lobbying by digital platforms (United States)



Source: UN, 2019

Global digital platforms: Leveraging business models

- Replaced the financial sector as the biggest lobbyists
- Acquisition of existing or potential competitors
  - Google has made more than 230 acquisitions (until 2019)
- Platforms are spreading their activities into non-digital industries
- Influencing the success of producers that use their marketplace by surfacing or "creating" consumer "demand" based on their analysis of deep behavior/psychological patterns

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https://www.un-ilibrary.org/content/books/9789210042161c010/read

III. Threats and concerns: Fairness, Cybersecurity, Fake News

Connectivity pitfalls

Fairness and Bias Concerns

- AI system's decisions are only as good as the data it's trained on.
  - If a particular population is underrepresented in the data used to train a machine learning model, the model's output could be unfairly discriminatory towards that population
- **Keywords: AI, State Control, privacy, mass surveillance**

Cybersecurity

- Critical activities interruption or disruption would have serious social and economic consequences
- Policies towards enhancing digital security of critical activities
- **Keywords: espionage and sabotage, data leakage, data protection**

Fake News

- **Disinformation:** Information that is false and deliberately created to harm a person, social group, organization or country
- **Misinformation:** Information that is false, but not created with the intention of causing harm
- **Malinformation:** Information that is based on reality, used to inflict harm on a person, organization or country
- **Keywords: democracy**

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https://www.cser.ac.uk/research/risks-from-artificial-intelligence/
https://www.boell.de/sites/default/files/2020-08/200825_E-Paper3_ENG.pdf

Artificial intelligence: fairness and bias concerns

"AI is a double-edged sword: both sides sharp, neither is well understood"

Examples of Benefits

"by 2030, AI could deliver additional global economic output of $13 trillion per year"

Source: McKinsey, 2018

- **Decision making:** simplify decision making
- **Experience of Use:** Enhancing experience of use with healthcare, public services, education, shopping, so on.
- **Efficiency:** AI-Driven Automation, productivity, cost cutting.

Examples of Pitfalls

- **Data processing**: sorting, linking, and properly using data has become increasingly difficult as the amount of unstructured data being ingested from sources such as the web, social media, mobile devices, sensors, and the Internet of Things has increased.
- **Malicious Use of AI**: fraudsters to exploit seemingly nonsensitive marketing, health, and financial data that companies collect to fuel AI systems.
- **Fairness and Bias Concerns**: biased results (which can happen, for example, if a population is underrepresented in the data used to train the model)

Source: University Cambridge, 2021

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https://www.cser.ac.uk/research/risks-fro

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3871635m-artificial-intelligence/

Cybersecurity: fundamentals

Global Cybersecurity Index 2020

Top Ranked

Country Name	Score	Rank
United States of America**	100	1
United Kingdom	99.54	2
Saudi Arabia	99.54	2
Estonia	99.48	3
Korea (Rep. of)	98.52	4
Singapore	98.52	4
Spain	98.52	4
Russian Federation	98.06	5
United Arab Emirates	98.06	5
Malaysia	98.06	5
Lithuania	97.93	6
Japan	97.82	7
Canada**	97.67	8
France	97.6	9
India	97.5	10
Turkey	97.49	11
Australia	97.47	12
Luxembourg	97.41	13
Germany	97.41	13
Portugal	97.32	14
Latvia	97.28	15
Netherlands**	97.05	16
Norway**	96.89	17
Mauritius	96.89	17
Brazil	96.6	18
Belgium	96.25	19
Italy	96.13	20

Bottom Ranked

Country Name	Score	Rank
Belize	10.29	159
Mali**	10.14	160
Guinea-Bissau	9.85	161
Liberia	9.72	162
Grenada	9.41	163
Lesotho	9.08	164
Nicaragua**	9	165
Solomon Islands	7.08	166
Haiti	6.4	167
Tuvalu**	5.78	168
South Sudan**	5.75	169
Dem. Rep. of the Congo	5.3	170
Afghanistan	5.2	171
Marshall Islands**	4.9	172
Timor-Leste**	4.26	173
Dominica	4.2	174
Comoros**	3.72	175
Central African Rep.**	3.24	176
Maldives**	2.95	177
Honduras**	2.2	178
Djibouti	1.73	179
Burundi	1.73	179
Eritrea**	1.73	179
Equatorial Guinea**	1.46	180
Dem. People's Rep. of Korea**	1.35	181
Micronesia*	0	182
Vatican*	0	182
Yemen*	0	182

Source: ITU, 2021

Cybersecurity: concept and strategies

- encompasses multiple different governance, policy, operational, technical and legal aspects
- **Cibersecurity strategies cover:**
  - tools, policies, guidelines, risk management approaches, actions, trainings, best practices, assurance, and technologies that can be used to protect the availability, integrity, and confidentiality of assets in the connected infrastructures pertaining to government, private organizations, and citizens
  - these assets include connected computing devices, personnel, infrastructure, applications, digital services, telecommunications systems, and data in the digital-environment.

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https://ncsguide.org/the-guide/introduction/
https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2021-PDF-E.pdf

Cybersecurity: a complex and multifaceted area

Cybersecurity complexity

Source: OECD, 2018

Enhancing the digital security of critical activities

- A **critical activity:**
  - economic and social activity which interruption or disruption would have serious consequences on the health, safety, and security of citizens; or the effective functioning of services essential to the economy and society, and of the government; or economic and social prosperity more broadly (OECD, 2019).
- **Identifying what to protect:**
  - Policies to enhance the digital security of critical activities aim primarily at encouraging public and private operators of these activities, such as banks, hospitals, water and energy distributors, telecommunication network providers, airports, rail companies, etc., to better manage digital security risk.

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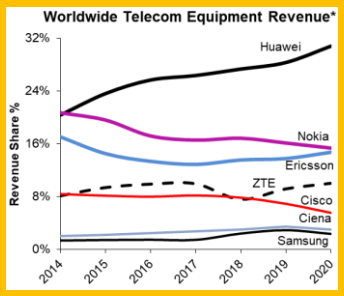
https://goingdigital.oecd.org/data/notes/No17_ToolkitNote_DigitalSecurity.pdf

Competition in the market of telecom equipment's vendors

2005 GSM/CDMA	2010 3G	2015 4G	2020 5G
Alcatel	Alcatel-Lucent	Alcatel-Lucent	Ericsson
Ericsson	Ericsson	Ericsson	Fujitsu
Fujitsu	Fujitsu	Fujitsu	Huawei
Huawai	Huawei	Huawei	NEC
NEC	NEC	NEC	Nokia
Lucent	Matsushita	Nokia	Samsung
Matsushita	Motorola	Samsung	ZTE
Motorola	Nokia	ZTE	
Nokia	Siemens		
Nortel	Panasonic		
Panasonic	Samsung		
Samsung	ZTE		
Siemens			
ZTE			
14	11	8	7

Source: Freitas, 2021

World Revenue Share per vendor



- oligopolistic competition imposes additional pressure on issues such as cost, innovation, and final price of consumers.

Source: EETimes, 2021

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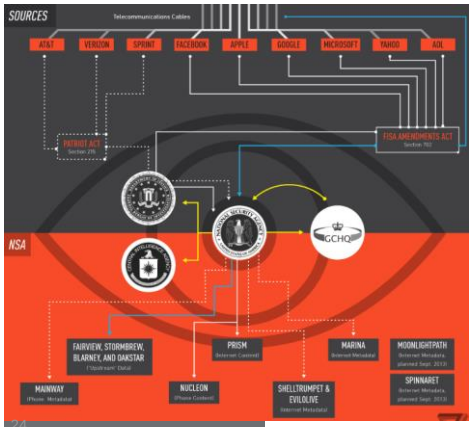
https://www.eetasia.com/huawei-maintains-lead-in-global-communications-equipment-market/

Mass Surveillance: concepts and references

The Verge´s Diagram of the NSA Mass Surveillance leak event



Source: The Verge, 2013

Concepts

- Mass surveillance is indiscriminate surveillance of people, business and government.
- It uses systems or technologies that collect, analyze, and/or generate data on indefinite or large numbers of people instead of limiting surveillance to individuals about which there is reasonable suspicion of wrongdoing.
  - Meta-data: data that is produced when electronic communication channels, like Internet or telephony are used and that provides information about the time, the origin the destination, the location, the duration and the frequency of communications carried out.
- Sources of data breaches: web browsing, email, social networks, cloud computing, or voice communications, so on
  - mass surveillance: considered a threat to civil liberties such as the right to freedom of opinion and expression
  - targeted lawful interception: necessary and legitimate instrument of intelligence and law enforcement

Source: European Parliament, 2015

European Commission

https://www.europarl.europa.eu/RegData/etudes/STUD/2015/527409/EPRS_STU%282015%29527409_REV1_EN.pdf
Htt

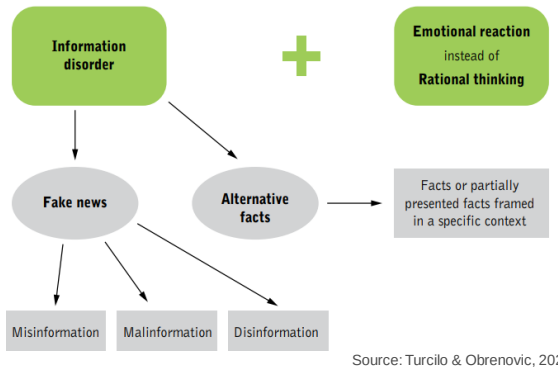
https://www.theverge.com/2013/7/17/4517480/nsa-spying-prism-surveillance-cheat-sheet
Notes:

Meta-data is data that is produced when electronic communication channels, like Internet or telephony are used and that provides information about the time, the origin the destination, the location, the duration and the frequency of communications carried out. Meta-data does, however, not
contain the content of communications. Two types of meta-data exist, meta-data that

provides data on the content (e.g. read/write/modify attributes of the file, author of the document, GPS location of a picture, etc.), and meta-data of the communication (e.g. sender, receiver, communication duration, communication starting date and time, communication channel, communication protocol used, etc.).
ps://harvardlawreview.org/wp-content/uploads/pdfs/vol126_richards.pdf

Democracy: Focus on Fake News

Rational of the information disorder



Source: Turcilo & Obrenovic, 2020

Fake News

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- **Misinformation:** Information that is false, but not created with the intention of causing harm.
- **Malinformation:** Information that is based on reality, used to inflict harm on a person, organization or country.

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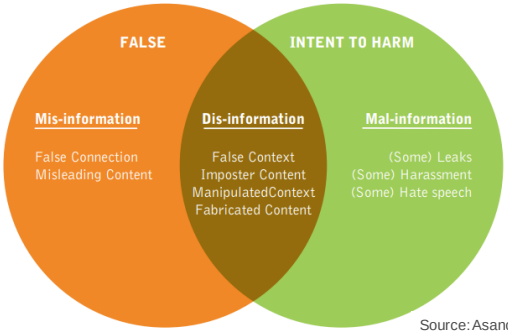
Fake news

"news articles that are intentionally and verifiably false, and could mislead readers"



Source: Asanov, 2019

Highlights

"people tend to believe what they want to believe … experiments show that people are much more critical when evaluating those facts that are contrary to their beliefs than when evaluating those facts that support what they think" (Castells, 2013)

- post-truth society is one which is based on the information disorder – either on fake news (misinformation, disinformation, and/or malinformation) or alternative facts (true or partly true information framed in a specific context) – to which the public reacts emotionally rather than rationally.

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Social Media, Democracy and Democratization

Social Media as an Emancipatory and Beneficial Tool for Democracy

- emerged as an important platform for debate and activism
- in some sense also aided the process of democratization in certain parts of the world.

Social Media as an Enslaving and Detrimental Tool for Democracy

- can damage the democratic fabric and solidify authoritarian regimes.
- instrument of social control at the disposal of authoritarian states and regimes which can create their own different worlds marked by isolation from the rest of the world and censorship.

Source: Diplomatist , 2021

To better understand how social media affects democracy, five key aspects and issues can be examined:

- **Surveillance:** social media platforms extract and combine user data to keep users engaged and make profit from selling targeted advertising.
- **Personalisation:** social media provide personalised content to increase the relevance of information for each user and to bolster engagement.
- **Disinformation:** social media facilitate the spread of false information either as an unintended consequence or due to certain users' efforts to manipulate the platforms.
- **Moderation**: social media platforms commonly remove or downgrade content and ban users in order to enforce internal rules and prevent alleged harms.
- **Micro-targeting:** social media enable targeted advertising that uses granular behavioural data to profile people and to covertly influence their choices.

Source: European Parliamentary, 2021

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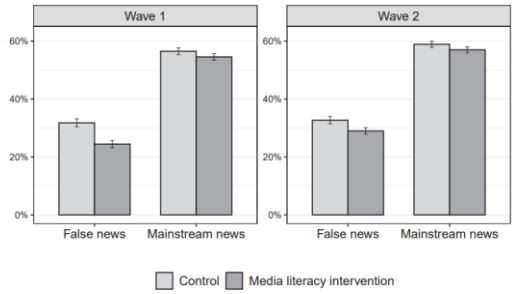
https://www.theatlantic.com/magazine/archive/2019/12/social-media-democracy/600763/

IV. Mitigation strategies: digital media literacy and data protection

Digital media literacy: causal nexus

Percentage of US respondents rating false and mainstream news headlines as somewhat accurate or very accurate



Source: Guess et al., 2019

"Digital media literacy intervention increases discernment between mainstream and false news"

- The proportion of respondents rating a false headline as "very accurate" or "somewhat accurate" decreased from 32% in the control condition to 24% among respondents who were assigned to the media literacy intervention in wave 1, a decrease of 7 percentage points. This effect represents a relative decrease of approximately one-fourth in the percentage of people wrongly endorsing misinformation

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https://www.pnas.org/doi/pdf/10.1073/pnas.1920498117

The General Data Protection Regulation (GDPR)

"The data protection package adopted in May 2016 aims at making Europe fit for the digital age. More than 90% of Europeans say they want the same data protection rights across the EU and regardless of where their data is processed"

Source: GDPR, 2022

- the toughest privacy and security law in the world.
- Though it was drafted and passed by the European Union (EU), it imposes obligations onto organizations anywhere, so long as they target or collect data related to people in the EU.
- The regulation was put into effect on May 25, 2018.
- The GDPR will levy harsh fines against those who violate its privacy and security standards, with penalties reaching into the tens of millions of euros.

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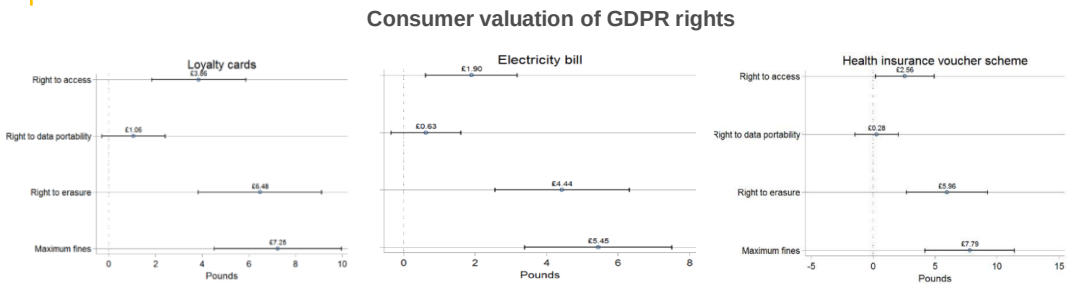
https://ec.europa.eu/info/law/law-topic/data-protection/data-protection-eu_en
https://gdpr.eu/what-is-gdpr/

Consumer valuation of GDPR rights



Source: LE, 2017

"Alleviating consumer privacy harms (…) is most difficult. The harm is probabilistic and manifested as both direct and indirect, as well as a financial and psychological loss. It can be catastrophic for some, while inconsequential for others."

The privacy paradox

"While people claim to be very concerned about their privacy, they nevertheless undertake very little to protect their personal data"

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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/635701/PersonalDataRights_LE_-_for_Data_Protection_Bill__1_.pdf

https://lawcat.berkeley.edu/record/1122311/files/fulltext.pdf

The costs of stringent federal data privacy law

"Federal legislation mirroring key provisions of privacy laws in Europe or California could cost the U.S. economy about $122 billion per year."

- A more focused, but still effective national data privacy law would cost about $6 billion per year—around 95% less than an EU-style law.
- Overly restrictive privacy rules for the digital economy will increase prices, reduce free access to products and services, and hinder innovation in ways that harm businesses and consumers.
- Congress should enact a targeted federal law to protect consumers, reduce uncertainty and compliance costs for covered organizations, and prevent states from creating a costlier thicket of conflicting laws.

Source: McQuinn, 2019

European Commission

https://itif.org/publications/2019/08/05/costs-unnecessarily-stringent-federal-data-privacy-law

Discussion (5+5 min)

- Handling the digital revolution is largely a matter of balancing its risks and benefits. On the one hand , it is up to the users to behave consciously, on the other hand it is up to the industry to manage software, hardware and algorithms in a way that respect consumers privacy while avoiding cyber threats.
- Governments may define general regulations and policy aimed at promoting fair use of technologies to avoid abuses.
- Question for discussion:
  - *What instruments and initiatives are available for EC delegations to assist countries in promoting fair use of digital connectivity (e.g., privacy and cybersecurity rules, etc.), mitigating its risks? Are Policy Based Loans (PBLs) feasible/possible in this context?*

Part 1: Quiz

Part 2 - Advantages and Disadvantages of Digital Connectivity

Benefits and risks of digital connectivity: the benefits

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I. Potential benefits of digitalisation

ICT as Social and Economic Enabler

ICTs offer major transformational opportunities

- They can contribute to enhanced productivity, competitiveness, growth, wealth creation, and poverty reduction
- They have the potential to shift from an information society to the next level – that of a knowledge-based society and economy
- ICTs provide the means by which knowledge is developed, stored, aggregated, manipulated and diffused
- ICTs, particularly access to broadband internet, are vital for development

"Broadband access – and the next generation broadband network infrastructure which underpins it – is a key enabler for economic and social growth… Broadband changes everything. It enables not just great new enabling applications, such as VoIP and IPTV, but also the delivery of essential services – from e-health to e-education to ecommerce to e-government. And broadband is helping us make great progress towards meeting the Millennium Development Goals – and improving the quality of life for countless people around the world."

Secretary-General Dr Hamadoun I. Touré, (ITU, 2009)

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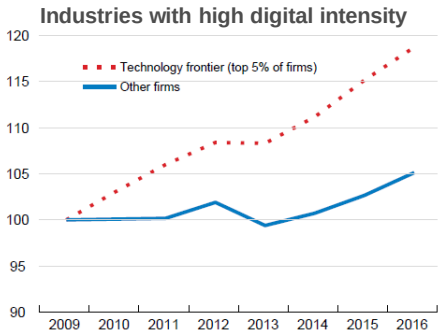
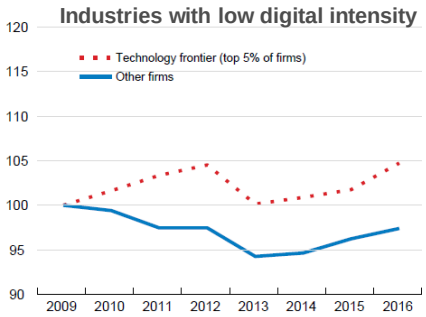
https://openknowledge.worldbank.org/bitstream/handle/10986/13277/74543.pdf?sequence=1

Digitalisation and Productivity





- Gains from digitalisation have not spread evenly across firms.
- Firms having better access to key technical, managerial and organizational skills have benefitted more than other firms.
  - Even in relatively low-tech industries (e.g. accommodation and food services) the growing availability of online user ratings and reviews tends to shift demand towards the more productive firms.

Source: OECD,2019

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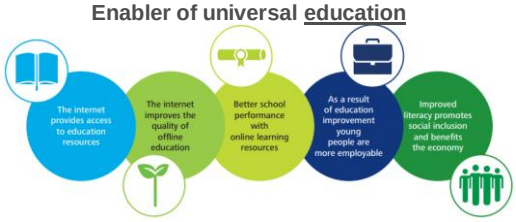
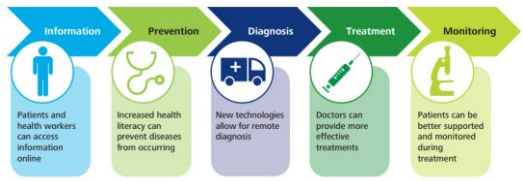
https://www.oecd.org/economy/growth/digitalisation-productivity-and-inclusiveness/

Social impacts of extending internet access

Enabler of universal education



Enabler of health improvements



Source: Deloitte, OECD, 2015

"Impacts of internet access extend well beyond economic growth. By facilitating access to information, the internet provider wide-ranging social benefits across health, education and social inclusion"

Source: OECD, 2016

"To close the connectivity divide, people not only need to have access to broadband services, but they need to be connected well, which means access the high-quality communication networks and services at affordable prices"

Source: OECD, 2021

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https://www.oecd-ilibrary.org/docserver/5jlwqf2r97g5-en.pdf?expires=1649869030&id=id&accname=guest&checksum=3658DC8018D6C72FC34039F8B58D0DF0

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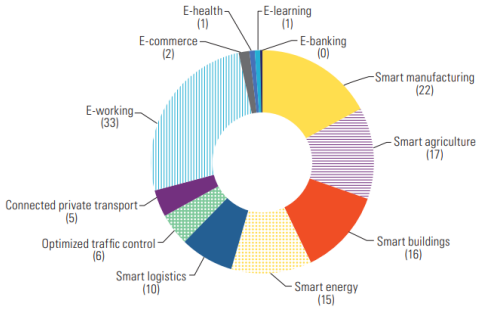
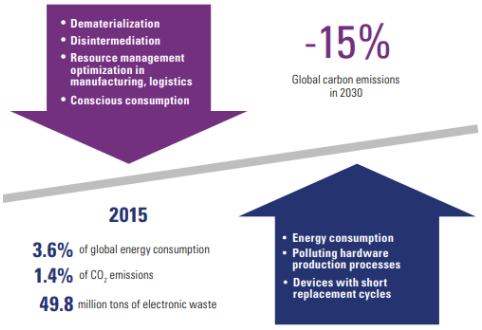
Digitalization and sustainability

Potential for reducing carbon dioxide (CO2) by 2030, by type of digital solution



The effects of digitalization on sustainability



- Digital technologies foster ecological innovations that contribute to sustainable development by reducing environmental impacts and optimizing resource use

Source: CEPAL, 2022

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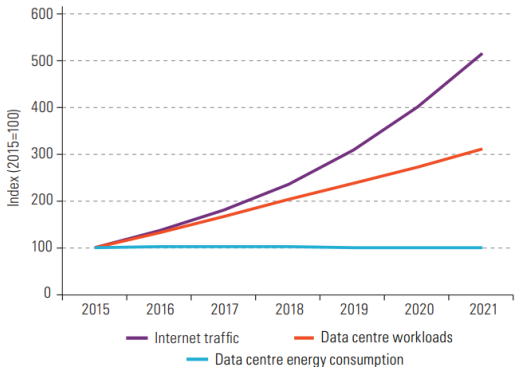
https://www.cepal.org/sites/default/files/publication/files/46817/S2000960_en.pdf

Digitalization and Sustainability?

A need for greening digital infrastructure

Carbon and energy footprint of ICTs and trends in Internet traffic and data centre workloads



"increased digital development generates negative effects associated with energy consumption (data centres and networks)"

	2007	2010	2015
Carbon footprint of the ICT sector ($tMCO_2$)	620	720	730
Operational electricity consumption of the ICT sector (TWh)	710	800	805
Carbon footprint per ICT subscription ($kg\ CO_2$/subs)	134	107	81
Carbon footprint per GB in networks ($kg\ CO_2$/GB)	7	3	0,8
Operational electricity consumption per subscription (kWh/subs)	153	119	89
Operational electricity consumption per GB in networks (kWh/GB)	7.6	3.3	0.88

Source: CEPAL, 2022

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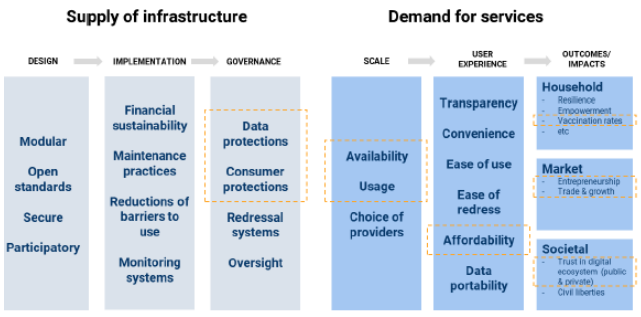
Holistic approach to measuring good digital infrastructure

Toward a more comprehensive understanding of digital infrastructure's impact on people and markets



Source: Brookings, 2022

Highlights

- Digital services and the infrastructure that enable them must be understood as offering new choices and new capabilities.
- Understanding the supply and demand sides requires mixed assessment methods.
- Digital transformation can support learning and improvement.

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Notes:

1. Infrastructure versus services: We distinguish between enabling infrastructure and the
services that ride on top. Infrastructure in this exercise refers to the platforms of payments,
identity, and data exchange. Services are the applications that are, for the most part, consumer facing such as digital banking (enabled by payments and identity infrastructure),
e-government service portals (enabled by identity and data exchange infrastructure), for
example.
The left side of the framework focuses on measures of the enabling infrastructure whereas
the right side of the framework focuses on measures of consumer-facing services.

2. Defined causal link: The framework suggests a measurement system must track the entire causal chain in order to discern whether the availability of digital infrastructure

is
leading to the broad set of outcomes at the individual/household, market, and societal
levels. As a starting point, the framework hypothesizes that the design, implementation, and
governance of infrastructure will affect the adoption and satisfaction in services for households but also the competitive nature of markets and societal level of trust in digital
services and information.
3. Lifecycle of supply: The framework recognizes the importance not only of enabling digital infrastructure but how it conforms to good practices in the different stages of design,
implementation, maintenance, and governance. While we do not fully capture the opportunity to examine digital infrastructure choices throughout the lifecycle, we include
some aspects including, for example, the need for a multiplicity of online and offline implementation tactics. Any final framework adopted should build upon this attempt to
monitor across the lifecycle.

II. Opportunities in key economic activities and public services

"5G will lead to the creation of industries not yet imagined. There are tangible and realizable acceleration opportunities to speed up the deployment process and maximize the benefits."

Source: Accenture, 2021

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https://www.iea.org/reports/data-centres-and-data-transmission-networks

5G roll-out and expected impacts

5G will cover all aspects of our life

Source: EU, 2022

Highlights

- 5G will connect more devices than ever before in the "internet of things"
- 5G services are essential for a wide range of innovative applications which have the potential to transform many sectors of the economy and improve citizens' daily lives
- A 2021 study estimated that between 2021 and 2025, 5G would add up to €1 trillion to the European gross domestic product (GDP) for the period, with the potential to create or transform up to 20 million jobs across all sectors of the economy

Manufacturing

- 20%- 30% potential overall productivity gains
- 50% improvement in assembly efficiency
- 20% increase asset life
- 90% defect detection

Automotive

- 80% reduction of vehicle accidents
- $3.6 billion savings in repair costs
- 25% reduction in traffic

Agriculture

- Improved connectivity and digitization can yield up to 25% increased productivity
- 30% decreased inputs, 20% decreased costs
- 15% increased crop yields

Source: Accenture, 2021

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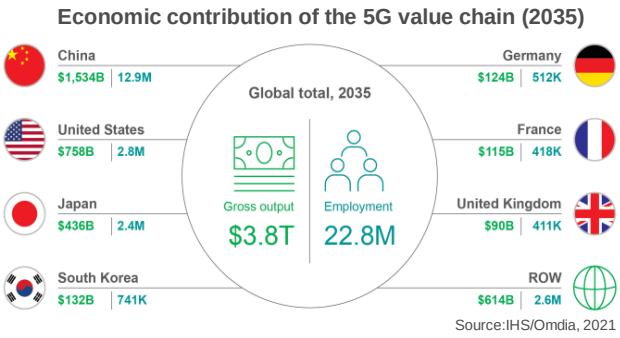
https://www.eca.europa.eu/Lists/ECADocuments/SR22_03/SR_Security-5G-networks_EN.pdf

Economic impacts of 5G: Countries



Source:IHS/Omdia, 2021

"China is expected to capture a higher share of the 5G value chain in 2035—about $400 billion (or 36%) higher at $1.5 trillion than the $1.1 trillion that was forecast in 2019."

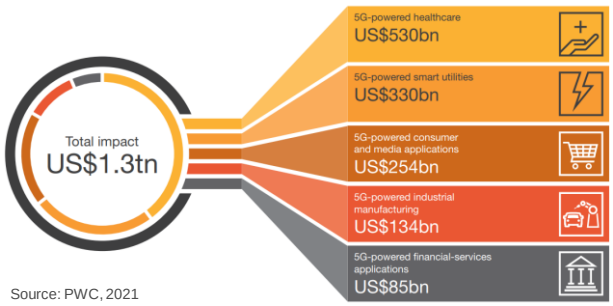
Highlights

- macroeconomic benefits of 5G can be measured by the global investments in infrastructure and associated R&D.
  - 5G-related investment (both CAPEX and R&D) from 2020 through 2035 will average over $260 billion annually.
- the 5G value chain will generate $3.8 trillion of gross output and support 22.8 million new jobs by 2035.
- seven countries will account for nearly 84% of the contribution to
- global 5G-related gross output and over 88% of the contribution to new employment.

https://www.qualcomm.com/media/documents/files/the-5g-economy-in-a-post-covid-19-era-report.pdf

Economic impacts of 5G: Industries

5G boost to global GDP by industry by 2030 (US$, 2019 values)



Source: PWC, 2021

Highlights

- Healthcare will be far and away the biggest contributor to the economic gains from 5G:
  - it could add more than half a trillion dollars to global GDP.
  - Fewer and shorter hospital stays
  - improve communication among doctors and with patients by enabling it to be continuous and real-time, both within and outside hospitals.

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https://www.pwc.com/gx/en/tmt/5g/global-economic-impact-5g.pdf

III. Cloud computing

Cloud computing

"service model for computing services based on a set of computing resources that can be accessed in a flexible, elastic, on-demand way with low management effort"

- accessing computing resources via the internet, such as software, storage and infrastructure.
  - by the year 2022, 20% of businesses will outsource their IT needs to the Cloud.
  - with cloud service providers, businesses can tap into the IT services that they need, when they need, for as long as they need without investing in any IT infrastructure
  - The result is a far more agile and cost-effective IT services

Source: OECD, 2017

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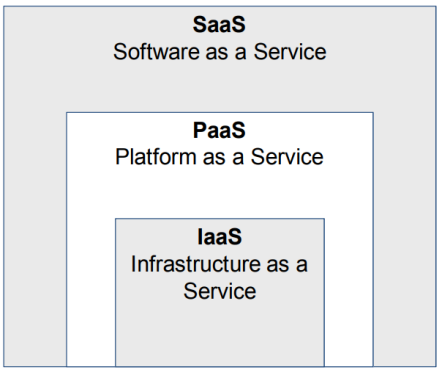
https://www.oecd.org/sti/broadband/47

https://www.oecd-ilibrary.org/docserver/5jxzf4lcc7f5-en.pdf?expires=1649513176&id=id&accname=guest&checksum=41449CF0BCDF255AA0B4A198C19D3F05633151.pdf

Cloud computing service models

Categories of cloud computing service models



Source: OECD, 2017

Cloud computing covers a huge range of services including software, platform and infrastructure services

- **Software as a service (SaaS):** applications for specific business processes and purposes (ex. business applications and integrated management software solutions such as customer relationship management)
- **Platform as a service (PaaS):** structured platform to deploy users own applications and services (ex. Programming platforms)
- **Infrastructure as a service (IaaS):** provides computing resources such as processing, storage and networks (ex. access to raw computing resources)

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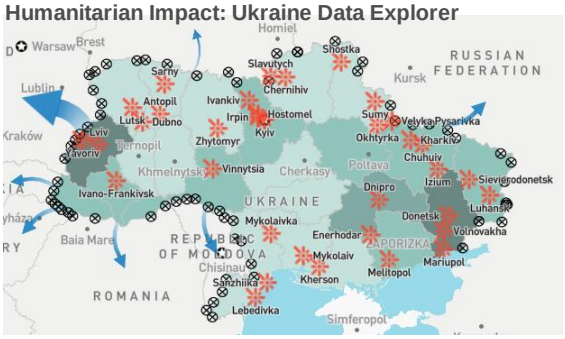
https://www.oecd-ilibrary.org/docserver/5jxzf4lcc7f5-en.pdf?expires=1649513176&id=id&accname=guest&checksum=41449CF0BCDF255AA0B4A198C19D3F05

IV. Big Data, Data Analytics and advanced computing

Advanced computing for social applications

Application of Big Data and Data Analytics Humanitarian Impact: Ukraine Data Explorer



Source: The Humanitarian Data Exchange, 2022

- Information is compiled from a variety of sources.
  - Technique: triangulation of information and sources is performed on a continuous basis.

Concepts

- **Big data:** term that describes large, hard-to-manage volumes of data.
- **Data Analytics**: tools that allows managing:
  - **Volume:** Organizations collect data from a variety of sources (IoT, devices, industrial equipment, videos, images, audio, social media, so on)
    - requires cheaper storage solutions: data lakes, Hadoop and the cloud
  - **Velocity:** unprecedented speed of data inflow and near-real time handing.

V. Democracy and Consumers rights

Elements of Internet openness

Technical	Economic	Social	Other
End-to-end principle ➢ *consistent use of open standards* ➢ *interoperable* ➢ *consistent address space* ➢ *uniform convention for domain names*	Cross-border supply and consumption	Respect for human rights, e.g.: ➢ *freedom of expression* ➢ *freedom to associate* ➢ *privacy* ➢ *freedom from discrimination* ➢ *education*	Digital security ➢ *availability* ➢ *integrity* ➢ *confidentiality* ➢ *but with some vulnerability*
Open protocols for core functions	Economic accessibility		Empowerment of users over data sent and received
	Regulatory transparency, certainty and capacity		Distributed control Inclusive governance
			Multilingualism

Source: OECD, 2016

Highlights

- Social openness is positively related to the ability of individuals to use the Internet to broaden their non-pecuniary opportunities.
- corresponds to people's ability to do more things online, whether it is starting a business, creating new services, expressing opinions, raising capital, sharing knowledge and ideas, conducting research, interacting with government.

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https://www.oecd-ilibrary.org/docserver/5jlwqf2r97g5-en.pdf?expires=1649517032&id=id&accname=guest&checksum=B5E30FEDA2DA22354C157E0D5E4DA176

Consumer rights and responsibilities in the digital world

Best Practice Guidelines for Consumer Protection in a Digital World

1. **Charting a strategic direction** giving consumer affairs a higher and better defined profile within a forward-looking overall policy framework covering both national and international contexts.
2. **Enhancing market competitiveness** at all levels, treating both ICT providers and OTT service providers equally in regard to consumer protection.
3. **Partnering with industry**, taking advantage of providers' desire to protect consumers from potential harm.
4. **Providing a sound framework for contractual services** ensuring transparency, and balance between rights and obligations.
5. **Multiple channels for redress** so that consumers can defend their rights rapidly and at no or minimal cost.
6. **Quality of service and consumer experience,** introducing measures to assure easy and reliable access to ICTs and web content for all, including consumers with disabilities.
7. **Protecting consumer privacy and data,** requiring consumer opt-in for online data collection, paying special attention to protecting children and young people, and setting up computer emergency response teams (CERTs).
8. **Empowering consumers** through education, awareness-raising, and participation in policy dialogues, using new media as well as traditional channels like schools.
9. **The consumer right to information,** ensuring clear, up-to-date, comparable information in a form that supports consumers' decisions.
10. **Redefining the role of regulators,** possibly including consumer advocacy, bringing evidence, technical expertise, and strong enforcement to bear on matters that concern consumers.

5

Consumer rights and responsibilities in the digital world

- consumer usually means a person who buys services for their own or household use.
- Basic consumer rights across all sectors were identified in the 1960s as: access, choice, information/education, safety, redress, sustainability, and representation.
- The 2014 ITU Global Regulatory Symposium incorporated these into their Best Practice Guidelines on consumer protection in a digital world

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https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-TRH.1-2020-PDF-E.pdf

Discussion (10+10 min)

- Digital transformation enabled by the connectivity infrastructure has been an important driver of socioeconomic progress. More than only providing connectivity, it is important to promote the adoption of technologies like 5G, SDN, and cloud computing.
- 5G has been identified as an enabling technology for digital transformation in different economic sectors, like health, transport, agriculture, education, and energy distribution.
- Question for discussion:
  - *What instruments and initiatives are available for EC delegations to assist countries in promoting digital transformation on top of the digital connectivity infrastructure? In other words, once there is 5G connectivity, how EC delegations could support the adoption of digital solutions in different economic sectors (e.g., incentives to start-ups, adoption of digital solutions by farmers, promote e-learning)?*

Part 2: Quiz

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