

# **Session 2. Defining and measuring digital economy. Economic theory**

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Digital Transformation of the World Economy  
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# Plan

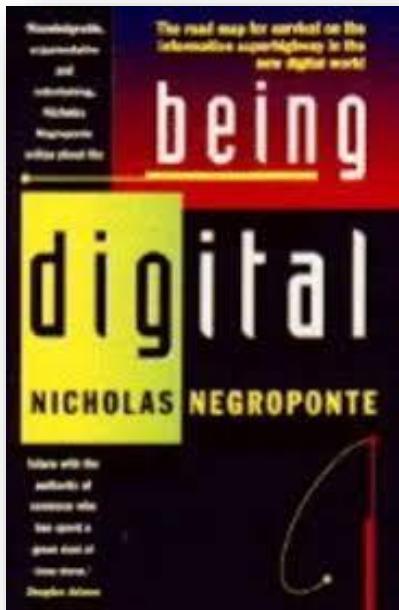
- Reflection from last session
- Define digital economy
- Conceptualize digital economy
- Measure digital economy
- Explain growth in digital economy

# Reflection

- Digital transformation is a transformation of analogue data into series of the smallest units of information - the digits 0 or 1
- Digital transformation enables economic activity that results from billions of everyday online connections
- Factors of production:
  - Classical economic theory: land, labor, and capital
  - New: information (data), time
    - Examples: valuation of Microsoft, Apple, Facebook

# **Definition**

# Defining the digital economy



*'The change from atoms to bits is irrevocable and unstoppable... and it is also exponential – small differences of yesterday can have suddenly shocking consequences tomorrow'* (Negroponte, 1995)

# Visualize exponential effect

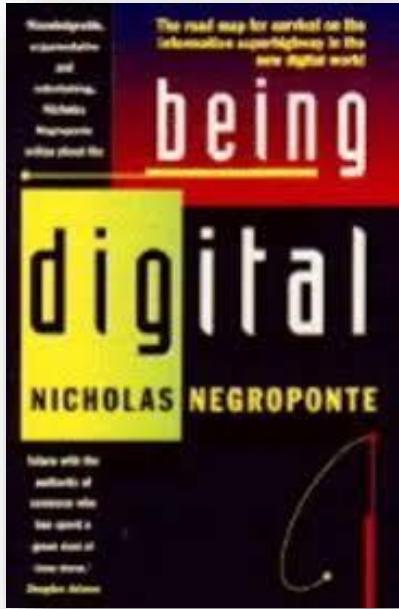
	A	B	C	D	E	F
1					1 Penny -->	\$0.01
2						\$0.02
3						\$0.04
4						\$0.08
5						\$0.16
6						\$0.32
7						\$0.64
8						\$1.28
9						\$2.56
10						\$5.12
11						\$10.24
12						\$20.48
13						\$40.96
14						\$81.92
15						\$163.84
16						\$327.68
17						\$655.36
18					Watch how huge it starts getting now!	\$1,310.72
19						\$2,621.44
20						\$5,242.88
21						\$10,485.76
22						\$20,971.52
23						\$41,943.04
24						\$83,886.08
25						\$167,772.16
26						\$335,544.32
27						\$671,088.64
28					\$1 Million on day #28!	\$1,342,177.28
29						\$2,684,354.56
30						\$5,368,709.12
31						\$10,737,418.23
32						



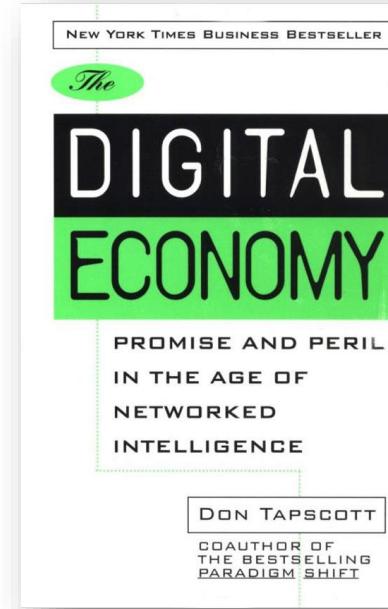
1 Penny Doubling Every Day  
Turns Into \$10 000 000 by  
Day #31

We are now experiencing those  
last 3 days in the spread of  
computing and digital  
telecommunication

# Defining the digital economy



*'The change from atoms to bits is irrevocable and unstoppable... and it is also exponential – small differences of yesterday can have suddenly shocking consequences tomorrow'* (Negroponte, 1995)



Don Tapscott's *The Digital Economy: Promise and Peril in the Age of Networked Intelligence* is typically-cited origin of the term 'digital economy' (1996)

# Challenge defining digital economy

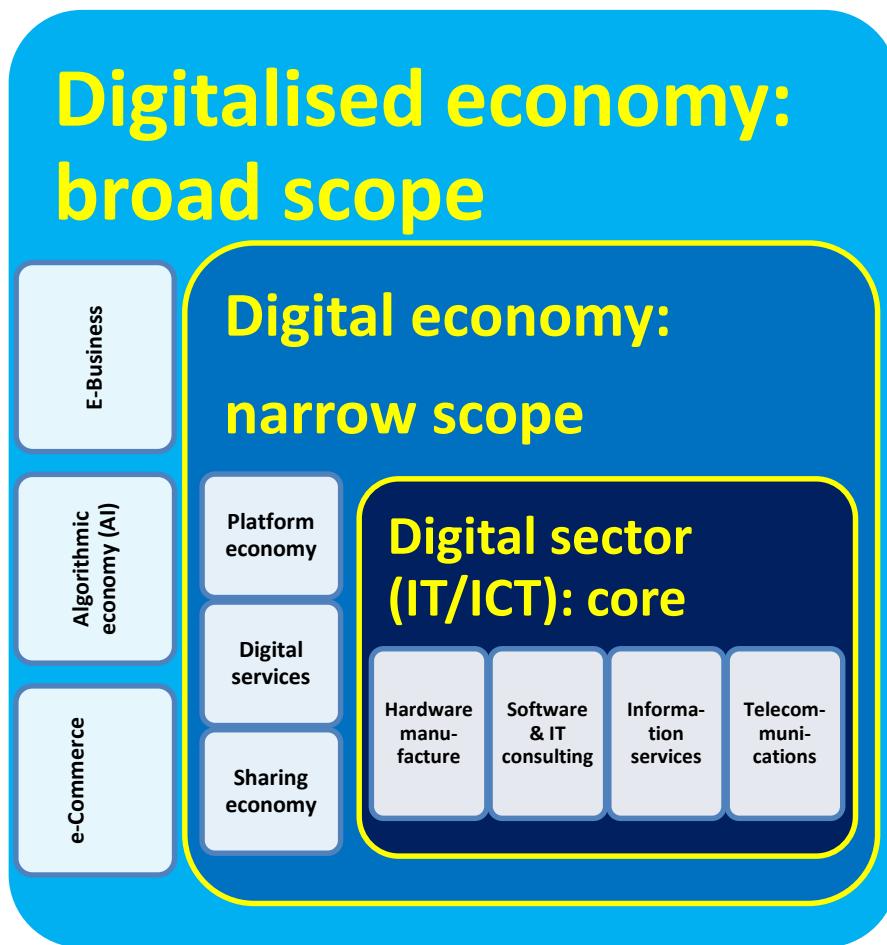
- Definitions reflect times and trends from which they emerge
- Early definitions of digital economy (1996-2001) focused on the Internet, reflecting its emergence as a mainstream technology
- Later - added new technologies (mobile & sensor networks, cloud computing, big data)

# **Conceptualization**

# Conceptualizing the digital economy

- An economic activity that results from billions of everyday online connections enabled by **digital transformation**
- The backbone of the digital economy is
  - big data
  - computing power
  - hyperconnectivity
- “Being digital” vs. “doing digital”:
  - placing digital technologies at the core of all business processes vs. simply using them

# Conceptualization: core-> narrow scope-> broad scope



## Problem with conceptualization:

- more and more services, manufacturing and primary production activities rely on ICTs

## Scoping for clarity:

- Broad scope - **digitalised economy** - all economic activity based on digital technologies
- Narrow scope – **digital economy** - intensive and extensive applications of ICTs
- Core - **digital sector** - “IT sector” or the “ICT sector

# Broad (widest) scope

**Digitalised economy** - use of ICTs in all economic fields

- **digitisation** - conversion of data to digital form
  - creating a digital (bits and bytes) version of analog/physical things such as paper documents, microfilm images, photographs, sounds, etc.
- **digitalisation** - application of digitisation to economic activity
  - ongoing adoption of digital technologies across all possible societal (including economic) and human activities

# Narrow scope (the true digital economy)

**Digital economy** – that part of economic output derived solely or primarily from digital technologies with a business model based on digital goods or services”

- intensive and extensive applications of ICTs
  - **intensive** - improve (intensify) existing economic activity
  - **extensive** - extend the boundaries of economic activity

Question: “has this activity only arisen due to ICTs?”:

If the answer is **no** – the activity already existed before ICTs – **then any use of ICTs is intensive**

If the answer is **yes** – the activity only exists because of ICTs – **then this is extensive**

# Core of the digital economy

**Digital sector** – the core of the digital economy is the ‘digital sector’: the IT/ICT sector producing foundational digital goods and services

- IT/ICT sector - combination of manufacturing and services industries that capture, *transmit* and *display* data and information *electronically*



# **Measurements**

# Metrics of digital economy

- Standard economic metrics
  - GDP (gross domestic product): the market value of all final goods and services produced within a country in a given period of time
  - Market value
    - value is the bundle of benefits expected from a given product or service
- GDP-based measure the digital economy
  - the bundle of benefits that digital technology delivers is measured by **proxy**:
    - add up the total spending by businesses and consumers on finished digital products and services

# Problems with measuring digital economy

- Different definitions across the world *make comparison difficult*
- Data quality
- Falling prices of ICTs power, storage and ICT-enabled services
- ‘Invisibility’ of many digitally-enabled economic activities

# Unknown vs. unknowable

- Assumed value:
  - total spending by businesses and consumers on finished digital products and services
- Actual value delivered:
- Digital economy
  - ~5% of global economic value (measured by assumed value)
  - ~20% of global economic value (measured by actual value delivered)

# Can GDP measure digital economy?

- "*You can see the computer age everywhere but in the productivity statistics*"

(Nobel laureate Robert Solow, 1987)

- "*We have to go back to GDP, the calculation of productivity, the value of things – in order to assess, and probably change, the way we look at the economy*"

(Christine Lagarde, head of the IMF, Davos, 2016)

# Explaining economic growth in DE

- Earlier theories of economic growth tend to emphasize physical capital accumulation
  - Example: neoclassical model of economic growth *Solow Growth Model* assumes three basic sources for GDP labor (L), capital (K) and knowledge (A). **Assumes the growth rates of knowledge and labor are constant.**
- The digital economy calls for a paradigm shift in explaining growth
  - factors and forces causing DE growth are different
  - investments in research activities enable new knowledge discovery. **New knowledge increases returns in production.**

# Reinterpretation of basic concepts of Schumpeter's theory of change for DE

	Schumpeter Theory	Digital economy
Innovation	Introduction of new goods	Introduction of new digital products and digital services
Technology	New methods of production	Digitization of the production processes of knowledge-based goods*
Customer orientation	Opening of new markets	Creation of electronic markets and digital distribution channels**
Coordination	Conquest of new supply sources	Implementation of B2B-EC to manage supply networks***
Entrepreneurship	Profit-orientation. Reorganization of the firm. Risk-taking strategies.	Profit-orientation – monetization. Development of new models to manage digital businesses. Startups.

\***Knowledge-based goods:** books, technology, patent, design, data-base

\*\***Electronic markets and digital distribution channels:** electronic purchasing systems, social networks' recommendation communities

\*\*\*B2B-EC: business-to-business electronic commerce, end user - business (vs B2C; end user - consumer)<sup>31</sup>

# Sources used in this presentation

- Heeks, R., 2017. Information and Communication Technology for Development, Routledge, Abingdon, UK
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