

**TARAS SHEVCHENKO NATIONAL UNIVERSITY OF KYIV
EDUCATIONAL AND SCIENTIFIC INSTITUTE OF PHILOLOGY**

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**ACADEMIC ENGLISH FOR
CYBER PROFIES**

PART 1

B2 – C1

2026

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The coursebook is designed for the fourth-year undergraduate students in the Faculty of Computer Science and Cybernetics. It has been developed in accordance with the syllabus for the course *English for Academic and Professional Purposes*. It consists of thematic modules that integrate all major language skills, focusing on the development of academic and professional vocabulary through structured practice, authentic texts, listening activities, academic writing tasks, project-based assignments, and case studies.

The coursebook aims to develop students' ability to analyse information, structure arguments logically, express personal opinions, and apply English effectively in academic and professional contexts related to computer science, while also preparing them for final examinations and further studies at the Master's level.

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**КИЇВСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ІМЕНІ ТАРАСА
ШЕВЧЕНКА**
Навчально-науковий інститут філології

**Інна Красовська
Оксана Степанечко**

**АКАДЕМІЧНА АНГЛІЙСЬКА ДЛЯ
КІБЕР ПРОФЕСІОНАЛІВ**

ЧАСТИНА 1

B2 – C1

Навчальний посібник

для студентів вищих закладів освіти III – IV рівнів акредитації

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Навчальний посібник призначений для студентів четвертого курсу факультету комп'ютерних наук і кібернетики та розроблений відповідно до програми курсу «Іноземна мова для академічних цілей та за професійним спрямуванням (англійська)». Посібник складається з 4 тематичних модулів, що спрямовані на розвиток усіх видів мовленнєвої діяльності та формування академічного й професійного словника шляхом виконання структурованих вправ, роботи з автентичними текстами, завдань на аудіювання, з академічного письма, а також проєктних завдань і кейсів.

Метою посібника є розвиток у студентів здатності аналізувати інформацію, логічно структурувати аргументи, висловлювати особисту думку й ефективно застосовувати англійську мову в академічному та професійному контекстах, а також підготовка їх до вступних іспитів до магістратури.

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PREFACE

Coursebook “**Academic English for Cyber Profies. Part 1**” is designed for fourth-year undergraduate students of the Faculty of Computer Science and Cybernetics and is developed in accordance with the syllabus of the course “*English for Academic and Professional Purposes*”. Part 1 of the book consists of 4 thematic modules that reflect the key topics of the curriculum and integrate all major language skills.

Each module focuses on the development of professional and academic vocabulary through structured practice, phrase-based activities, and authentic texts. Special attention is paid to listening comprehension, critical analysis, summarising, and reproduction of information in English. The academic component is represented by sections on academic writing, where students develop skills in describing concepts and applications, analysing the advantages and disadvantages of innovations, structuring arguments, and expressing personal opinions clearly and logically.

A distinctive feature of the coursebook is a set of project-based tasks included in each module. These projects encourage students to conduct research related to their future professional field, prepare presentations, and develop visual materials that demonstrate both analytical and creative skills.

Another key element of the coursebook is a collection of case studies, one for each module. The case studies are based on real-life professional situations and designed for collaborative discussion, analysis, and problem-solving. They combine learning, analytical, and teamwork activities, thus fostering practical application of knowledge and supporting the development of critical thinking and communication skills.

Successful completion of the course enables students to apply the acquired language skills in their professional activities and prepares them for final examinations as well as entrance examinations to Master’s degree programmes.

ПЕРЕДМОВА

Навчальний посібник «Академічна англійська для кібер професіоналів. Частина 1» призначений для студентів четвертого курсу факультету комп'ютерних наук та кібернетики і розроблений згідно з вимогами й змістовими темами робочої навчальної програми з дисципліни «Іноземна мова для академічних цілей та за професійним спрямуванням (англійська)».

Структурно перша частина навчального посібника складається з чотирьох тематичних модулів, що відображають зміст навчальних тем програми та опрацьовуються із залученням усіх видів мовленнєвої діяльності. Кожен модуль передбачає засвоєння лексичного матеріалу, систематизоване опрацювання нових одиниць лексики в практичних вправах, фразових та текстових одиницях. Належна увага приділяється сприйняттю інформації іноземною мовою на слух, її аналіз, узагальнення та відтворення. Академічна складова представлена в підрозділах академічного письма, де студенти розвивають й удосконалюють уміння описувати персону, характеризувати додатки, визначати позитивні й негативні сторони інновацій, структурувати й висловлювати власну думку тощо.

На особливу увагу заслуговують проєкти (projects), розроблені до кожної теми. Студентам пропонуються завдання з чіткими інструкціями підготувати презентації на визначену тему, дотичну до їхньої майбутньої діяльності. У проєктній роботі студенти керують своїм навчанням шляхом дослідження, працюючи над проєктами та створюючи візуальний супровід до них, що відображає їхні дослідницькі й креативні навички.

Родзинкою посібника є навчальні кейси, створені до кожного модуля, де використовуються реальні ситуації (кейси) з метою спільного обговорення, аналізу або виконання послідовних завдань студентами. Виконання кейсу відображає практичну життєву проблему й одночасно актуалізує певний набір знань, що необхідно засвоїти у процесі її вирішення, а також поєднує навчальну, аналітичну та командну діяльність. Така комбінація, беззаперечно, є актуальною й ефективною для реалізації сучасних освітніх завдань.

Належне засвоєння студентами викладеного у посібнику навчального матеріалу дає змогу застосовувати набуті знання в професійній діяльності та підготуватися до успішного складання іспитів (як підсумкового, так і вступного до магістратури).

UNIT 1. CYBERNETICS

PART 1. BASICS

LEAD-IN

Task 1. Read the quotes given below. What science do they describe?

“It is the science of control and communication in the animal and the machine.”

Norbert Wiener

“This field of science is the scientific comparison of control and communication between living things and machines. The idea is that you can see how something is done in a living thing - and see if that’s useful for solving problems in computers...AND you can see how things are done in computers and use that knowledge to assist your understanding about how living things might operate.”

Steve Baker

“This science is a little-understood and mainly philosophical interdisciplinary field of study. It has been applied to physical and spatial relationships, social theory, and computer science, to name just a few of the many areas upon which it touches.”

Abdel Fudadin

“It is the science of communication and control theory that is concerned especially with the comparative study of automatic control systems (such as the nervous system and brain and mechanical-electrical communication systems).”

Merriam Webster

[40; 28]

Task 2. Think why cybernetics is important in the contemporary world. Read the reasons given below and choose the most relevant ones. Explain your choice.

- Cybernetics ensures robots, control systems, and neural networks to employ the feedback and adaptive mechanisms that make them "intelligent" or responsive;
- As machines become more autonomous and embedded in daily life (think wearable tech, autonomous cars, or AI assistants), cybernetics helps ensure meaningful, safe, and ethical interaction between humans and machines;
- Cybernetics (which includes the observer in the system) fosters ethical reflection on: “Who designs systems? What values are embedded? How do systems affect human autonomy?”
- Cybernetic principles help design systems that are not only efficient but also sustainable and resilient – capable of adapting to shocks (like pandemics, ecological collapse, or economic crises);
- its principles underpin some of the most transformative technologies and organizational strategies of the 21st century, making it vital to both understanding and shaping our future;
- Cybernetics enables us to navigate the big challenges of our time collectively, rather than tackling them separately. It provides tools and techniques to look for solutions that integrate technology and its social and environmental implications;
- Rather than seeing technology as something that determines social structures and cultural values, cybernetics focuses on the role of technology as part of society and the broader systems of our world.

[37]

Task 3. Explain your reasons for applying to the cybernetics department. What fields of the economy can you apply your knowledge to in the future?

Task 4. Study the table that exemplifies the application of cybernetics in different fields to solve many practical issues. Match the examples (A- F) to a particular field.

FIELD	CYBERNETIC FEATURE	EXAMPLES
ECONOMICS	Distributed control, modeling	
MEDICINE	Biofeedback, adaptive systems	
ECOLOGY	Self-regulating systems	

Examples:

- A. *Climate models integrate feedback mechanisms such as the albedo effect, carbon cycles, and atmospheric feedback.*
- B. *EEG (electroencephalography) neurofeedback is used to treat ADHD (attention-deficit/hyperactivity disorder), anxiety, or epilepsy by training the brain using real-time data.*
- C. *Project Cybersyn in Chile (1971–1973) attempted to use cybernetic principles to manage the national economy in real-time through distributed control and feedback loops between factories and central planners.*
- D. *A bionic arm that reads neural signals and adjusts grip force dynamically, learning from the user's behavior.*
- E. *Cybernetic models simulate predator-prey dynamics or the resilience of wetlands, guiding conservation policies.*
- F. *The Phillips machine (Moniac), built in the 1940s, was an early analog cybernetic model simulating national economies using water flow to represent money - a dynamic system with real-time feedback.*

Task 5. Make a list of the most essential concepts applied in cybernetics.

E.g., system, communication, ...

Task 6. Compare your list with the one suggested below. Match concepts (1-17) with their definitions (a-q). Tick off the concepts that you have not known yet.

	CONCEPTS	DEFINITION
1	system	
2	feedback	
3	control	
4	regulation	
5	communication	
6	black box	
7	homeostasis	
8	adaptation	
9	feedforward	
10	variety	
11	observer	
12	recursion	
13	autopoiesis	
14	emergence	
15	self-organization	
16	viable system model	
17	machine learning	

- a. information about the result of a process that is used to adjust the process itself;
- b. maintaining a variable within desired limits, despite disturbances;
- c. modern implementations of cybernetic ideas where machines learn from feedback (data) to improve performance or predictions;
- d. when systems contain sub-systems that follow the same principles;

- e. the ability of a system to maintain internal stability despite external changes, through self-regulation;
- f. a system whose internal structure is unknown, but whose inputs and outputs can be observed and used to infer its behavior;
- g. the transfer of information within and between systems;
- h. a collection of interconnected elements that work together to achieve a goal;
- i. the process of steering a system toward a desired goal or state using feedback and decision rules;
- j. anticipatory action taken based on predictions of future states, before feedback arrives;
- k. complex behaviors or patterns that arise from simple interactions within a system, not predictable from individual components alone;
- l. The number of possible states a system can take;
- m. Self-creating, self-maintaining systems – like living cells or social systems – that produce their own components and preserve their identity;
- n. a cybernetic model of organizational structure proposed by Stafford Beer to ensure viability through self-regulation and adaptability;
- o. The system's ability to change its behavior or structure in response to changes in the environment;
- p. a system which, through interactions, retains a representation of another system (the observed system) within it;
- q. the ability of a system to develop structure or order spontaneously without external control; [52; 1; 37; 48]

PART 2. WHAT IS CYBERNETICS?

Task 1. Work in pairs. Find out how much you know about cybernetics. Answer the following questions.

1. What is the second term used to name cybernetics?

2. What is the origin of the term “cybernetics”?
3. Who first suggested calling the non-existent science cybernetics?
4. When did cybernetics originate as a science?
5. Who is considered to be the father of cybernetics?
6. Which science is cybernetics closely connected with?
7. How is the essence of cybernetics approached broadly?

LISTENING

Task 1. Listen to an article from the Encyclopedia Britannica and check your answers. [4]

Task 2. Listen again and fill in the gaps with the appropriate words.

1. In the first half of the 19th century, the French physicist André-Marie Ampère, in his classification of the sciences, suggested that the still nonexistent science _____be called cybernetics.
2. Wiener defined cybernetics as “the science _____in the animal and machine.”
3. The information sent by the monitor to the controller is called _____.
4. Indeed, some of the earliest work done in cybernetics was the study of control rules by which human action takes place, with the goal of _____that could be tied in with the brain.
5. In subsequent years the computer and the areas of mathematics related to it (e.g., mathematical logic) had a great influence on the development of cybernetics – for the simple reason that computers can be used not only for automatic calculation but also for all _____. [4]

Task 3. Compare two views to define cybernetics as a distinct scientific field. Which one can be referred to as narrow/broad? Which approach has more spheres of application?

“Cybernetics is the interdisciplinary science of systems, control, and communication in animals, machines, organizations, and ecosystems. It focuses on how systems self-regulate, adapt, and evolve through feedback mechanisms, regardless of the physical form or scale of the system.”

“Cybernetics is the study of feedback and control mechanisms in engineered and biological systems. It concentrates on the design and analysis of systems that can monitor their own performance and adjust their behavior accordingly.” [4]

SPEAKING

Task 1. Study the Table “Comparison of Broad and Narrow Definitions of Cybernetics”. Use the information from the table and compare the two definitions in focus. Make use of the expressions suggested below to structure your presentation.

Table 1. Comparison of Broad and Narrow Definitions of Cybernetics [1; 3; 4]

ASPECT	BROAD DEFINITION	NARROW DEFINITION
Scope	Interdisciplinary and conceptual, addressing systems of all kinds	Technical and application-oriented, focusing on specific systems
Focus	Self-regulation, communication, and adaptation in any organized system	Feedback and control mechanisms in engineered and biological systems
Disciplinary Range	Encompasses biology, sociology, philosophy, ecology, economics, and more	Primarily concerned with engineering, robotics, automation, and control systems
Key Applications	Modeling ecosystems, managing organizations, AI ethics, social systems	Designing autopilots, thermostats, prosthetics, and neural control systems

Level of Abstraction	High: emphasizes principles applicable across domains	Low to medium: emphasizes practical implementation and system design
Notable Theorists/ Projects	Norbert Wiener, Gregory Bateson, Stafford Beer, the Gaia Hypothesis, second-order cybernetics	Norbert Wiener, control theory, cyber-physical systems, robotics, artificial limbs

Useful Phrases to Describe the Table:

1. Introducing the table:

- *Table 1 presents a comparative overview of...*
- *This table outlines the key differences between ...*
- *The comparison is structured across several dimensions...*
- *As illustrated in Table 1, cybernetics can be understood from two perspectives:*

2. Referring to specific aspects:

- *In terms of scope, the broad definition refers to... whereas the narrow view focuses on...*
- *Regarding disciplinary range, the broad perspective encompasses..., while the narrow definition is primarily limited to...*
- *When examining key applications, it becomes clear that the broad definition is more concerned with... whereas the narrow definition highlights...*
- *The difference in the level of abstraction is particularly striking, with the broad view emphasizing... and the narrow one focusing on...*
- *Notable figures associated with each perspective are also listed, underscoring the distinct historical and theoretical roots.*

3. Interpreting or Analyzing the Comparison

- *The contrast between the two definitions highlights*
- *This comparison demonstrates how the same field can serve.....*
- *The broad definition aims to generalize....., while the narrow approach seeks.....*
- *The inclusion of thinkers such as Bateson and Beer in the broad definition suggests*
- *The table helps to clarify how*

4. Transitioning or Concluding Remarks

- *This structured comparison provides a foundation for....*
- *Understanding both perspectives is crucial for*
- *The distinctions outlined above reveal how*
- *In summary, Table 1 helps illuminate*

[19; 49]

ACADEMIC WRITING

Task 1. Study the guide on how to write an academic essay to describe a scientific field.

ESSAY: A SCIENTIFIC FIELD DESCRIPTION

1. Understand Your Purpose

Your goal is to:

- inform the reader about the scope, origin, and evolution of the field.
- explain key concepts, methods, and applications.
- show the field's relevance to modern science, technology, or society.
- optionally, reflect on its future directions.

2. Structure Your Essay

Use the classical academic essay format:

I. Introduction

- introduce the field: define the scientific field briefly;
- provide background: mention when and why the field emerged;

State your thesis: What are you aiming to show? (e.g., the significance, growth, and interdisciplinary nature of the field)

Tip: Include a “hook” - a surprising fact, question, or brief quote.

II. Main Body

Divide this into 3–5 logically organized paragraphs, each with a clear focus.

◆ **A. Historical Background**

When did the field originate?

Who were the founders or pioneers?

What were the key breakthroughs?

◆ **B. Key Concepts and Theories**

Define and explain major concepts or principles.

Use technical terms but define them clearly.

Support with examples or diagrams, if appropriate.

◆ **C. Methodology**

How do scientists in this field research and analyze problems?

What tools, experiments, or models do they use?

◆ **D. Applications**

Where is the field applied today? (e.g., in medicine, technology, economics)

Give real-world examples that demonstrate its impact.

◆ **E. Interdisciplinary Links and Current Trends**

How does it connect with other disciplines?

Mention recent developments, debates, or innovations.

III. Conclusion

- summarize the main points;
- reaffirm the importance of the field;
- optionally, reflect on future challenges or directions.

Tip: Avoid introducing new ideas in the conclusion.

3. Style and Language Tips

- use formal, objective language.
- define technical terms; avoid jargon unless explained.
- use transition words for flow (e.g., “Moreover”, “Also”, “For instance”, "As a result").
- support claims with evidence (citations, if required).
- maintain third-person perspective (avoid “I” or “we” unless allowed).

Common Phrases to Use

Here are some academic phrases you can integrate:

1. General Descriptors

- *interdisciplinary science;*
- *the science of systems and control;*
- *study of communication and regulation in systems;*
- *theoretical and applied science;*
- *systems-oriented approach;*
- *cross-disciplinary field;*
- *scientific framework for feedback and adaptation;*
- *integrative scientific domain;*
- *mechanism-based science;*
- *structural-functional analysis of systems.*

2. Core Concepts and Keywords

- *feedback loops’*
- *control mechanisms;*
- *information processing;*
- *self-regulation;*
- *system dynamics;*
- *goal-directed behavior;*
- *adaptive systems;*

- *autonomy and learning;*
- *communication pathways;*
- *signal transmission;*
- *input-output relations;*

3. Key Verbs and Verb Phrases

- *explores the principles of...;*
- *analyzes how systems...;*
- *models the behavior of...;*
- *regulates through feedback...;*
- *simulates dynamic processes...'*
- *integrates data from...;*
- *observes systemic interactions...;*
- *controls and adjusts responses to...;*
- *predicts system evolution under...;*
- *establishes connections between...;*

4. Comparative and Contextual Phrases

- *unlike linear sciences, cybernetics emphasizes...;*
- *in contrast to purely mechanical models...;*
- *closely related to systems theory...;*
- *applied across both biological and artificial systems...;*
- *serves as a bridge between engineering and biology...;*
- *shares foundational principles with control theory...;*
- *has applications in robotics, AI, neuroscience, and sociology...;*
- *draws from fields such as mathematics, computer science, and philosophy...*

5. Describing Its Purpose or Importance

- *aims to understand how systems self-regulate and communicate;*
- *seeks to unify principles governing living and artificial systems;*
- *provides tools for analyzing complex adaptive systems;*
- *helps design intelligent and responsive machines;*

- *contributes to advancements in automation and artificial intelligence;*
- *enhances understanding of cognitive and biological processes*

6. Defining the Science

- *... refers to...;*
- *... can be defined as...;*
- *... is concerned with the investigation of...;*
- *... explores the principles and mechanisms of...;*
- *... is defined as the discipline that focuses on...;*
- *... involves the systematic study of...;*
- *... is an interdisciplinary area that combines elements of...;*
- *... is a field of study dedicated to...;*
- *... is the theoretical and practical study of...;*
- *... encompasses the analysis of...*

7. Describing Origin

- *...takes its origin from...;*
- *... was first introduced by...;*
- *the field first took shape in the context of...;*
- *it arose from early attempts to...;*
- *the development of [science] began with...;*
- *it was initially formulated by... in the [century/decade];*
- *[science] evolved out of...;*
- *the roots of [science] lie in..*

[19; 49]

Task 2. Make a plan to write an academic essay on the topic “Cybernetics: A Vision Ahead of Its Time”.

Task 3. Compile a list of keywords and word combinations that you can use to write the essay on the given topic.

Task 4. Compare your list with the one suggested below:

KEY WORDS:

1. to take its origin from;
2. to originate from;
3. to be a breakthrough in;
4. to research into;
5. to make a contribution to;
6. to set an objective
7. to implement an idea
8. to devise a concept;
9. to come up with the idea of
- 10.to give insight into;
- 11.to be a landmark event in;
- 12.to go ahead its time;
13. to recap the research;
- 14.to include diverse fields;
- 15.to vary from ... to..;
- 16.to embrace a diverse number of..

[49]

Task 5. Group the key words under the following headings:

A. Origins & Historical Context

B. Research & Contribution

C. Purpose & Innovation

D. Insight & Interdisciplinarity

Task 6. Match the key words (1-16) with their synonyms (a-p)

1	to take its origin from	o. to stem from, to arise from, to be rooted in, to derive from
---	-------------------------	---

2	to originate from	
3	to be a breakthrough in	
4	to research into	
5	to make a contribution to	
6	to set an objective	
7	to implement an idea	
8	to devise a concept	
9	to come up with the idea of	
10	to give insight into	
11	to be a landmark event in	
12	to go ahead its time	
13	to recap the research	
14	to include diverse fields	
15	to vary from ... to..	
16	to embrace a diverse number of..	

- a. to provide understanding of, to shed light on, to clarify;
- b. to involve numerous, to incorporate a wide range of, to cover a broad array of;
- c. to formulate a concept, to create a model, to develop a theory;
- d. to define a goal, to establish a target, to determine a purpose;
- e. to propose, to introduce, to suggest, to conceptualize;
- f. to be a turning point in, to mark a major advance in, to revolutionize;

- g. to be visionary, to anticipate future developments;
- h. to apply a concept, to execute a plan, to put into practice;
- i. to span multiple disciplines, to draw on various fields, to encompass a range of fields;
- j. to summarize the research, to provide an overview, to restate the findings;
- k. to investigate, to explore, to examine, to study;
- l. to advance, to enhance, to participate in, to aid, to further;
- m. to emerge from, to come from, to be developed from;
- n. to range from ... to ..., to extend from ... to ..., to differ between ... and ...;
- o. to stem from, to arise from, to be rooted in, to derive from;
- p. to be a milestone in, to mark a pivotal moment in, to be a defining moment.

[19; 42]

Task 7. Fill in the gaps with the words and word combinations from Task 6.

[1; ;3; 4]

1. Cybernetics early studies of control mechanisms in biology and engineering.
2. The concept Norbert Wiener's work in the 1940s.
3. The publication of Wiener's "Cybernetics" was a ... in systems theory.
4. The Macy Conferences were a in the development of interdisciplinary systems thinking.
5. Wiener's theories of their time, anticipating modern AI and automation.
6. Scientists continue to ... into adaptive systems and machine learning.
7. Cybernetics has made a significant ... to the development of robotics.
8. ... the research, cybernetics offers a unifying model for understanding control across disciplines.
9. The researchers to explore self-regulating systems.
10. The team the idea of machine feedback in early control systems.

11. Wiener ... the concept of feedback loops as fundamental to system regulation.
12. Ashby ... the idea of "variety" as a measure of system complexity.
13. Cybernetics ... into how complex systems adapt and self-organize.
14. The science of cybernetics includes ... such as biology, engineering, psychology, and computer science.
15. Applications of cybernetics ... industrial automation to cognitive neuroscience.
16. Modern cybernetics a diverse number of disciplines and methodologies.

Task 8. Read the essay on the topic “Cybernetics: A Vision Ahead of Its Time”. Fill in the gaps with the missing word combinations. Divide the text into paragraphs in accordance with the plan:

- *Origins & Historical Context*
- *Research & Contribution*
- *Purpose & Innovation*
- *Insight & Interdisciplinarity*
- *Conclusion*

Cybernetics: A Vision Ahead of Its Time

Cybernetics, as a field of knowledge, (1)_____ the mid-20th century, but its relevance continues to expand across the rapidly changing landscape of the 21st century. It (2)_____ the efforts of scientists such as Norbert Wiener, who was among the first (3)_____ controlling systems through feedback and communication. This revolutionary approach was (4)_____ how we understand and interact with machines, nature, and even human society. The field of cybernetics (5)_____ our understanding of how systems regulate themselves and

respond to change. It (6)_____, ranging from engineering and biology to psychology and economics. Its applications (7)_____ robotic automation and artificial intelligence to ecological management and organizational theory. Researchers continue (8)_____ in cybernetics – among them, the development of self-regulating machines, adaptive systems, and resilient social structures. From the beginning, the pioneers of cybernetics worked (9)_____ that would challenge conventional science and technology. They (10)_____ of feedback loops, enabling systems to adjust their behavior based on environmental input. The cybernetic lens (11)_____ how both natural and artificial systems maintain balance, adapt, and evolve. Understanding processes such as homeostasis, communication, and control has provided scientists and engineers with tools for innovation across domains. In particular, the use of feedback in prosthetics, climate modeling, and economic systems has been (12)_____ modern science. Cybernetics often (13)_____, offering theoretical models long before technology is ready to realize them. One famous example is Stafford Beer’s Project Cybersyn, an attempt to apply cybernetics to the real-time governance of Chile’s economy in the 1970s – an experiment that was both bold and visionary. To this day, scholars and technologists continue (14)_____ adaptive systems, machine learning, and second-order cybernetics, where the observer becomes part of the system observed. As we (15)_____ of the past decades, we see that cybernetics (16)_____ fields that collectively shape our future – from sustainable development to intelligent machines. In conclusion, cybernetics is not just a scientific field; it is a philosophical and practical framework for thinking about complexity, communication, and control. By studying systems and how they learn, adapt, and evolve, we not only gain a deeper understanding – we also build the foundation for innovation in a world that grows ever more interconnected. [1; ;3; 4]

a. to vary from ... to	b. recap the research	c. gives insight into
d. a landmark event in	e. to research into	f. to set ambitious objectives
g. includes diverse fields	h. makes a significant contribution to	i. originated from
j. a breakthrough in	k. embraces a diverse number of	l. goes ahead of its time
m. devised the concept	n. to research into	o. to implement ideas
p. takes its origin from		

Task 9. Write an academic essay on one of the suggested topics. Follow the steps presented in the guide.

- ***“Cybernetics: A Science of Systems and Self-Regulation”***
- ***“Cybernetics: An interdisciplinary Science”***
- ***“Past and Present Days of Cybernetics”***
- ***“Limitations and Potentials of Cybernetics as a Scientific Discipline”***
- ***” The Scientific Status of Cybernetics: Between Theory and Application”***
- ***“The Birth of a Science: How Cybernetics Redefined Control and Communication”***
- ***“Cybernetics and the Philosophy of Science: Order, Purpose, and Feedback”***

PART 3. CYBERNETICS: THE SCIENCE OF CONTROL AND COMMUNICATION

READING

Pre-reading

Task 1. Tick off adjectives that you would use to describe “a cybernetic system”:

complex	agile	modular	responsive
resistant	purposive	rigid	self-regulative
hybrid	artificial	well-composed	autonomous

Task 2. Read some definitions of a cybernetic system. Pick up the most comprehensive one. Explain your choice.

“A cybernetic system is any engineered or natural system incorporating a controller and a controlled object, interacting via a feedback loop to maintain stability and performance.” (Wikipedia)

“A cybernetic system is an organized set of components – biological, mechanical, or social – that self-regulates by detecting deviations from goals and correcting them through feedback.” [13]

“A cybernetic system is governed by a closed-loop feedback mechanism. The system’s output is continuously compared to a reference input, and adjustments are made to minimize any deviation (error).” [27]

Task 3. Define the main goal of any cybernetic system. Choose the most appropriate verb to embody your idea:

to steer	to control	to convey	to adapt	to monitor
to adjust	to fix	to detect	to execute	to transmit
to deliver	to deter	to pursue	to record	to monitor

Task 4. Read the article and find out how a cybernetic system works.

HOW DOES CYBERNETICS WORK?

In simple terms, the goal of every cybernetic system is to structure the system so that its actions are correlated with the (1) **reference control signal**. This is accomplished through the use of a (2) **feedback-based automatic control system** that determines which actions should be monitored, which behaviors should be adjusted, how to compare the actions to the reference, and how to best alter the relevant behaviors.

This regulating system evolves or (3) **self-organizes** in natural cybernetic systems. Artificial cybernetic systems respond to human-implemented automatic control systems. The (4) **controller** and the item it regulates are two key components of cybernetic systems.

Both natural and artificial cybernetic systems are prone, to begin with, to the controlled object, which contains all of the capabilities required for its functions, and then develops the controller once the object has been accurately characterized. When these two components are connected, the system begins to behave in a (5) **goal-oriented manner**. Regardless of system disturbances, the goal is to retain all key system characteristics in accordance with the reference input.

To accomplish this, the controller must be able to motivate the system to take appropriate actions that alter the relevant (6) **variables**. When the system's regulatory system discovers an anomaly in its behavior, it attempts to fix it by assessing the discrepancies between its imaginary aim and the (7) **aberrant behavior** and changing the system to compensate for the (8) **disparity**. As the (9) **now-purposive system** begins to take incremental steps toward its goal, this process of error identification and correction repeats. The information that flows back and forth between the controlled object and its controller gradually loses its hierarchy. Each link in this (10) **closed-loop system** contributes to the overall system's control. [21]

Task 5. Match the terms used in the article (1-10) with their definitions (a-j) given below

1.	disparity	a.	a mechanical or electronic device that automatically regulates a system to maintain a desired state or set point without human interaction.
2.	controller	b.	irregular behaviour that deviates from what is considered normal.
3.	variables	c.	focused on reaching or completing specific tasks to achieve a planned outcome.
4.	goal-oriented manner	d.	object, event, idea, feeling, time period, or any other type of category you are trying to measure.
5.	self-organize	e.	a system designed to produce products or services, take care of a population, or leverage some technology at a given period of time.
6.	aberrant behavior	f.	the desired output of a control system.
7.	closed-loop system	g.	a control system that tends to maintain a relationship of one system variable to another by comparing functions of these variables and using the difference as a means of control.
8.	now-purposive system	h.	is a process where some form of overall order arises from local interactions between parts of an initially disordered system.

9.	reference control signal	i.	the device or algorithm that processes the sensor input and generates the control output.
10.	feedback-based automatic control system	j.	a difference in level or treatment.

[9; 20; 26; 44]

Task 6. Answer the following questions.

1. What is the main goal of every cybernetic system?
2. How is the goal of a cybernetic system achieved?
3. What role does feedback play in a cybernetic system?
4. What are the two key components of cybernetic systems?
5. How do natural and artificial cybernetic systems differ in terms of control?
6. What triggers the development of the controller in a cybernetic system?
7. What happens when the controlled object and controller are connected?
8. What is the system expected to maintain despite disturbances?
9. What must the controller be capable of in order to achieve the system's goal?
10. How does the system respond when an anomaly is discovered in its behavior?

CASE STUDY

Task 1. Study the outline of the following case that involves cybernetic insight into its solution.

Cybernetic Insights into Supply Chain Disruption During the COVID-19 Pandemic

Background

At the onset of the COVID-19 pandemic, global retail systems experienced significant disruptions. Store shelves were unexpectedly emptied of everyday items such as flour, pasta, and diapers. These shortages were commonly attributed to failures in “the supply chain.” However, a cybernetic perspective offers a more comprehensive explanation, revealing deeper systemic issues.

The Systemic View from Cybernetics

Cybernetics, the science of control and communication within systems, shifts the focus from isolated supply chain mechanisms to the broader system that serves consumer needs. In this context, the retail supply network is a **goal-oriented cybernetic system**: it continuously monitors demand signals and regulates the flow of goods to maintain a balance between supply and demand.

This system is typically optimized for a relatively **stable, predictable environment** – one in which consumer behavior follows known patterns, and goods are delivered on a just-in-time basis to minimize waste and cost.

The Disruption

The outbreak of COVID-19 introduced a **massive external perturbation**. Consumer behavior shifted drastically and unpredictably – stockpiling, panic buying, and changed household needs broke the system's equilibrium. As a result, the control mechanisms built into the supply system – designed for minor fluctuations – were unable to cope.

This event revealed the **fragility of the just-in-time model**, a system that lacked the flexibility and feedback responsiveness required for major shocks. The tightly coupled, efficiency-driven system began to fail at its goal: to ensure the availability of essential goods.

(adapted from: Why we need to know cybernetics) [51]

Task 2. Suggest a solution to the case presented. Follow the steps below:

Step 1. Identify the System

Objective: Understand what the cybernetic system is in this context.

- What is the main system under analysis in the case study? Is it a retail or production system?
- What are the key components of this system (e.g., inputs, outputs, controller, environment)? Match the given concepts with the key

components of this system: consumer demand, logistics, inventory management, economic conditions, and product delivery.

- Identify the system's goal. How is success measured? Is it measured by the range of products available and the customer satisfaction level?

Step 2. Analyze the Disruption

Objective: *Recognize the source and impact of the disturbance.*

- What caused the system to fail or become unstable?
- Describe how the demand side of the system changed during the pandemic.
- What were the immediate and long-term effects of this disruption?

Step 3. Apply Cybernetic Principles

Objective: *Use cybernetic concepts to interpret the system behavior.*

- Explain how **feedback** works in this system. What kind of feedback loops exist?
- Where did **feedback failure** occur, and why?
- How could better **regulation** have helped maintain balance in the system?

Step 4: Redesign the System

Objective: *Propose improvements to increase system resilience.*

- Suggest ways to improve the feedback and control mechanisms in the system.
- What **redundancies**, buffers, or flexible strategies could be added?
- How would a more **adaptive system** respond differently to such disruptions?

Step 5: Reflect and Extend

Objective: *Think critically about broader implications and future applications.*

- What does this case teach us about the limits of just-in-time systems?

- How can understanding cybernetics help in preparing for other global or personal disruptions?
- Can the principles from this case be applied to **healthcare, education, or energy systems**?

Task 3. Compare your assumptions and solutions of this case study with the expert analysis. What inferences can you make?

Cybernetic Breakdown

From a cybernetic standpoint, the system failed in several key areas:

- **Feedback delay:** The system was slow to detect and respond to new consumption patterns.
- **Inflexibility:** The control structures were not adaptable to the sudden changes in demand.
- **Insufficient redundancy:** There were minimal buffers or alternatives in place to absorb shocks.

The result was a prolonged period of disorder, during which shelves remained empty and restocking efforts were inconsistent.

Lessons Learned

Cybernetics offers critical insights into how such systems can be better designed for **resilience**, not just efficiency:

- **Real-time feedback loops** must be improved to detect demand changes earlier.
- **Flexible control strategies** can allow supply systems to self-adjust.
- **Scenario modeling and stress testing** can prepare systems for outlier events like pandemics.

Conclusion

The COVID-19 pandemic highlighted how modern supply systems – though optimized for performance – may lack the adaptive capacity required in

times of crisis. A cybernetic lens allows us to reconceptualize these systems not as rigid pipelines, but as dynamic, adaptive networks requiring **continuous feedback, robust design, and goal-oriented regulation**. Thus, in **healthcare**, cybernetic thinking can help balance patient flow and resource allocation during epidemics. In **education**, feedback-driven systems can personalize learning and adjust to student needs. In **energy**, smart grids use feedback to balance supply and demand in real time.

PROJECT WORK

Task 1. Study the diagram below. Read its outline.

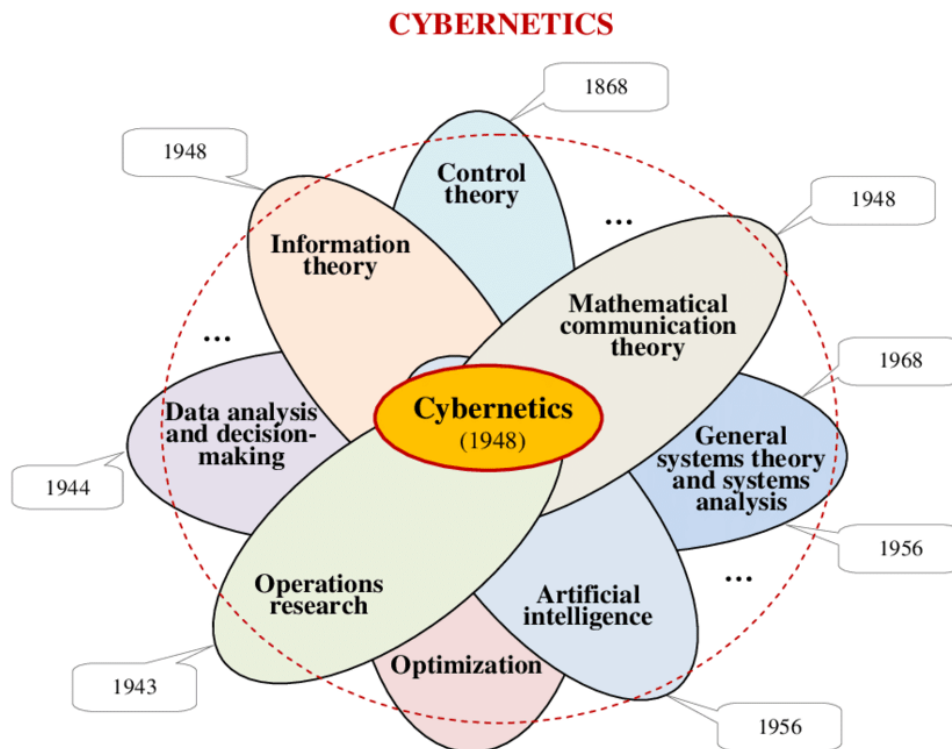


Figure 1.1 *The diagram of Cybernetics*

Image credit: [Dmitry A. Novikov](#)

The diagram presents a **conceptual and historical overview of the emergence and evolution of Cybernetics** as a scientific field. It highlights the **interdisciplinary roots** of cybernetics and its influence on adjacent fields, with key dates marking significant developments.

The central yellow oval indicates that **Cybernetics** formally emerged in **1948**, primarily associated with **Norbert Wiener's publication "Cybernetics: Or Control and Communication in the Animal and the Machine."**

Cybernetics developed through the convergence of several scientific disciplines, represented as overlapping ellipses. The **dashed red ellipse** surrounding all components illustrates how **cybernetics is both influenced by and influences** other fields. Some areas, like **Artificial Intelligence**,

Optimization, and **Systems Theory**, were expanded or redefined through cybernetic thinking after 1948.

In summary, this diagram shows that **Cybernetics emerged in 1948** from the integration of ideas from multiple disciplines. It was not an isolated invention but a **synthesis of developments** in mathematics, engineering, communication, and decision sciences. Cybernetics then served as a **foundation for the evolution of modern fields** such as AI, systems theory, and information theory [51].

Task 2. Find more information to expand the given outline. Make a visual presentation in compliance with the following presentation script.

Presentation Script: The Emergence and Influence of Cybernetics

[Slide 1: Title Slide]

Title: The Emergence and Influence of Cybernetics

*E.g., “Good [morning/afternoon], everyone. Today, I’ll be presenting an overview of the scientific field of **cybernetics**.....*

[Slide 2: Birth of Cybernetics (1948)]

*E.g., At the heart of this development is the year 1948, when **Norbert Wiener** published his groundbreaking work, **Cybernetics***

[Slide 3: Disciplinary Roots of Cybernetics]

E.g., Cybernetics didn’t emerge in isolation. As we can see in the diagram, it was formed at the intersection of several key scientific disciplines....

[Slide 4: Expansion and Integration]

*E.g., After 1948, cybernetics **influenced and merged with several other fields**...*

[Slide 5: From Cybernetics to New Disciplines]

*E.g., Cybernetics not only drew from earlier theories, but also **catalyzed the formation and growth** of entirely new disciplines:*

[Slide 6: Interdisciplinary Influence]

*E.g., The **dashed red circle** in the diagram illustrates how cybernetics served as both a **central node and a bridge***

[Slide 7: Conclusion]

E.g., To sum up, Cybernetics officially emerged in 1948 as an interdisciplinary science.

Thank you for your attention.

SPEAKING

Task 1. Study the diagram that illustrates how closed and open loop systems work. Study the guide that describes a scientific process. Make your own description using the keywords given below.

KEY WORDS:

- act upon the output of the system; - to automatically regulate the output - to input changes - to reflect the new input value. - to regulate the process variable - to maintain the desired output level or value.	- to maintain a desired state or set point; - human interaction; - actual state of the system; - desired state of the system; - to achieve controllability of the system; - to utilize a feedback path; - to compare with the reference input.
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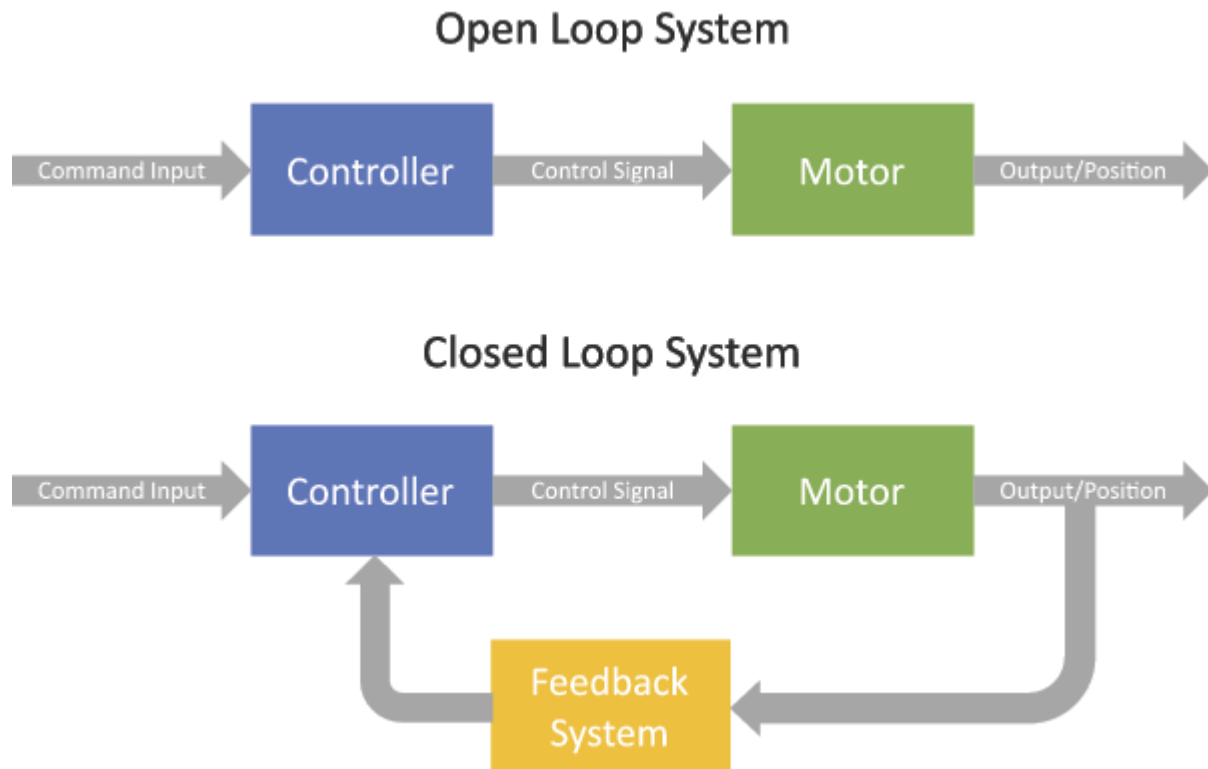


Figure 1.2 *The Feedback Loop in Cybernetic Systems.*

Adapted from “What is Cybernetics? - Definition, Types and Applications”, by P. Ghosh, 2023, *Analytics Steps* (<https://www.analyticssteps.com/blogs/what-cybernetics-definition-types-and-applications>) [21].

Guide: How to Describe a Scientific Process

1. Title the Process Clearly

- Choose a **descriptive and concise title** that captures the core of the process.

E.g.: In the field of systems engineering and cybernetics, control systems play a fundamental role in regulating processes and ensuring desired performance outcomes.

2. Introduce the Process

- Briefly explain:
 - **What** the process is
 - **Where** it occurs (context or system)
 - **Why** it is important (its purpose or significance)

*E.g.: An **open-loop control system** operates on a straightforward principle: the controller issues commands to an actuator or motor based solely on the initial input.*

3. Identify the Key Components or Participants

- List and define the main **materials, tools, substances, or agents** involved.

E.g.: The closed-loop system also includes a feedback loop in which the output or position is continuously monitored by a feedback system.

4. Describe the Sequence of Steps (Chronological Order)

Use **clear, sequential language** (first, then, next, finally) or **numbered steps** to show how the process unfolds. Each step should describe:

- **What happens**
- **What changes** or results from the step

E.g.: In a typical configuration, a command input is fed into a controller, which processes this signal and transmits a control signal to a motor or actuator.

5. Explain the Result or Outcome

- What is produced?
- Where is it stored or transported?
- What is the function of the final product?

E.g.: A thermostat-controlled heating system exemplifies a closed-loop design: it monitors the room temperature and activates or deactivates the heating element to maintain a setpoint temperature.

6. (Optional) Include a Diagram or Flowchart

- A visual representation often enhances understanding.
- Label all parts clearly.
- Use arrows to indicate direction or flow.

7. Analyze or Reflect on the Process (If Needed)

- Is it efficient?
- Are there limitations or conditions where it fails?

- How does it relate to other processes?

Language Tips

- Use **precise and formal vocabulary**
- Prefer **present tense** (unless describing a specific experiment)
- Use **passive voice** where appropriate (e.g., “The substance is heated..”)
- Define all **technical terms** the first time you use them

[19; 32; 33; 49]



Figure 1.3. *Analytics Steps* (<https://www.analyticsteps.com/blogs/what-cybernetics-definition-types-and-applications>).

UNIT 2.

THE FATHER OF THE INFORMATION AGE

LEAD-IN

Task 1. Read the quotes from the book “The Dark Hero of the Information Age” by Flo Conway and Jim Siegelman. Decide to whom this book is devoted?

“His work has shaped the lives of billions of people. His discoveries have transformed the world's economies and cultures.”

“He was one of the most brilliant minds of the twentieth century, a child prodigy who became a world-class genius and visionary thinker.”

“....an absentminded professor whose eccentricities assumed mythical proportions, a best-selling author whose name was a household word during America's first heyday of high technology.”

“His footprints are everywhere today, etched in silicon, wandering in cyberspace, and in every corner of daily life. Yet his words are muted echoes in the memory.”

“His early mathematical work solved practical problems in electronics theory that engineers had been wrestling with for decades.”

(Adopted from: Dark hero of the Information Age) [12]

LISTENING

[\[5\]](#)

Pre-listening

Task 1. Have you ever heard about Norbert Wiener’s contribution to science? What do you know about this personality and his achievements?

Task 2. Listen to the first part of the program telling about Norbert Wiener’s life. Fill in the chart with the landmark events in his early life.

YEAR	EVENT
November 26 1894	
1909	
1913	
1913 (Cambridge)	

Critical thinking question: What would have happened if Wiener had made himself study zoology?

Task 3. Listen to the second part of the program. What occupations did he take up during World War I? Fill in the gaps of the program summary with the missing words.

During the 1920s Wiener did highly innovative and fundamental work on what are now called (1)_____ and, in particular, on the theory of (2)_____ and _____ on _____ generalized (3)_____, as well as significant work on other problems of mathematical analysis. In 1933 Wiener was elected to the (4)_____ but soon resigned, repelled by some of the aspects of (5)_____ science that he encountered there.

Task 4. Listen to the third part. Make a list of his scientific legacy.

E.g., stochastic process,...

Task 5. Work out the essence of Norbert Wiener's most remarkable scientific contributions. Match scientific concepts with the appropriate definition. [11;13; 15]

1.	Brownian motion	a.	a mathematical object usually defined as a sequence of random variables, where the index of the
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			sequence has the interpretation of time. It is widely used as a mathematical model of systems and phenomena that appear to vary in a random manner.
2.	Wiener process	b.	one whose properties do not depend on the time at which the series is observed.
3.	Wiener filter	c.	the idea that any physical property is constantly undergoing some small, random physical movement and changes. Unless there is intentional movement or outside forces influencing the medium, the medium itself will gradually spread over a surface, diffusing across the medium.
4.	stationary time series	d.	a continuous stochastic movement in which the random variation in a logarithm scale follows along a long-term trend with drift.
5.	Wiener equation	e.	helps to explain how a randomized process – such as noise – can be turned into the desired process. It helps to limit random noise and remove other feedback.
6.	stochastic process	f.	a simple mathematical expression of Brownian motion assuming that the velocity of fluid particles varies randomly.

LISTENING 2

[\[34\]](#)

Pre-listening

Task 1. Before you listen to the interview with Norbert Wiener. Describe how you imagine him as a personality. What adjectives would you use from the list below to characterize him?

intelligent	arrogant	self-assured	humble
haughty	opinionated	wise	penetrating
dignified	sarcastic	self-conscious	purposeful

Task 2. Listen to the interview with Norbert Winer (Part 1). What are his main personal traits? Would you call him a thinker, a jester, a brilliant eccentric, or something else?

Task 3. Listen to the second part of the interview. Put down key words to describe the principles involved in his system used for aiming with anti-aircraft guns.

Task 4. Explain the meaning of the following scientific principles:

- *aim ahead;*
- *anticipate the target;*
- *mathematical theory of predictability.*

Task 5. Listen to the third part of the interview. Answer the questions:

- How do artillery and aircraft illustrate the cybernetic problem?
- How can the cybernetic problem be solved?
- What is another example of a feedback system?
- Can the cybernetic approach be applied in economics? How?
- What are the limits of application of cybernetics to economics or human affairs?

Task 6. Comment on the following statement. Agree or disagree.

“...it is in choosing and defining relationships that we have the problem. Nevertheless, we have to understand even more complex systems if we are to deal with the future. Without that understanding, there may be no future.”

READING

Pre-reading

Task 1. Explain the title of the book “The Dark Hero of the Information Age” by Flo Conway and Jim Siegelman. What idea about its main character can it imply?

Task 2. Read the excerpt from the book “The Dark Hero of the Information Age” by Flo Conway and Jim Siegelman. Explain the title of this book.

THE DARK HERO OF THE INFORMATION AGE

His 1948 book *Cybernetics: Or Control and Communication in the Animal and the Machine* set off a scientific and technological revolution. In less than a decade, cybernetics transformed the day-to-day labors of workers in every industry and unleashed a flood of dazzling devices on postwar society.

Wiener gave the word "feedback" its modern meaning and introduced it into popular parlance. He was the first **(1) to perceive the essence** of the new stuff called "information." He worked with eminent biologists and neurophysiologists to crack the communication codes of the human nervous system, and with the engineers who **(2) incorporated** those codes **into** the circuits of the first programmable “electronic brains.” He led the medical team that created the first bionic arm controlled by the user's own thoughts.

(3) In his mind’s eye, he saw the technical promises of the new world that was dawning and modern marvels few could imagine at the time. But, alone among his peers, Wiener also saw the darker side of the new cybernetic era. He foresaw the worldwide social, political, and economic **(4) upheavals** that would begin to surface with the first large-scale applications of computers and automation. He saw a **(5) relentless** momentum that would pit human beings against the seductive speed and efficiency of intelligent machines. He worried that the new time- and labor-saving technology would **(6) prompt** people to

surrender to machines their own purpose, their powers of mind, and their most precious power of all—their capacity to choose. And he feared for humanity's future.

Wiener spent his later years tirelessly warning the leaders of governments, corporations, labor unions, and the public about those **(7) far-reaching** changes that were coming to work and daily living. He was the first person to sound alarms about intelligent machines that could learn from experience, reproduce without limitation, and act in ways unforeseen by their human creators, and he called for greater moral and social responsibility by scientists and technicians in an age of **(8) mushrooming** productive and destructive power.

Time has confirmed that Wiener's work was revolutionary in the scientific sense. He identified a new set of fundamental entities of which the universe is composed: messages, information, and basic communication and control processes observable in every domain of life. He brought within the bounds of understanding phenomena of both mind and matter that had eluded philosophers and scientists for centuries.

And another important part of his legacy is only beginning to appear. His work paved the way for the digital revolution, but Wiener's driving passions were analog. His imagination was inspired, not by strings of ones and zeros, but by automatic machines that **(9) mimicked** the movements of human muscles and limbs, and by intelligent devices that **(10) emulated** the feats performed by human brains and minds. The advance of digital technology put many of those analog processes out to pasture, yet today they are emerging as the dark horses of twenty-first-century science.

(Adapted from: *Dark hero of the information age*) [12]

Task 3. Match the highlighted words in the text with the correct definition.

- A) (v) reproduce the function or action;
- B) (adj) rapidly growing, expanding, or developing;

- C) (adj) having important and widely applicable effects or implications;
- D) (w-c) become aware or conscious of some important side of the matter;
- E) (v) imitate;
- F) (adj) unceasingly intense;
- G) (v) to unite or combine to form a single whole;
- H) (n) a violent or sudden change or disruption to something;
- I) (v) encourage to say/do something;
- J) (w-c) in one's imagination. [7]

Task 4. Work out the meaning of the following “imaginary” expressions.

Paraphrase them in your own words.

- What does the word “*upheavals*” in paragraph 3 suggest about the nature of the changes Wiener predicted?
- Why is the term “*seductive speed and efficiency*” used to describe intelligent machines?
- What does the expression “*mushrooming productive and destructive power*” imply?
- Why might Wiener's ideas about analog systems be considered important again today?
- How do the terms “*mimic*” and “*emulate*” help describe the kinds of technologies Wiener imagined?

Task 5. Complete the table with the correct derivatives:

NOUN	VERB	ADJECTIVE	ADVERB
	relent		
	emulate		
upheaval			
		productive	

Task 6. Match each word with its closest synonym.

1. upheaval
 2. relentless
 3. prompt
 4. emulate
 5. mushrooming
 6. far-reaching
- a. stimulate
 - b. copy
 - c. dramatic change
 - d. expanding rapidly
 - e. extensive
 - f. unstoppable

Task 7. Rewrite the sentences, substituting a relative clause with Participle

1.

E.g., Original: He worked with the engineers who incorporated those codes into the circuits.

*Reduced: He worked with the engineers, **incorporating those codes into the circuits***

1. He worked with the scientists **who founded fundamental concepts in various fields.**
2. He led the medical team **that created the first bionic arm.**
3. He was the first scientist **who perceived the essence of the new stuff called ‘information.**
4. He warned the leaders of governments **who ignored the coming changes.**
5. He admired the automatic machines **that mimicked the movements of human muscles.**

Task 8. Change the given direct speech sentences into reported speech.

- Wiener warned, “Machines may learn from experience.”
- He said, “Technology will prompt people to surrender their powers of mind.”
- He warned, “People will give up their ability to choose.”
- He said, “Intelligent devices can emulate the feats of human brains.”
- He declared, “Automation is going to change work and daily life.”
- He said, “Scientists must take responsibility for the consequences of their work.”

Task 9. Identify the meaning of *would*, *could*, and *might* in these sentences.

Which of the verbs render certainty, possibility, or strong doubt?

- He foresaw upheavals that would begin to surface.
- Machines could act in ways unforeseen by their human creators.
- He warned that people might surrender to machines.
- Automation could transform the structure of work.
- Intelligent machines might reproduce without limitation.
- The new technology would change daily living.
- Such devices could mimic the movements of human muscles.

Task 10. Answer the following questions:

1. How did cybernetics impact society within a decade of its introduction?
2. In what way did Wiener redefine the term “feedback”?
3. Who did Wiener collaborate with to study the communication codes of the human nervous system?
4. What was the significance of the first bionic arm mentioned in the text?
5. What future risks did Wiener foresee as a result of computer automation and intelligent machines?
6. What was Wiener’s major concern about human reliance on machines?

7. How did Wiener use his later years to influence public and professional thinking about technology?
8. What kind of moral responsibility did Wiener urge from scientists and technicians?
9. What are the “fundamental entities” Wiener identified in the universe?

OPTIONAL READING

Task 1. Read the article and choose the best summary.

- A. The article explains how modern AI systems were created in the 21st century.
- B. The article shows how Norbert Wiener’s cybernetic ideas predicted modern artificial intelligence and its ethical challenges.
- C. The article focuses only on the history of robotics in the 1950s.

NORBERT WIENER’S CYBERNETIC PROPHECIES:

Predictions That Hit the Mark

Reading Wiener today, it’s striking how many of his predictions have come to pass:

“Let us remember that the automatic machine is the precise economic equivalent of slave labor,” Wiener wrote. “Any labor which competes with slave labor must accept the economic conditions of slave labor.”

Machine-to-Machine Communication: Wiener anticipated a world where machines would communicate with other machines with minimal human intervention. “In the future development of these messages and communication facilities, messages between man and machines, between machines and man, and between machine and machine, are destined to play an ever-increasing part,” he wrote. Today’s Internet of Things, with billions of connected devices exchanging data autonomously, is the realization of this vision.

Feedback Systems: Central to Wiener’s conception of cybernetics was the idea of feedback — systems that monitor their own output and adjust their behavior accordingly. Modern AI systems, particularly those using reinforcement learning, embody this principle. When an AI like AlphaGo learns to play Go by playing against itself and adjusting its strategy based on wins and losses, it’s implementing the cybernetic principles Wiener described.

Automation and Labor: Wiener warned that the Second Industrial Revolution would displace workers across many sectors, not just in manufacturing but in any field where judgment could be automated. “The modern industrial revolution is similarly bound to devalue the human brain, at least in its simpler and more routine decisions,” he predicted. Today’s debates about AI’s impact on employment echo Wiener’s concerns from over 70 years ago.

The Centrality of Information: Perhaps most fundamentally, Wiener recognized that information itself — not just physical resources — would become a central commodity in the modern world. “Information is information, not matter or energy,” he famously wrote. Our information economy, where the world’s most valuable companies deal primarily in data rather than physical goods, vindicates this insight.

Despite these accurate predictions, Wiener never claimed that machines would achieve human-like general intelligence. In fact, he was careful to distinguish between specific automated functions and the broader capabilities of the human mind. This nuanced view aligns with my old professor’s skepticism about artificial general intelligence (AGI).

What Wiener understood — and what many modern AI enthusiasts sometimes overlook — is that intelligence isn’t just about processing power or algorithms. It emerges from embodied experience, social interaction, and biological imperatives that are difficult to replicate in silicon. As Wiener put it, “Information is a name for the content of what is exchanged with the outer world as we adjust to it, and make our adjustment felt upon it.

Perhaps the most enduring aspect of Wiener's work is his humanistic approach to technology. Unlike many technologists who focus solely on what can be built, Wiener consistently asked what should be built and how technology could serve human flourishing rather than diminish it.

Wiener's ethical stance led him to refuse military funding for his research after witnessing the destructive applications of science in World War II. He believed scientists had a moral responsibility to consider the consequences of their work – a position that anticipated modern movements for ethical AI and responsible innovation.

As we navigate the opportunities and challenges of modern AI, Wiener's work offers a valuable perspective. He reminds us that technological progress is not inevitable or unidirectional but shaped by human choices and values. He warns against treating technology as an end in itself rather than a means to human flourishing. And he insists that the technical questions of how to build intelligent machines cannot be separated from the ethical questions of how they should be used.

[50]

Task 2. Decide if the statements are True (T), False (F), or Not Given (NG).

1. Norbert Wiener believed machines should replace humans completely.
2. Cybernetics influenced the development of modern AI.
3. Wiener warned about the misuse of intelligent machines.
4. The article claims AI will always behave ethically.

Task 3. Match the terms with their definitions.

1. *Cybernetics*
2. *Feedback loop*
3. *Automation*
4. *Ethical responsibility*

5. *Control system*

- a. A system that regulates its behaviour using information from its output
- b. The study of control and communication in humans and machines
- c. The use of machines to perform tasks without human intervention
- d. The moral obligation related to technological decisions
- e. A process where output influences future actions

[4; 20]

Task 4. Complete the sentences with words from the text. Use the correct form of the words.

- 1. Wiener _____ a future where machines would exchange information autonomously.
- 2. Modern AI systems _____ cybernetic principles through feedback mechanisms.
- 3. The rise of automation has caused job _____ in many sectors.
- 4. In today's economy, _____ is often more valuable than physical resources.
- 5. Wiener's views on AI were highly _____ rather than simplistic.

Task 5. Find synonyms from the text. Find words or phrases in the text that mean the following:

- 1. take the place of (verb)
- 2. based on moral principles (adjective)
- 3. result from (verb)
- 4. improve or adjust (verb)
- 5. long-lasting (adjective)

Task 6. Complete the table with the correct form of the word.

Verb	Noun	Adjective
predict		
automate		
	value	
communicate		
	response	

Task 7. Rewrite the sentences using the passive voice.

1. Wiener predicted the displacement of workers by automation.
2. Modern companies trade data rather than physical goods.
3. Scientists must consider the consequences of their work.
4. Wiener's work offers a valuable perspective.

Task 8. Choose the correct linker (discourse markers) to complete each sentence: *however, therefore, unlike, despite, as a result, and nevertheless.*

1. _____ many technologists, Wiener focused on ethical responsibility.
2. Automation can replace human labor; _____, workers may lose their jobs.
3. _____ his accurate predictions, Wiener rejected the idea of AGI.
4. AI systems are becoming increasingly powerful; _____, they still lack embodied human experience.
5. Wiener believed in technological progress; _____, he warned against using technology without ethical reflection.

Task 9. Complete the sentences using the correct verb forms.

1. What Wiener understood was that intelligence _____ (not / reduce) to processing power alone but _____ (emerge) from embodied and social experience.

2. He argued that if intelligence _____ (define) solely in computational terms, its human dimension _____ (be) fundamentally misunderstood.
3. Wiener maintained that technological systems _____ (need) to be evaluated not only by what they _____ (do) efficiently, but also by how they _____ (affect) human values and social structures.
4. He warned that unless ethical considerations _____ (integrate) into technological development, scientific progress _____ (risk) undermining human flourishing.

ACADEMIC WRITING

Task 1. Study the guide on how to write a character sketch of a scientist.

CHARACTER SKETCH OF A SCIENTIST

1. Start with Basic Information

Give the reader a clear introduction to **who the scientist is**.

- Full name
- Date of birth/death (if applicable)
- Nationality
- Field of study
- Most notable achievements

E.g., Norbert Wiener, an American-born scientist who laid the foundation of cybernetics, bridging mathematics, biology, engineering, and philosophy.

2. Describe Their Appearance and Presence (*Optional but engaging*)

Paint a picture – how did they look, speak, or carry themselves?

- Clothing style or habits
- Facial features
- Any quirks or memorable traits
- First impressions

E.g., Norbert Wiener was often seen as the archetypal intellectual: bespectacled, with an unkempt beard and thick curly hair

3. Explore Personality and Character Traits

Highlight key **traits** that defined the scientist's character.

- Were they curious? Determined? Introverted?
- How did they interact with others?
- What motivated them

Tip: Use *adjectives* such as “meticulous,” “visionary,” “eccentric,” “passionate,” “ethical,” etc.

E.g., Wiener was socially awkward at times, but he was intensely curious and emotionally sensitive to the ethical consequences of technology

4. Discuss Their Education and Background

Include significant life experiences that shaped their thinking.

- Early education and mentors
- Turning points in life
- Challenges they overcame

E.g., His education spanned philosophy, mathematics, and logic – fields he would later combine into a new scientific vision.

5. Explain Their Major Contributions

Focus on **what they did**, and **why it mattered**.

- Key discoveries or theories
- Innovations or inventions
- Influence on science or society

E.g., He foresaw the rise of automation, artificial intelligence, and even smart devices, long before they became mainstream realities.

6. Include Their Beliefs, Values, or Ethical Views

Show what they **stood for**.

- Did they care about social justice?
- Were they concerned about how their work was used?

- Did they reject or support the military use of science?

E.g., Wiener firmly believed that science had to serve humanity, not control or dehumanize it.

7. Mention Their Habits and Work Style

Reveal how they worked and lived.

- Were they disciplined or chaotic?
- Did they prefer solitude or collaboration?
- What were their routines or rituals?

E.g., His thinking was nonlinear and intuitive, often jumping from pure mathematics to psychology to engineering with astonishing ease.

8. End with Their Legacy and Impact

Summarize **how they are remembered** and why they still matter.

- Influence on current science or technology
- Institutions or awards named after them
- Cultural or ethical legacy

E.g., He reminds us that wisdom must accompany innovation, and that the most powerful systems are those designed with conscience [19; 49]

Task 2. Read the sample of Norbert Wiener's character sketch. Match the paragraphs (1-4) with the appropriate headings (A-D).

A. Beliefs and Values

B. Physical Appearance & Presence

C. Personality Traits

D. Education & Background

1. Norbert Wiener was often seen as the archetypal intellectual: bespectacled, with an unkempt beard and thick curly hair. He wore suits in the academic tradition, though he rarely paid much attention to style or polish. His eyes revealed a deep, almost perpetual intensity – he was always thinking, always

processing. His presence in a room was not commanding in a conventional sense, but intellectually magnetic.

2. Wiener was a brilliant, eccentric, and deeply humane thinker. Though socially awkward at times, he was intensely curious and emotionally sensitive to the ethical consequences of technology. He often appeared absent-minded, losing track of things, yet when it came to abstract thinking, he was razor-sharp. He was deeply concerned about the moral implications of science, especially in the wake of World War II, and often voiced warnings about the dangers of unchecked automation and military technology. His moral compass was as strong as his intellect.

3. A child prodigy, Norbert was taught at home by his father, Leo Wiener, a Harvard professor and linguist. He entered college at age 11 and earned his PhD at 18, studying under famed philosophers and mathematicians like Bertrand Russell. His education spanned philosophy, mathematics, and logic – fields he would later combine into a new scientific vision. He served in World War I and later worked at MIT, where he conducted groundbreaking research in mathematics and communication systems.

4. Wiener firmly believed that science must serve humanity, not control or dehumanize it. He feared a world where machines replaced thoughtful human judgment. His value system was rooted in **human dignity**, responsibility, and a need for ethical foresight in technological progress. He refused to work on military projects after seeing how science had been used to build destructive weapons in WWII. His work was always laced with philosophical inquiry and a strong ethical foundation [5; 12].

Task 3. Complete the character sketch of Norbert Wiener. Contribute more information about him under the headings suggested. Make use of key phrases.

Major Contributions & Goals

- to found a science;
- to foresee the rise of..;
- to design self-regulative systems;
- to avoid becoming enslaved by inventions;

Habits and Intellectual Style

- an intuitive thinker;
- to scribble notes;
- to be absent-minded about practical matters;
- to be jested upon;
- to become a byword.

Inner Conflicts & Legacy

- to struggle with dissonance between...;
- to fear the misuse of scientific achievements;
- to be appreciated (unappreciated) in one`s lifetime;
- to bear moral responsibility for;
- to lay groundwork for...

Final Thoughts

- a visionary
- to have a reflective and adaptive mind;
- to be ahead of his time;
- to design powerful systems with conscience.

[49]

Task 4. Write a character sketch of any scientist that you can find in the section “Project Work”.

SPEAKING

Task 1. Work in groups and discuss the following questions. Report on the most striking opinions expressed during the discussion.

1. How did Wiener's views on automation and military technology differ from those of his contemporaries?
2. Why might Wiener be regarded as a visionary ahead of his time?
3. Do you agree with Wiener's conviction that science should serve humanity rather than control it? Why or why not?
4. How would Wiener respond to today's developments in artificial intelligence?
5. What qualities of Wiener do you admire most? Which would be challenging to work with?
6. If you could ask Norbert Wiener one question, what would it be?

Task 2. Act out a conversation between Norbert Wiener and a modern AI scientist. Think what issues they might debate, what ethical considerations Norbert Wiener could raise. Make a list of questions and suggest true-to-reality answers.

Student A – Norbert Wiener, who appears in the 21st century and sees all the advances he once predicted with his own eyes.

Student B – a modern AI scientist who has created an AI Personal Assistant.

CASE STUDY

Task 1. Study the background of the case that deals with the predictions about will-be consequences of the technology application.

Norbert Wiener's Predictions: Cybernetics, Automation, and the Future of Humanity

Background

Norbert Wiener (1894–1964), the American mathematician and philosopher, is widely regarded as the founder of **cybernetics** – the science of communication and control in animals, machines, and organizations. Through his pioneering works *Cybernetics* (1948) and *The Human Use of Human Beings*

(1950), Wiener made a series of bold predictions about the impact of emerging technologies on society.

This case study examines several of Wiener's most significant foresight, evaluates how they have unfolded in the modern world, and reflects on the ethical and societal implications.

THE PREDICTIONS:

1. Automation and Job Displacement

Wiener foresaw that machines would increasingly take over repetitive, routine, and manual labor, leading to massive unemployment if not ethically managed.

2. The Rise of Artificial Intelligence

Wiener predicted that machines would evolve to simulate human reasoning, learning, and communication.

3. Cybernetic Warfare and Ethical Concerns

Wiener warned against the militarization of intelligent machines, especially in autonomous weapons and surveillance.

4. Machine Control Over Human Decision-Making

He cautioned that over-reliance on intelligent machines could lead to a loss of human autonomy.

5. Information as a Fundamental Resource

Wiener claimed that information, not energy or matter, would become the key resource of future societies.

6. Blurring of Human-Machine Boundaries

Wiener anticipated the integration of machines and humans through feedback loops – especially in medicine, communication, and cognitive systems.

(Adapted from: Wiener, N. Cybernetics: Or control and communication in the animal and the machine) [52].

Task 2. Follow the steps suggested below to unravel the challenges of the given case.

Step 1: Understanding Key Predictions

Objective: *Identify and explain the core predictions made by Norbert Wiener.*

- In your own words, **explain each prediction** and what problem or opportunity Wiener associated with it.
- Which prediction do you think was the most **accurate or farsighted**, and why?

Step 2: Connecting Predictions to Reality

Objective: *Compare Wiener's forecasts to present-day technologies and systems.*

- Choose **two predictions** and find **real-world examples** that show they have come true.

E.g., Modern reality proves that Drones, autonomous weapon systems, and algorithmic decision-making in military operations have raised serious ethical questions. Organizations like the UN and human rights groups are now debating bans on “killer robots.”

- Are there any areas where Wiener's predictions have **not yet come true** or **remain only partially fulfilled**? Give reasons.

Step 3: Analyzing Ethical Concerns

Objective: *Explore the ethical dimensions of cybernetics and automation.*

- Why was Wiener concerned about **military uses** of intelligent machines?
- What risks did he foresee in letting machines make decisions **without human oversight**?
- How do these concerns apply to **modern technologies** such as autonomous drones or predictive policing?

Step 4: Designing a Future-Ready System

Objective: *Apply cybernetic principles to a modern system or problem.*

- Choose a modern system (e.g., transportation, healthcare, education).
- How could you **design it using cybernetic principles** (feedback, control, adaptation)?

- How would you **avoid the ethical pitfalls** Wiener warned about?

Step 5: Reflection and Discussion

Objective: *think critically and provide a personal connection to the topic.*

- Do you believe society has **learned from Wiener’s warnings**, or are we repeating the same mistakes?
- In what ways can **cybernetics help build a more ethical future** with technology?
- Should there be limits on how far we integrate machines with human life? Explain your view.

Task 3. Summarize your findings obtained in the course of the case study. What does his study challenge us to take into account? What lessons are we supposed to learn from his far-sighted predictions?

Norbert Wiener’s work challenges us:

Lessons Learned:

Task 4. Compare your summary with a broad expert assessment of Norbert Wiener’s legacy.

Wiener’s predictions were not mere technical forecasts – they were deeply **ethical and philosophical warnings**. He recognized the dual-use nature of cybernetic systems: they could empower humanity or undermine it, depending on how they are governed. His work challenges us to think critically about who controls machines, design systems that prioritize human values, and ensure that technological progress does not come at the cost of human dignity.

Wiener’s long-range vision anticipated challenges we still face today. His anticipations prove that **cybernetic thinking remains relevant** in AI ethics, systems design, and digital governance. Current problems arising due to extensive usage of advanced technologies have appeared to testify that **ethical**

considerations must be integrated early in technological development, not after crises emerge.

(Adapted from: Cannons, K. *A review of visual tracking*) [8]

Task 5. Imagine you were Norbert Wiener living in 2026. Write a short report predicting:

- One benefit and one danger of AI or automation in the next 20 years.
- A cybernetic principle that could help solve a global issue (e.g., climate change, inequality, mental health).
- Jobs of the future in cooperation with AI.
- What ethical advice would you give today's engineers and designers?

PROJECT WORK

Prepare a visual presentation “Cybernetics – Hall of Fame”. Follow the presentation script as suggested. You can make use of the reference material provided.

Slide 1. Scientists – Pioneers of New Knowledge

Slide 2. Brief Background of Each Scientist Selected

Slide 3. Their Beliefs and Academic Values

Slide 4. Scientific Milestones of Their Innovations

Slide 5. Their Scientific Legacy

Slide 6. Final Thoughts – Why It Still Matters

The Hall of Cybernetics Fame

W. Ross Ashby

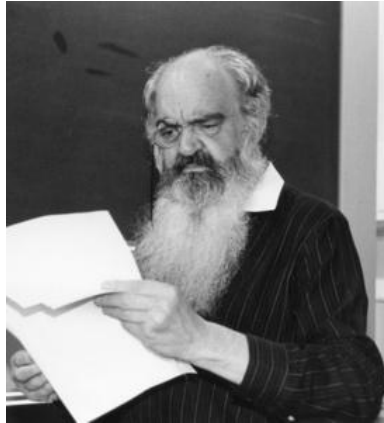
(6 September 1903 – 15 November 1972)



*A British psychiatrist and systems theorist, the pioneer in cybernetics, introduced key concepts like the Homeostat and Law of Requisite Variety. Ashby made cybernetics essential in biology and ecological systems. His two books, “Design for a Brain” and *An Introduction to Cybernetics*”, introduced exact and logical thinking into the brand new discipline of cybernetics and were highly influential [4].*

Stafford Beer

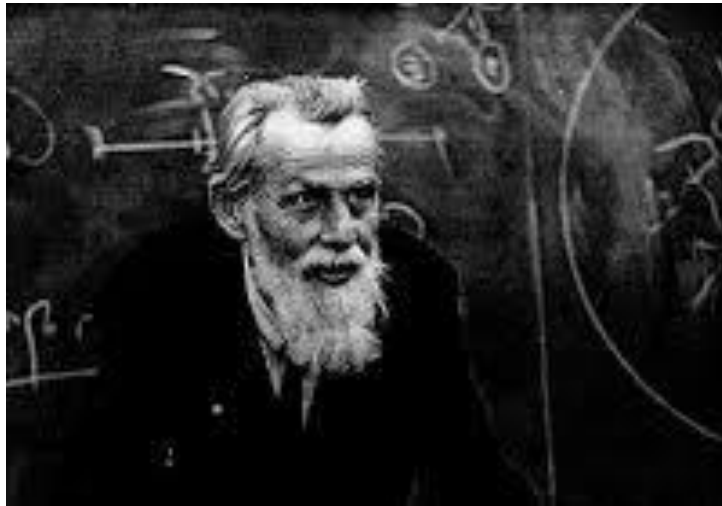
(25 September 1926 – 23 August 2002)



*Stafford Beer was a British theorist who developed the Viable System Model, a framework for organizing companies and governments based on cybernetic principles of self-regulation. Most notably, he spearheaded **Project Cybersyn** in 1970s Chile, an ambitious attempt to manage the national economy in real-time using a decentralized network of telex machines and a futuristic operations room. Beyond his technical prowess, Beer was a charismatic figure who viewed management as the “science of effective organization.” [4].*

Warren McCulloch

(November 16, 1898 – September 24, 1969)



An American neurophysiologist and cybernetician, known for his work on the foundation of certain brain theories and his contribution to the cybernetics movement. Warren McCulloch's crowning achievement was the 1943 co-authorship of the paper "A Logical Calculus of the Ideas Immanent in Nervous Activity," which provided the first mathematical model of a biological neuron. [4].

Victor Glushkov
(August 24, 1923 – January 30, 1982)



*Victor Glushkov is considered the founding father of information technology in the Soviet Union and a pioneer of Soviet cybernetics, particularly for his seminal work on the theory of automata. His influential book, *Synthesis of Digital Automata*, laid the groundwork for modern computer architecture behind the Iron Curtain. [4].*

Heinz von Foerster
(November 13, 1911 – October 2, 2002)



An Austrian-American physicist and philosopher who founded the Biological Computer Laboratory at the University of Illinois, where he pioneered second-order cybernetics – the cybernetics of observing systems. Instead of just studying systems, he asked, “What about the observer in the system?” As a polymath, he created nearly two hundred professional papers in fields ranging from computer science to epistemology. [4].

Gregory Bateson
(9 May 1904 – 4 July 1980)



A British polymath, anthropologist, and systems thinker brought cybernetics into the study of culture, psychology, and communication. Bateson believed that learning and change happen through feedback – not just in machines, but in families, societies, and ecosystems. Therefore, he applied cybernetics to the field of ecological anthropology and the homeostatic concept in his book “Steps to an Ecology of Mind”. [4].

Norbert Wiener

(November 26, 1894 – March 18, 1964)



An American mathematician and philosopher published the groundbreaking book “Cybernetics: Or Control and Communication in the Animal and the Machine.” He was the first to articulate how feedback loops and control systems could unify biology and engineering. He was also a pioneer in stochastic processes, specifically developing the “Wiener process,” which remains the fundamental mathematical model for describing the random motion of particles known as Brownian motion. [4].

Marvin Minsky
(August 9, 1927 – January 24, 2016)



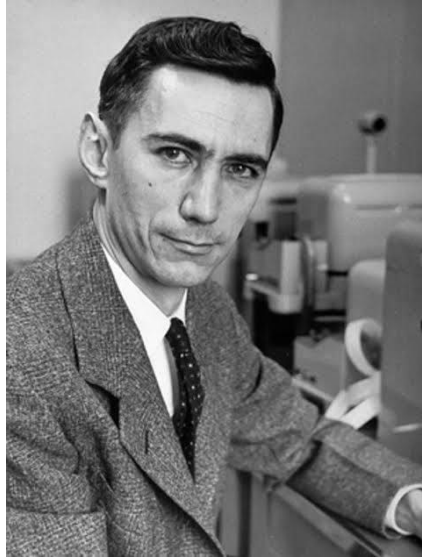
A cognitive scientist and co-founder of MIT's AI Lab applied cybernetic ideas to artificial intelligence. He viewed the mind as a “society of mind” – made up of many interacting agents. To streamline Marvin Minsky's concept, he proposed “frames” as a foundational data structure that provides a computer with the necessary “common sense” context or mental stereotypes required to interpret new situations before it even begins processing specific instructions. [4].

Alan Turing
(23 June 1912 – 7 June 1954)



A British mathematician and logician, the father of modern computer science, Alan Turing was famous for his work developing the first modern computers, decoding the encryption of German Enigma machines during the Second World War, and detailing a procedure known as the Turing Test, forming the foundational concepts for artificial intelligence and cognitive science. Alan Turing was a polymath whose genius spanned everything from the abstract world of logic and philosophy to the biological mysteries of life. He is arguably the most influential figure in the birth of the digital age. [4].

Claude Shannon
(April 30, 1916 – February 24, 2001)



An American mathematician and computer scientist who conceived and laid the foundations for information theory. His theories laid the groundwork for the electronic communications networks that now lace the earth. Shannon proved that electrical switches aren't just for moving power; they are capable of performing symbolic logic. [4].

James Grier Miller
(July 17, 1916-November 7, 2002)



An American pioneering psychologist and biologist who spent decades developing Living Systems Theory (LST), a massive framework designed to

identify the universal laws governing all life from a single cell to a global society. His magnum opus, the 1,100-page Living Systems, argued that all living entities are “open systems” that must maintain a steady state by processing inputs of matter, energy, and information. Miller’s genius was in showing that the same functional roles exist at different “levels” of complexity. [4].

Peter Checkland
(18 December 1930-)

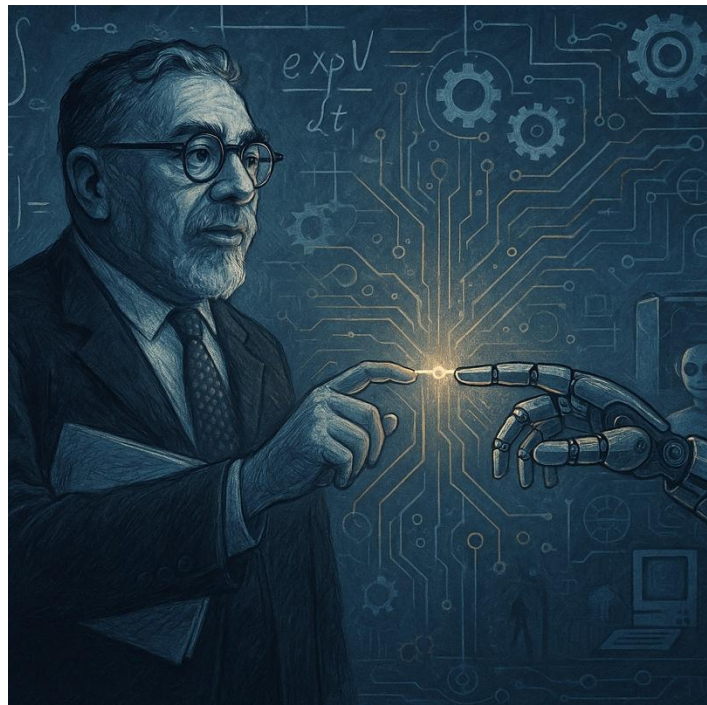


A British management scientist and a creator of soft systems methodology (SSM): a systemic process of inquiry into problematic situations in order to define and take ‘action to improve’. He introduced a number of key conceptual developments, in particular his distinction between ‘hard’ and ‘soft’ systems thinking, and his championing of the soft approach. The scientist highlighted the need for flexible approaches to tackle the subjective and multifaceted nature of real-world challenges. [4].

Herbert A. Simon
(June 15, 1916 – February 9, 2001)



An American scientist, A Nobel-prize winner in economics for his pioneering research into the decision-making process within economic organizations, known as “behaviorism”. He is a pioneer in the field of artificial intelligence, creating with Allen Newell the Logic Theory Machine (1956) and the General Problem Solver (GPS) (1957) programs. [4].



UNIT 3. INTERNET SECURITY ISSUES

LEAD-IN

Task 1. Read the given statistics. Summarize what these figures alert us about.

In 2024, the average cost of a data breach was estimated to be about \$4.88 million.

Secure frame reports show that cybercrime losses will reach \$8 trillion by 2029. According to the latest survey, increasing phishing attacks have already involved 40% of data breaches worldwide.

Human error is estimated to have contributed to 68% of data breaches.

55% of companies interviewed claim that cybercriminals are more advanced than their internal teams.

Businesses have experienced a significant loss of \$1.85 million as a result of ransomware attacks.

The latest research has identified that just 3% of organizations have an appropriate level of readiness to be resilient against cybersecurity challenges.

The current surge in cyber-attacks has prompted organizations to anticipate a 51% increase in their cybersecurity investment. [18; 39]

Task 2. Make a list of words and word combinations that you associate with cybersecurity threats.

Task 3. Compare your list with the one given below. Match terms (1-11) with their definitions (a-k).

1	malware	a	a system or combination of systems that enforces a boundary between two or more networks
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2	phishing	b	program that spreads itself from network to network, often “clogging” information systems as it spreads
3	spam	c	an attempt to exploit a computer system or a private network inside a computer.
4	identity theft	d	a method to dupe a user into opening an email, instant message, or text message that leads to the installation of malware
5	spyware	e	a program that can “infect” other programs by modifying them
6	virus	f	a form of malware that locks the user out of their files or their device, then demands a payment (often in cryptocurrency) to restore access
7	worm	g	taking personal information to conduct fraudulent financial activity
8	authentication	h	software that is installed on your computer and monitors your activity, without your knowledge or consent
9	ransomware	i	positively identifying a user in order to allow access to a system
10	hacking	j	email sent to large numbers of people to promote products or services
11	firewall	k	any form of malicious software, including viruses, Trojan horses, malicious content

[11; 14; 15; 30; 44]

Task 4. Study the mind map “Cybersecurity Issues”. Match sections (1-6) with the headings (A-F) [20; 25].

A. Emerging Challenges

B. Legal & Ethical Aspects

C. Consequences of Cyber Attacks

D. Cyber Threats

E. Prevention & Protection Measures

F. Vulnerabilities

1. -viruses - worms - trojans - spyware - ransomware - password cracking - brute-force attacks -malicious insiders - fake websites	2. - outdated software - weak passwords - unpatched security flaws - misconfigured systems - insecure networks (public wi-fi, open ports)	3. - financial loss - data theft/leakage - reputation damage - operational disruption - legal persecution
4. - firewalls - antivirus software - intrusion detection systems (IDS) - data encryption - strong passwords - multi-factor authentication (MFA) - regular software updates - suspicious link awareness	5. - ai-driven cyberattacks - internet of things (iot) insecurity - cloud storage flaws - deepfake advances - state-sponsored cyber warfare	6. - data protection laws (gdpr, ccpa, etc.) - cybercrime legislation - ethical hacking & penetration testing - privacy breach

Task 5. Read the following essay. Fill in the gaps using words and word combinations from Task 4.

Cyberstorm: A Day in the Life of TechCorp

It started on a quiet Monday morning at **TechCorp**, a mid-sized company handling international logistics. An employee named **Maris** received an email from “IT Support” asking her to install a “critical video player update.” She clicked it, unknowingly installing a (1)... that also carried a (2) Within minutes, the worm spread through the network, opening the door for (3) ... to monitor keystrokes and (4) ... attempts on admin accounts.

Meanwhile, a hacker launched a (5) against TechCorp’s client portal. The weak password *admin123* was cracked in under a minute, giving them access to order records. At the same time, another attacker set up a (6)... .. mimicking TechCorp’s shipping tracker, tricking customers into entering credentials.

All this turmoil was possible because several (7)... had stacked up. First and foremost, the warehouse system ran (8)... .. that hadn’t been patched in years. Secondly, a database was (9)..., making sensitive shipment data publicly accessible. Finally, several employees used **insecure** (10) to log in from airports during travel.

Unfortunately, by Tuesday, the consequences were in full swing. Fraudulent shipment resulted in an immediate (11) of \$50,000. Besides, news outlets couldn’t resist covering the breach, causing (12) that led to contract cancellations. The legal team of the company warned the management that the violations could result in heavy (13)

The IT department had a row of sleepless nights to activate (14)... :

- (15)... were reconfigured to block malicious IP addresses.
- (16) quarantined infected files.
- an (17) alerted them to abnormal overseas traffic.
- (18) was applied to backups to prevent further leaks.
- all accounts switched to (19) and (20)... ..

- systems were put on a **regular update schedule**, and staff were retrained on **suspicious link awareness**.

But the threats weren't over. A week later, attackers tried **AI-driven (21) ...** ... so convincing they fooled senior managers. At the same time, a hacked **IoT security camera** inside the warehouse became an entry point for further attacks. The company's **cloud storage** was also at risk due to a configuration error. Rumors spread that a **(22) ...** of the CEO was circulating online, authorizing a false fund transfer – possibly part of **state-sponsored (23) ...** ... targeting logistics companies.

In the aftermath, TechCorp brought in an **ethical hacking & (24) ...** ... team to audit every system. They filed reports to comply with **(25) ...** ... and worked closely with law enforcement under **(26)** Still, a separate **privacy breach** involving a third-party tracking app kept regulators watching closely.

TechCorp survived – barely – but the cyberstorm left them forever changed. They learned the hard way that in the modern world, digital defenses aren't a luxury; they're a daily vital necessity [16].

Task 6. Work in small groups and conduct the research to find out what kinds of cybercrimes people have been victims of. Answer the questions of the suggested questionnaire and summarize the findings in the form of statistics.

Question 1. Have you or anyone you know ever been a victim of a cybercrime?

☐ Yes ☐ No ☐ Unsure

Question 2. If **yes**, please select all that apply:

- ☐ phishing (fraudulent emails, messages, or websites)
- ☐ identity theft (personal details used without consent)
- ☐ online fraud/scams (fake job offers, investment scams, etc.)
- ☐ credit card fraud

- ☐ ransomware attack
- ☐ malware/virus infection
- ☐ social media account hacking
- ☐ email account hacking
- ☐ cyberstalking or harassment
- ☐ data breach (personal data exposed from a company or service)
- ☐ unauthorized access to cloud storage or online accounts
- ☐ sextortion or online blackmail
- ☐ other (please specify): _____

Question 3. When did the most recent incident involving cybercrime occur?

- ☐ within the last month
- ☐ within the last 6 months
- ☐ within the last year
- ☐ over a year ago

Question 4. Did you or the person impacted report the incident?

- ☐ yes, to local police
- ☐ yes, to an online platform/service provider
- ☐ yes, to a national cybercrime reporting agency
- ☐ no, I did not report it
- ☐ other: _____

Question 5. If you or the person impacted did **not** report it, why?

- ☐ didn't know where/how to report
- ☐ thought it wouldn't be taken seriously
- ☐ financial loss was too small
- ☐ privacy concerns

☐ other: _____

Question 6. Have you ever worked for an organization/business that suffered financial loss as a result of a cyberattack?

Question 7. If yes, specify the average sum of financial loss involved.

Question 8. What practical steps do you follow daily to deter cyber threats? Please, select all that you apply:

- ☐ use strong, unique passwords for different accounts
- ☐ enable two-factor authentication (2fa) wherever possible
- ☐ avoid saving passwords in browsers without encryption
- ☐ avoid clicking on suspicious links or pop-ups
- ☐ download apps/software only from trusted sources
- ☐ ignore unsolicited emails asking for personal or financial info
- ☐ verify unexpected attachments before opening them
- ☐ keep operating systems, apps, and browsers updated
- ☐ use antivirus/anti-malware software and let it run real-time protection
- ☐ backup important files to external drives or secure cloud storage
- ☐ limit personal information shared online

Task 7. Study a brief description of the following software. What is it aimed at? Have you ever used any? [22, 46]

Norton (Norton 360)

- includes real-time malware protection, firewall, phishing defense, dark web monitoring, identity protection, password manager, and cloud backup, depending on the plan;
- typically scores around 99.8–100% in malware protection tests;
- combines antivirus with VPN (secure VPN) and other tools;
- can be resource-intensive and expensive;

- VPN embraces 28 countries.

Surfshark

- The VPN option offers unlimited simultaneous connections;
- awarded for strong privacy;
- budget pricing, excellent speed;
- equipped with antivirus, data breach alerts, webcam protection, and ID protection;
- superior customer support with fast responses and multiple contact options;
- some antivirus features are under maturing;
- lacks parental controls and may have longer scan times.

MacKeeper

- offers antivirus with ~99% detection rate, cleanup tools, adware blocking, and system optimization;
- built-in VPN with 300 servers in 50+ countries, p2p/torrenting support, and works with Netflix;
- ID Theft guard for breached email monitoring – simple to use;
- all tools included in every plan; 14-day money-back guarantee;
- unclear logging practices; possible data collection, including IP and browser screenshots;
- no anti-phishing, firewall, or parental control;
- aggressive marketing,
- some user reports claim MacKeeper contributes to system issues.

[22, 46]

Task 8. Compare these cybersecurity solutions and fill in the table given above. For the comparison, apply the following parameters:

- *security & protection features*
- *VPN capabilities*
- *privacy & logging policy*

- *platform compatibility*
- *performance impact*
- *pricing & plans*
- *usability & support*
- *reputation & reviews*

ANTIVIRUS PRODUCTS COMPARED

Product	Strengths	Weaknesses
Norton		VPN limitations,...
Surfshark	feature-rich,....	...
MacKeeper		

Task 9. Summarize the information about these products and write a short review of each software.

E.g., Norton – a well-established, all-in-one security suite offering strong malware protection, identity monitoring, and bundled VPN. Ideal for users wanting a complete package, though it's heavier on system resources, more expensive, and its VPN is limited in features and server locations.

Task 10. Study the following headlines. Think what consequences they could have caused. Refer to the harmful consequences listed below for each event. (adapted from BBC NEWS HIGHLIGHTS)

1. RANSOMWARE ATTACK HITS DOZENS OF ROMANIAN HOSPITALS
2. TWITTER GLITCH ALLOWS CIA INFORMANT CHANNEL TO BE HACKED
3. EUROVISION 2023: HOTEL PHISHING SCAM TARGETS SONG CONTEST FANS
4. SCHOOLS HIT BY CYBER ATTACK AND DOCUMENTS LEAKED

5. APPLE LAUNCHES LOCKDOWN MODE TO BLOCK SPYWARE ATTACKS ON AT-RISK USERS

Might-Be Consequences:

- a) *Hotels and event organizers may face backlash for “allowing” scams.*
- b) *Medical services delayed, surgeries postponed, patient records inaccessible.*
- c) *Organizations may receive heavy fines for failing to comply with child data protection standards.*
- d) *A big IT corporation had been employing some attack methods that were rendered ineffective.*
- e) *This news caused Anxiety among students, parents, and teachers that their personal data could be exposed to illegal deeds.*
- f) *Apple could be prosecuted for having failed to adopt high standards to comply with privacy and security laws.*

Task 11. Suggest some protective measures to deter the situations envisioned above. Choose from the solutions presented below and apply them to each case from Task 10. [15; 25].

SOLUTION	OBJECTIVE	TOOLS
Mobile Threat Defense (MTD)	to detect spyware and malicious apps	<i>Lookout, Zimperium</i>
Secure Payment Gateway	to reduce fraud risk	<i>Stripe, PayPal Buyer Protection</i>
Two-Factor Authentication (2FA)	to protect accounts from unauthorized access	<i>Duo Security, Google Authenticator</i>

Endpoint Detection & Response (EDR)	to detect and isolate ransomware before it spreads	<i>CrowdStrike Falcon, SentinelOne</i>
Data Loss Prevention (DLP)	to monitor and block sensitive data transfers	<i>Symantec DLP, Forcepoint DLP</i>
Encrypted Messaging Apps (e.g.,) –.	to protect high-risk communications	<i>Signal, ProtonMail</i>
Offline & Encrypted Backups (e.g.,)	to restore systems without paying ransom	<i>Veeam Backup & Replication, Acronis Cyber Protect</i>
Public Awareness Campaigns	educating fans on booking only through official links	<i>Posts, Ads</i>
Cloud Access Security Broker (CASB)	to secure online learning platforms	<i>Microsoft Defender for Cloud Apps</i>
Account Takeover Prevention Tools	to safeguard identity and session integrity	<i>Okta, Auth0</i>

E.g., To deter Apple's lockdown mode and improve spyware defense, it is advisable to apply the following protective tools:

- spyware and malicious apps can be detected with the help of Mobile Threat Defence tools, like **Lookout or Zimperium**;*
- the company should introduce more advanced device management that can help to set up strict security settings on all devices under its brand name;*
- users are supposed to have access to encrypted messaging apps, for instance Signal or ProtonMail, that guarantee secure communication protection.*

LISTENING

Task 1. Watch the video and list the consequences of the cyber-attack. Airports of which cities/countries were affected?

<https://www.youtube.com/watch?v=-thSQ6ca8oQ>

1. Which consequence of cyber attacks mentioned in the video do you find the most damaging and serious – financial, reputational, or social? Why?
2. How might employees feel after learning they were responsible for a data breach due to human error?
3. If you were a customer of a company that lost your data, what would you expect them to do?
4. What lessons should governments and businesses learn from the statistics in the video?
5. Do you think cyber attacks could affect your everyday life, even if you are not working in IT? How?
6. Do you think financial loss or reputational damage is more damaging to a company after a cyberattack? Why?
7. How can cyber attacks affect trust between companies and their customers?

ACADEMIC WRITING

Task 1. Study the guide on how to write a brief description of the application that protects a system from cyber threats.

How to Describe a Cybersecurity Application

1. Start your description by mentioning the application name and category

What to include:

- full name of the application;
- category or type (e.g., antivirus, firewall, intrusion detection system, password manager).

E.g., Bitdefender GravityZone – Endpoint Protection Platform.

2. Rest on the main security functions and the target audience this product is designed for.

What to include:

- the main security function(s) it serves;
- who it is designed for (individuals, businesses, government agencies, etc.).

E.g., Designed to protect small-to-medium businesses from malware, ransomware, and phishing attacks.

3. Dwell on key features and functions that make this product stand out.

What to include:

- list of main tools and technologies used;
- any standout or innovative features.

E.g., The product is equipped with real-time malware detection. Its algorithms are AI-driven to give insight into potential threats. The engine of the software has an admirable opportunity to scan cloud information. It offers a powerful password-encrypted vault.

4. Inform the users what platforms the product supports and what platforms it can be integrated with.

What to include:

- OS compatibility (Windows, macOS, Linux, Android, iOS);

- whether it integrates with other tools (cloud services, SIEM, endpoint management).

E.g., Available on Windows, macOS, and Android, integrates with Microsoft Defender for centralized monitoring.

5. Make sure that your description highlights the security technologies used to create the product.

What to include:

- methods or algorithms (signature-based detection, heuristic analysis, sandboxing, encryption standards, MFA).

E.g., Uses AES-256 encryption, behavioral analysis, and zero-day exploit protection.

6. Your promotion is supposed to outline all the benefits and advantages of the product in comparison with other similar products available on the market.

What to include:

- how it reduces cyber risks;
- how it improves operational efficiency or compliance.

E.g., Our solution reduces downtime by automatically isolating infected endpoints and restoring from backups.

8. You should be clear about your pricing policy and state the licensing terms. What to include:

- subscription model, one-time purchase, or freemium;
- license terms (per user, per device, enterprise-wide).

E.g., Annual subscription starting at \$29.99 per device.

9. It's a good idea to finish your description by telling a real example of the product application that was able to deter or solve a security issue.

What to include:

- a brief scenario showing the app in action.

E.g., A ransomware attack attempts to encrypt company files, but the application detects and quarantines the malware within seconds, restoring affected files from a secure backup.

[43; 49]

Task 2. Read the information about Norton. Match the paragraphs (1-8) to the right heading (A-H). Order the paragraphs in accordance with the recommendations given in the method guide on “How to Describe a Cybersecurity Application”.

A. Benefits and Advantages

B. Example in Action

C. Pricing and Licensing

D. Security Technologies

E. Key Features & Functions

F. Supported Platforms & Integration

G. Introduction

H. Purpose & Target Audience

1. Norton 360 Deluxe is offered via an **annual subscription**, starting at around **\$49.99 per year** for up to five devices, with license terms per device. Higher-tier packages add LifeLock identity theft protection [22].
2. This suite offers **real-time malware detection**, an **AI-powered threat analysis engine**, and **cloud-based backup** for important files. Its **secure VPN** ensures private browsing, while **Dark Web Monitoring** alerts users if personal information appears on illegal marketplaces. A **password manager** securely stores login credentials, and **Parental Control** tools help families manage children’s online activity [22].
3. The software uses **heuristic analysis** to detect unknown threats, **signature-based detection** for known malware, **AES-256 encryption** for data

protection, **sandboxing** to test suspicious files in isolation, and **multi-factor authentication (MFA)** for enhanced account security [22].

4. Norton 360 Deluxe is built to safeguard **individual users, families, and small businesses** from malware, ransomware, phishing scams, and identity theft. It caters to people who need robust, always-on protection for both personal and work-related devices [22].
5. Compared to similar products, Norton 360 Deluxe offers **all-in-one protection** without the need for multiple separate apps. It reduces cyber risks through proactive threat prevention and improves operational efficiency with automated updates, performance optimization tools, and cloud backup [22].
6. Norton 360 Deluxe is an **all-in-one antivirus and cybersecurity platform** designed to protect users from a wide spectrum of digital threats. Categorized as a comprehensive security suite, it goes beyond traditional antivirus protection to include identity theft prevention, secure VPN browsing, and advanced firewall management [22].
7. In one real-world incident, a Norton 360 user received a phishing email disguised as a legitimate PayPal request. Norton immediately flagged the email as suspicious, blocked the malicious link, and prevented credential theft – saving the user from potential financial loss [22].
8. Norton 360 Deluxe supports **Windows, macOS, Android, and iOS**. It integrates with popular browsers for safe web browsing and can work alongside Microsoft’s built-in security tools for layered protection [22].

Task 3. Write a comprehensive description of any cybersecurity application.

READING

CYBERATTACK TARGETS THE MOST VULNERABLE

Pre-reading

Task 1. Imagine you or your friend was scammed and had money fished out of them. Describe how you/your friend would feel under such circumstances.

Task 2. Explain what psychological hooks are usually used by scammers to fool their victims.

Task 3. Read the article that follows and find out the answer to the question it contains.

Why Young People Fall for “Obvious” Scams More Often Than You Think

From fake parcel texts to fraudulent banking sites, scams are getting sharper – and young people are finding themselves **(1) in the crosshairs** more often than any other group. 28-year-old Timothée’s account of his experience illustrates the vulnerability of some young people to scams. Expecting a €500 refund from France’s CAF family allowance fund, he received a text claiming his payment had arrived. Overjoyed, he clicked the link, entered his bank details on a convincing fake site – and lost the money. His bank refused **(2) reimbursement** because he’d “authorised” the transaction himself.

This is far from rare. In today’s digital-first world, sharing personal details online feels routine. Scammers exploit this, using personal data from social media to create personalised, believable traps. Young people’s limited experience with official institutions and their overconfidence in their tech skills can make them easier marks.

During their interviews, the young people expressed a kind of resignation to the growing threat and a reluctance to limit their digital lives. So, they adopt **(3) avoidance strategies** – often automatically or unconsciously – such as only using virtual bank cards, keeping the balance in their current accounts low,

regularly checking their banking apps, and not clicking on suspicious emails. Unfortunately, these precautions are often insufficient. Avoiding fraud requires **(4) heightened vigilance**, but their digital security knowledge is sometimes limited and based either on what their loved ones have told them or on **(5) preconceptions**.

To understand their relatively high **(6) vulnerability**, it is vital to examine their online habits. The probability of falling victim to fraud seems to be more closely related to online habits, particularly around financial transactions, than to age.

According to INSEE (Institut National de la Sstatistique et des Études Économiques – French National Institute of Statistics and Economic Studies), 75% of young people say that their online security fears don't stop them from ordering or buying products online. This figure drops to 67% for the population as a whole, and further still to 63% for 50- to 64-year-olds.

Young people are just as likely to fall victim to fraud as older people with the same habits and socio-demographic profiles. Although young people are considered **(7) technophiles**, they also find themselves between childhood – with **(8) financial dependence** on their parents – and adulthood. They're experiencing significant changes in their resources and expenditure. Their habits are not yet set, and they tend to try various devices, which can **(9) expose** them to various risks. Young people use the Internet more to buy and sell things, send money, search for jobs, play games and carry out admin tasks. That may explain their overrepresentation among victims of fraud. In this sense, young people find themselves **(10) on the front line**. They explore and improvise, they test out apps recommended by friends, family, and influencers, and sometimes they make mistakes. Their digital behaviours evolve as they experience risk, which underscores the need for continuous cybersecurity education.

So, numerous factors contribute to the overrepresentation of young people among victims of online fraud. It is partly explained by the greater variety and

frequency of their use of digital technology involving payment methods, as well as by their confidence in their expertise, which they often overestimate. This is not **(11) conducive to protective self-censorship**, setting young adults apart from other population groups [10].

Task 4. Find words in the text that make collocations with the following verbs.

Explain the meaning of the collocation in your own words.

- to fall...
- to click ...
- to enter ...
- to limit ...
- to carry out ...
- to explore ...
- to order ...
- to keep ...
- to experience

Task 5. Make derivatives from the words suggested in the table below.

Noun	Adjective	Adverb	Verb
			confide
security			
			educate
		dependently	
representation			
	authorized		
fraud			
	experienced		
		continuously	
person			

Task 6. Match the following definition (a-k) with the words and word combinations (1-11) in bold in the text.

- a. a person who loves technology;
- b. relying on someone else for money;
- c. ideas formed before having the full facts;
- d. repayment for money spent or lost;
- e. methods to stay away from risk or danger;
- f. extremely careful watch for possible danger;
- g. behaviors or restraints that help protect oneself from harm, and that are favorable to staying safe;
- h. being *directly targeted* or *focused on*;
- i. being directly involved in dealing with the most urgent, risky, or challenging part of a situation;
- j. being open to danger, harm, or risk;
- k. to leave unprotected or vulnerable.

[9; 20; 44; 45]

Task 7. Find words containing prefixes -over and -pre. Explain their meaning.

Task 8. Derive words using the prefixes -over and -pre from the words given and use them to fill in the gaps in the following sentences.

load	use	dependence	estimate
expose	complicate	caution	configure

1. Routers are often _____ with a default password.
2. _____ security settings can confuse users and lead to mistakes.
3. Enabling multi-factor authentication is a _____ against account theft.
4. _____ of the same password makes accounts more vulnerable.

5. Posting your home address online _____ you to identity theft.
6. The server crashed due to a deliberate traffic _____ during a DDoS attack.
7. _____ on cloud storage without backups can be dangerous.
8. Users often _____ how secure their personal data is.

Task 9. Rewrite sentences as unreal conditional structures.

E.g., If young people had heightened vigilance, they.....

- Avoiding fraud requires heightened vigilance.
- Young people's limited experience with official institutions can make them easier marks.
- Scammers exploit personal data from social media to create believable traps.
- Young people use the Internet more to buy and sell things, send money, search for jobs, play games, and carry out admin tasks.
- Their digital security knowledge is sometimes limited and based on preconceptions.

Task 10. Identify modal verbs and define their meaning. State which modal verb is used to render: possibility, ability, necessity, uncertainty, potential consequence.

- Their habits are not yet set, and they tend to try various devices, which can expose them to risks.
- Scammers may use personal data from social media to create personalized traps.
- Young people must remain vigilant to avoid falling victim to scams.
- They might not recognize a scam even on official-looking sites.
- Users can protect themselves by using virtual bank cards.
- Failure to follow security advice could result in financial loss.

Task 11. Answer the following questions.

- Why did Timothée's bank refuse to reimburse the stolen money?
- What method did the scammers use to make their attack look convincing?
- According to the article, why might young people be more vulnerable to scams than older people?
- What avoidance strategies do young people use to try to prevent fraud?
- How do scammers use personal data from social media to make their traps more convincing?
- Why might overconfidence in tech skills increase the risk of falling victim to scams?
- How do young people's life stage and financial circumstances influence their vulnerability to fraud?
- What role do evolving digital habits play in exposure to cyber threats?
- Why might avoidance strategies like using virtual bank cards still be insufficient for complete fraud protection?

SPEAKING

Task 1. Work in small groups. Discuss the issues given below. Share your opinions and report your findings to the group.

Do you think banks should reimburse victims like Timothée even if they entered their details voluntarily? Why or why not?

Should cybersecurity education be made a standard part of school and university curricula?

How could social media platforms help reduce the risk of scams targeting young users?

What are the most effective ways to teach young adults about online safety without limiting their freedom online?

Do you think older generations are actually safer online, or is it just that they use the Internet differently?

CASE STUDY

https://www.youtube.com/watch?v=KiZF7GIAs6Q&ab_channel=BBCNews

Rising Ransomware Threats in the UK – The 2025 Outlook

Task 1. You are going to watch the BBC's Panorama about the rising number of ransomware attacks on businesses in the UK. Before watching the program, read the background of the case.

Background

The UK is facing an unprecedented surge in ransomware attacks – malicious cyber incidents in which hackers steal data, encrypt systems, and demand payment for restoration. The National Cyber Security Centre (NCSC), part of GCHQ, and the National Crime Agency (NCA) are at the forefront of the response. Industry experts and investigative journalists warn that **2025 could be the worst year on record** for such crimes.

Task 2. After watching the program, follow the steps to solve the case.

Step 1. Risk Assessment and Gap Analysis.

Objective: figure out the problem that is looming for the whole country.

- What is ransomware, and how does it typically operate?
- Which organizations were mentioned as recent ransomware victims in the UK?
- How did hackers gain access to K&P's systems?
- What was the financial impact of ransomware on UK businesses last year?
- Which two government bodies were highlighted as leading the fight against ransomware?
- What role does the National Crime Agency play after a ransomware attack?

Step 2. Process & Tactics.

Objective: give insight into ransomware attack characteristics

- What are “blagging” and social engineering, and how were they used in these cases?
- Who are “Akira” and “Scattered Spiders” in the context of this case?
- Why is it difficult for UK authorities to prosecute many ransomware gangs?
- What new trends in hacker profiles were identified in the report?

Step 3. Impact and Response.

Objective: summarize what harm the attack brought and study the efficiency of countermeasures.

- What financial, operational, and reputational damage did the companies under siege experience?
- What role do NCSC and NCA play in deterring attacks?
- Why is 2025 predicted to be the worst year on record for ransomware attacks?
- What are the main weaknesses in UK cybersecurity, according to the National Audit Office?
- Why do some companies choose to pay ransom demands quietly instead of reporting incidents?
- How could increased transparency about attacks benefit national cyber defense?
- In what ways is the analogy of “a warehouse full of goods” relevant to cyber defense responsibilities?

Step 4. Lessons Learned.

Objective: define the measures to be taken to stand against the cyberattacks

- If you were advising Marks & Spencer after the attack, what three immediate steps would you recommend? Choose from the list below:

incident simulation

password & access policy strengthening

backup & recovery planning

public communication strategy

post-incident review

employee cybersecurity training

- How can organizations balance technical defenses with human-factor training?
- What policies could the UK government implement to reduce ransomware incidents?
- How could international cooperation be improved to address overseas cybercriminals?
- Do you think ransomware is more of a corporate or a national security issue? Why?

Step 5. Ready to Act.

Objective: work out a step-by-step approach to a similar ransomware attack

Background: You are the head of cybersecurity at a logistics company. A hacker has just sent a ransom note saying they have locked your systems.

Write a short action plan (5–7 points) showing what you would do in the next 24 hours.

LISTENING

LAWS OF CYBERSECURITY

https://www.youtube.com/watch?v=_nVq7f26-Uo&t=12s&ab_channel=TEDxTalks

Pre-listening

Task 1. You are going to listen to an expert in cybersecurity and network infrastructure, Nick Espinosa, who is delivering a lecture on “Cybersecurity” at the TEDx Talks event. Before you listen to the lecture, find out the definitions of the core terms (1-7) used by the lecturer. Match them to their definitions (a-g)

TERM	DEFINITION
1. breach	

2. social engineering	
3. blagging	
4. IoT	
5. bandwidth attack	
6. life hacking	
7. exploit	

a. pretending to be a legitimate user to gain access

b. a break into a system or data storage

c. tricking people into giving information

d. to take advantage of a weakness

e. overloading a system to make it stop working

f. devices connected to the internet, like smart home gadgets

g. finding clever shortcuts to make tasks easier

Task 2. The program contains some words derived with the help of suffixes and prefixes. Coin the words with the help of the suggested derivation pattern (E.g., suffix+noun or prefix+verb) to have the meaning defined.

Derivation Pattern	Word Meaning	Word
1. cyber+noun	safety for computers and networks	Cybersecurity
2. anti+noun	against harmful software	
3. verb+tion	the act of creating something new	
4. verb+ation	the act of using something, often unfairly	
5. inter+verb	Link together	
6. dis+verb	not believe or not trust	

7. verb+ing	tricking people online to get data	
8. adjective+ity	the state of being weak or open to attack	

Task 3. Study the given words and put them together to make collocations. You can use two or more words to bind them into a collocation.

nuclear	online	breach	data	media	massive
cyber	devices	network	people	strategies	weapons
program	infrastructure	defense	IoT	bandwidth	platform
technological	attack	social	computer	security	

Task 4. Fill in the gaps in the sentences below with the collocations coined in Task 3 so that they match the meaning defined in the gaps.

1. Many companies invest in (*plans and methods to protect systems from cyberattacks*) to protect data.
2. The virus spread quickly through the company's (*a group of connected computers that share data and resources*).
3. A (*very large break into a computer system, exposing data*) exposed millions of customer records.
4. Banks must follow strict (*measures to protect information from unauthorized access or changes*) regulations.
5. A country's (*the physical and digital systems supporting technology use*) must be well protected.
6. We must be careful about trusting (*individuals who use the internet for communication or activity*) we don't know.
7. Facebook is a popular (*a website or app that allows users to share content and connect*).

8. Many (*internet-connected gadgets, like smart home appliances*) can be hacked if they aren't secured.
9. (*An attempt to overload a network so it stops working*) made the website unavailable.
10. Hackers once disrupted an illegal nuclear (*a government or group's effort to develop nuclear arms*). [7]

Task 5. Suggest synonyms to the following words.

Word	Synonym
1. trust	
2. innovation	
3. exploit	
4. vulnerability	
5. breach	
6. hacker	
7. prevention	
8. opportunity	
9. security	

Task 6. Listen to the lecture for the first time. Put down the definitions of 5 Cybersecurity Laws. Explain how you understand them.

CYBERSECURITY LAWS

Law 1: If there is a....

Law 2: Everything is ...

Law 3: Humans...

Law 4: With innovation..

Law 5. When in doubt...

Task 7. Listen to the lecture for the second time and formulate your opinion on the following discursive issues.

1. *The speaker calls the Internet “the largest culture by far.”*

Do you agree that online culture can be considered a “culture” in the same way as national or ethnic cultures? Why or why not?

2. Law #1 states: If there is a vulnerability, it will be exploited. No exceptions.

Does this mean that perfect cybersecurity is impossible? Can you imagine a situation where this law might not hold true?

3. The speaker mentions that humans trust even when they shouldn’t.

Is it possible to have a safe online environment without reducing trust? How can societies balance trust and skepticism in the digital age?

4. The Mirai virus case showed how IoT devices could be weaponized.

Should innovation in technology be slowed down until better security is ensured, or should we innovate first and fix vulnerabilities later?

5. The speaker calls himself a “Nerd-to-English translator.”

How important is it for technical experts to translate complex concepts into everyday language? Can you think of other fields where this is necessary?

6. The speaker compares the universality of math to Internet protocols and emojis.

Could a “universal language” of cybersecurity awareness ever exist? What would it look like?

7. Some of the biggest data breaches have happened in organizations with massive cybersecurity budgets.

What does this suggest about the limitations of money and technology in preventing cybercrime?

8. Thinking like a hacker is suggested as a defensive strategy.

Is this ethical for ordinary users? Where should the line be drawn between ethical hacking and illegal activity?

PROJECT WORK

“Interview with a Hacker”

Work in groups and role-play the interview with a fictitious hacker. Share your roles. The interview can be recorded and then shown in class. Before you role-play the interview, work out a script with planned questions and answers.

Roles:

- **Interviewers** (journalist, cybersecurity expert, or student reporter)
- **Hacker** (ethical hacker or fictionalized cybercriminal)

The interview is supposed to involve:

Introduction (1–2 min.) – the interviewer briefly introduces the guest and the topic under discussion; the hacker gives a short personal background.

Main Body of the Interview (5-8 min.) – should give insight into motivation, mindset of the hacker, hacking process; raise and discuss ethical considerations of hacking; speculate over consequences of some cyberattacks; encourage the hacker to give cybersecurity pieces of advice.

Conclusion (1 min.) – summarize the key points of the interview, give a final thought (*E.g., Technologies are neither good nor bad, everything depends on how humans use them.*)

CASE STUDY

“Shadow War: Anonymous cracks Russia’s Digital Fortress” (2022)

1. Background

On February 24, 2022, following the Russian invasion of Ukraine, the international hacktivist collective known as **Anonymous** “officially” proclaimed cyber war on the Russian government. This conflict serves as a primary example of asymmetric cyber warfare, where a decentralized global “hivemind” utilized high-level technical exploits traditionally reserved for state-sponsored actors. This case study examines how they leveraged various digital tools to disrupt a world power [6; 29].

Key Terminology:

Hacktivism – the use of computer-based techniques to promote a political agenda or social change.

Asymmetric Warfare – a conflict where the resources of two belligerents differ significantly in terms of maximizing.

Decentralization – the transfer of control from a single central authority to localized units.

Botnet Orchestration – the central control of a network of “zombie” computers.

Zero-Day Exploit – a cyberattack targeting a software flaw unknown to the developer.

Exfiltration Pipeline – a systematic path for moving stolen data out of a network.

OT Protocols – communication rules for industrial hardware (e.g., Modbus).

2. Implementation: The Six Top Tactics

According to reports (CNBC, 2022), Anonymous and its affiliates utilized six primary methods to target Russian infrastructure:

1. **DDoS (Distributed Denial of Service) Attacks:** Overwhelming government and bank websites (like Sberbank) with traffic to take them offline.
2. **Database Leaks and Doxing:** Infiltrating agencies like *Roskomnadzor* (the censorship bureau) and releasing hundreds of gigabytes of internal emails and documents.
3. **Hijacking State Media:** Hacking TV channels (Russia 24, Channel One) and streaming services to broadcast footage of the war in Ukraine to Russian citizens.
4. **Targeting Industrial Control Systems (ICS):** Allegedly breaching satellite systems and printer networks to send anti-war messages or disrupt hardware.
5. **Bypassing the “Splinternet” (Censorship):** Creating tools to help Russian citizens access Western news and circumvent state-imposed firewalls.
6. **Economic Disruption:** Targeting multinational corporations that refused to leave the Russian market, using digital pressure to force their exit.

3. Impact and Outcomes

The campaign had both psychological and technical consequences:

- **Information Breakthrough:** By hacking state TV, Anonymous bypassed the “Iron Curtain” of state media, reaching an audience that had limited access to external news.
- **Administrative Friction:** Leaked databases forced Russian agencies to spend significant time and resources on “cleanup” and security audits.
- **Symbolic Victory:** The attacks demonstrated that even a highly secured nation is vulnerable to a global, uncoordinated group of volunteers.

- **Risk of Escalation:** Security experts noted that hacktivism blurs the line between civilian and combatant, potentially leading to unpredictable retaliation.

[6; 29]

4. Steps in a Hacktivist Operation

Analyze the typical workflow of these attacks:

1. **Reconnaissance:** Identifying vulnerable servers or unprotected APIs within the target's network.
2. **Mobilization:** Using social media (Twitter/X and Telegram) to share targets and "call to arms."
3. **Exploitation:** Using tools like *Low Orbit Ion Cannon (LOIC)* for DDoS or SQL injection for data theft.
4. **Exfiltration:** Moving stolen data out of the target system to public hosting sites.
5. **Amplification:** Working with journalists and social media influencers to ensure the hack receives maximum global visibility.
6. **Workflow analysis:** Diagram the 5 steps with pseudocode (e.g., LOIC for DDoS), then discuss in pairs: "How would you mitigate as defender?"
7. **Report writing:** Write a report based on your research (100 words), including the information: Which of the six tactics do you believe was the most effective? Why? How can a government defend itself against a decentralized "crowdsourced" attack?

UNIT 4.

BIG DATA

PART 1. BIG DATA FUNDAMENTALS

LEAD-IN

Task 1. What do these figures measure?

Kilobyte (KB) = 1,000 bytes

Megabyte (MB) = 1,000 KB

Gigabyte (GB) = 1,000 MB

Terabyte (TB) = 1,000 GB

Petabyte (PB) = 1,000 TB

Exabyte (EB) = 1,000 P

Zettabyte (ZB) = 1,000 EB

Yottabyte (YB) = 1,000 ZB



Task 2. What is the difference between big and small data? Headline the columns Big and Small Data.

(adapted from: *Difference Between Small Data and Big Data*) [16]

Data is typically structured and uniform	Data is often unstructured and heterogeneous
Data is generally high quality and reliable	Data quality and reliability can vary widely
Data can often be processed on a single machine or in-memory	Data requires distributed processing frameworks such as MapReduce or Spark
Traditional	Modern
Traditional statistical techniques can be used to analyze data	Advanced analytics techniques such as machine learning are often required

Task 3. Study the examples of dig data across various domains. Refer them to the appropriate sphere (A-F). What kind of big data do you generate daily?

A. Social Media

B. E-commerce & Retail

C. Healthcare

D. Financial Services

E. Transportation

F. Smart Cities / IoT

Examples of Big Data:

- 1. GPS data from ride-sharing apps (Uber, Lyft), airlines, and shipping companies.*
- 2. Stock exchange transaction data, credit card usage, fraud detection systems, and cryptocurrency transactions.*
- 3. Posts, likes, comments, shares, videos, and images all form huge unstructured datasets.*
- 4. Amazon, Walmart, and Alibaba collect purchase history, product views, customer reviews, and clickstream data.*
- 5. Electronic health records (EHRs), MRI/CT scan images, genomic sequencing data, and patient monitoring sensors produce massive datasets.*
- 6. Sensors monitor electricity, water, air quality, and traffic patterns.*

Task 4. Make a list of at least 5 questions that you would ask about the big data issue if you were a non-technical person. Compare your list with the one that goes below. Answer them as a technical expert.

What is big data?

Why is it called Big?

Where does Big Data come from?

Why is Big Data important?

How is Big Data used?

How is Big Data stored?

Is Big Data safe?

Is my personal data a part of Big Data?

Does Big Data imply AI?

Who owns Big Data?

What are the risks of Big Data?

What is a digital footprint, and how much information might it include?

Task 5. Study the mind map “Big Data”. Match the headings (A-F) to the correct section (1-6).

A. Sources of Big Data

B. Characteristics

C. Challenges

D. Analysis & Processing

E. Applications

F. Storage & Management

1. massive size; speed of data flow; accuracy; reliability; usefulness; decision-making	2. Facebook, TikTok, X/Twitter; smart homes, wearables, cars; medical imaging; crypto; shopping behavior reviews); satellites	3. Google Cloud, Azure; data centers; databases (Hadoop, NoSQL, Spark)
4.	5.	6.

machine learning & AI; data mining; predictive analytics; visualization tools	personalized recommendations (Netflix, Amazon); healthcare diagnosis & drug discovery; fraud detection (banks, credit cards); smart cities (traffic, energy, environment); scientific discoveries & research	data privacy & security; quality & accuracy issues; cost of storage & processing; skilled workforce requirements
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[9; 15; 16]

Task 6. Describe each section of the mind map. Use the phrases suggested.

Characteristics:

to include; to involve; to be characterized by

Sources:

to come from; to contribute to; to generate data; to expand the diversity of ..

Storage and Management:

to be facilitated, though, to provide scalable solutions for

Analysis/Processing:

to apply, to transform raw information into; to enable processing

Applications:

to range from ... to; to power; to strengthen; to advance

Challenges:

to raise concern about; to be constrained by; to nurture a pressing demand for.

Task 7. Make a glossary of terms about Big Data. Match the terms with their definitions.

TERMS	DEFINITIONS
1. Big Data	
2. data analytics	
3. structured data	
4. unstructured data	
5. data lake	
6. Hadoop	
7. Scala	
8. real-time processing	
9. batch processing	
10. relational databases	
11. MapReduce	

- a. a software programming language that blends object-oriented methods with functional programming capabilities.
- b. analyzing data immediately as it's created (e.g., fraud detection in banking).
- c. huge and complex data sets that cannot be managed or analyzed with traditional software.
- d. an open-source distributed processing framework that manages data processing and storage for big data applications.
- e. the process of examining data to find patterns, trends, and useful information.
- f. specific tools that support distributed computing on large data sets.
- g. a collection of information that organizes data points with defined relationships for easy access.
- h. analyzing data in large groups at once, instead of instantly (e.g., monthly sales reports).
- i. data organized in tables and databases (e.g., names, phone numbers, financial records).

j. a storage system that keeps raw data in all formats (structured, semi-structured, unstructured).

k. data without a fixed format (e.g., videos, images, social media posts, emails).

[9; 14; 15; 44]

Task 8. Fill in the gaps with the correct term from the glossary above.

1. _____ is the sleek, versatile language that empowers developers to turn complex Big Data projects into reality.

2. _____ is the genius engine that breaks huge tasks into smaller pieces, working in parallel to tackle Big Data at lightning speed.

3. _____ handles the big jobs behind the curtain, crunching massive amounts of data efficiently and reliably.

4. With smart _____, businesses can turn raw numbers into stories that guide decisions and shape the future.

5. _____ are the classic organizers of information, keeping everything tidy, connected, and accessible.

6. _____ is the hero behind the scenes, making sure enormous datasets are stored, sorted, and ready to work wonders.

7. _____ is neat, organized, and predictable – think spreadsheets and tables that make sense at a glance.

8. _____ is messy, wild, and everywhere – from tweets to videos – and it holds secrets brands can't afford to miss.

9. A _____ is a massive digital reservoir, storing every piece of data imaginable, ready for exploration and discovery.

10. _____ is the goldmine of the digital age – massive, powerful, and full of hidden insights waiting to be discovered.

LISTENING

Pre-listening

1. Guess how much data these services generate daily? Check your answers.

Google	Facebook	X (Twitter)	Spotify	eBay
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Task 1. You are going to listen to the tutorial on “What is big data?” Listen for the first time and find out what the 5Vs are that enable us to define big data. Match each V with its synonym.

Size/amount	Volume
Speed	Velocity
Range	Variety
Trustworthiness	Veracity
Importance/efficiency	Value

Task 2. Listen to the tutorial for the second time. Answer the following questions.

1. What factors make the data generated by smartphones and the internet fall under the category of *big data*?
2. Explain the five Vs of big data (Volume, Velocity, Variety, Veracity, and Value) using the healthcare example provided in the tutorial.
3. How does analyzing patient records and test results contribute to faster disease detection, better treatment, and reduced costs in the healthcare sector?
4. Describe how the Hadoop Distributed File System (HDFS) ensures both distributed storage and fault tolerance. Why is data broken into smaller chunks and replicated?
5. How does the MapReduce model achieve faster data processing compared to traditional computing systems? What analogy is used by the speaker?

6. In what ways do gaming companies like those producing *Halo 3* and *Call of Duty* benefit from analyzing user data, and how does this reduce customer churn?
7. Why do game designers analyze data about when players pause, restart, or quit the game?
8. What role did Big Data play in predicting and managing Hurricane Sandy in 2012, and how did it improve preparedness compared to earlier methods?
9. How do traditional computing systems struggle with handling big data compared to frameworks like Hadoop and Spark?

Task 3. Reflect on the following issues. Share your opinion.

What do you think will be the most significant impact of big data in the future across industries such as healthcare, disaster management, or entertainment?

The tutorial emphasizes the “Value” of Big Data. Do you agree that value is the most important “V”? Why or why not? Support your argument with examples.

Do you have an idea how to check the Veracity of the information provided through the media?

SPEAKING

Task 1. Suppose you were to solve the issues given below. What type of data would you have to analyze and why? Match each business issue (1-5) with the most relevant set of data (A-E).

1. Amazon needs to target its ads;
2. A logistics company is seeking a relevant delivery route;
3. A bank is developing a new client database;
4. A pharmaceutical retailer is optimizing its sales scheme.
5. A TV channel is creating new content.

Data:

A. Sales transaction data, seasonal demand, health trends, competitor pricing.

- B. Audience demographics, viewing behavior, social media engagement, ratings.
- C. Customer browsing history, purchase history, demographics, behavioral clicks.
- D. Geospatial data, traffic patterns, weather conditions, and delivery records.
- E. Personal identification, financial records, transactions, risk assessment data.

Task 2. Consider the following business matters in terms of big data applications.

1. Why is customer browsing history important for Amazon in targeting ads?
2. How can traffic and weather data improve logistics and delivery efficiency?
3. What role does risk assessment data (e.g., credit scores) play in building a bank's client database?
4. Why is it useful for a pharmaceutical retailer to analyze regional health trends?
5. How can a TV channel use social media engagement to design new content?
6. Which type of data (Volume, Velocity, Variety, Veracity, or Value) do you think is the most challenging to manage in each case? Justify your answer with examples.
7. Imagine you are a data analyst at one of these companies. Which tools (Hadoop, Spark, cloud storage, machine learning models, etc.) would you choose for analyzing the data, and why?

PART 2. PROS AND CONS OF BIG DATA

LEAD-IN

1. Study the big data statistics. Decide which facts show the advantages and disadvantages of big data.

BIG DATA PROS	BIG DATA CONS

BIG DATA STATISTICS:

1. Spending on Big Data & Business Analytics solutions hit **\$215.7 billion** in 2021. The global Big Data market is forecasted to grow to **\$103 billion** by 2027.
2. Breaches and misuse are major fears, especially in light of high-profile cases like Cambridge Analytica, where data from **87 million Facebook users** was misused without consent.
3. By 2027, global data is projected to reach **183 zettabytes** – an astronomical 46 trillion gigabytes.
4. In Europe, improved operational efficiency via Big Data could save government administrations over **€100 billion**.
5. Around **90% of data generated** – especially from sensors – goes unanalyzed.
6. Data centers are energy-intensive. In the U.S., they consumed **70 billion kWh** in 2014 – that's **1.8% of the nation's electricity usage**.
7. **66.7%** of organizations reported that Big Data analytics helped reduce expenses (New Vantage survey), and **59.4%** observed cost reduction and improved efficiency (Syncsort survey).
8. Storing redundant or unused data can cost organizations heavily – potentially **\$899 billion** in storage and management by 2025 across EMEA.

[2; 31; 48]

READING

Pre-reading

1. **Reflect on the challenges that big data can present in the future. Choose the one that raises your personal concern the most. Why?**

Task 1. Read the article from the online blog of Harvard University. Compare your personal concerns about big data with the ones described in the article.

The Advantages and Challenges of Big Data

Every time you check your GPS for directions and receive an estimated arrival time, or when streaming platforms such as Netflix and Disney+ recommend shows or movies based on your preferences, you are experiencing the benefits of big data. Beyond these everyday conveniences, big data drives innovation across multiple industries, including health care, government, business, finance, and retail.

Big data is transforming health care by improving research and providing better insights into disease prevention, diagnosis, and treatment. Health organizations use large datasets to analyze patient information, identify health trends, predict disease outbreaks, and develop treatment plans that enhance both individual and public health outcomes. Katherine Chou, Director of Research and Innovation at Google, explains: *“People are expecting data to be used for the purposes of improving health care outcomes.”*

Governments use big data to enhance public services, allocate resources efficiently, and engage citizens more effectively. From urban planning and traffic management to health care and emergency response, data-driven decisions allow governments to benefit communities and improve overall quality of life.

Big data is changing education by supporting personalized learning and adaptive teaching methods. Teachers and schools utilize data analytics to monitor student progress, pinpoint learning gaps, and tailor instruction to meet individual needs. For example, Professor Raj Chetty uses big data to examine the effects of class size and the impact of higher education on students from different socioeconomic and geographic backgrounds.

Big data also supports social and environmental initiatives. Policymakers and activists use data to monitor climate trends, respond to disasters, and create social welfare programs. Chetty’s research on social mobility demonstrates how large datasets can inform policy and help communities improve social and economic outcomes.

Despite its advantages, big data also presents significant challenges. Collecting and analyzing vast amounts of data increases the risk of privacy breaches and cyberattacks. Protecting personal information and ensuring data security are major concerns for individuals and organizations.

Implementing big data solutions can be expensive. Organizations often need to invest in infrastructure, software, and trained staff, and they may face ongoing costs for data storage and maintenance. These expenses can be particularly challenging for non-profit and educational institutions.

Algorithms used to process big data may contain biases based on race, gender, or socioeconomic factors. This can perpetuate inequalities, especially in health care and financial systems, where biased datasets lead to unfair outcomes. Ed Davis, CEO of the Edward Davis Company, notes: “Inequities in the health and criminal justice system, police brutality issues, issues around COVID, these are all problems that big data can affect.”

From limited historical records to the massive datasets available today, big data has reshaped industries, society, and daily life. When used responsibly, it can provide valuable insights, drive innovation, and create positive social change. However, organizations must balance opportunities with careful attention to privacy, fairness, and cost in order to maximize the benefits of big data for society.

(Adapted from: Pros and Cons of Big Data) [39]

Task 2. Match the words in Column A with their most natural collocations in Column B. The verbs in Column A can make collocations with more than one option from Column B.

Column A	Column B
1. analyze	a. disease outbreaks
2. enhance	b. patient information

3. implement	c. adaptive learning methods
4. monitor	d. public services
5. create	e. data-driven decisions
6. predict	f. privacy and security strategies
7. allocate	g. social welfare programs
8. ensure	h. valuable insights
9. tailor	i. health outcomes
10. reduce	j. instruction to student needs
11. drive	k. infrastructure costs
12. protect	l. personal information

[7]

Task 3. Study the vocabulary from the article. Sort out the collocations under the following headings.

Opportunities & Benefits	Challenges & Risks	Government & Society	Health Care

positive social change, resource allocation, treatment plans, infrastructure costs, improved outcomes, urban planning, public health outcomes, privacy breaches, insights, biased datasets, emergency response, disease prevention [7]

Task 4. Fill in the blanks with the right vocabulary item.

personalized learning	innovation	algorithm	data-driven decisions
data analytics	infrastructure costs	social mobility	privacy breaches

1. Hospitals use _____ to predict disease outbreaks and improve treatments.

2. Governments rely on _____ to plan cities, manage traffic, and respond to emergencies.
3. One of the biggest risks of big data is _____, where personal information can be stolen.
4. Education is being transformed by _____, which adjusts teaching to each student's needs.
5. Companies face high _____ when building big data infrastructure.
6. If an _____ is based on unfair information, it may lead to discrimination.
7. The study of _____ helps policymakers understand how people's economic status changes over time.
8. Proper use of big data can drive _____ and support positive social change.

Task 5. Transform the words in brackets to complete the following sentences.

1. Big data is the most effective ... to improve research and patient outcomes (SOLVE)
2. An effective resource ... can be achieved by processing big data. (MANAGE)
3. It can be hard to foresee ... based on socioeconomic status. (DISCRIMINATE)
4. Using big data responsibly requires careful of privacy and fairness. (CONSIDER)
5. The most burning issue on the agenda of today's meeting is ... of the budget resources. (ALLOCATE)
6. Data-driven can improve efficiency in urban planning. (DECIDE)
7. Big data supports the ... of new business models. (INNOVATE)
8. The of personal information is a major challenge for organizations. (SECURE)
9. Teachers apply data analysis for ... of student progress. (ASSESS)

10.Climate ... is possible through the use of big data. (MONITOR)

Task 6. Rewrite the sentences using either passive voice or cleft sentences for emphasis.

Example:

- **Active:** *Scientists study climate patterns.*
 - **Passive:** *Climate patterns are studied by scientists.*
 - **Cleft:** *It is climate patterns that scientists study.*
1. Health organizations analyze patient information to identify trends.
 2. Chetty's research demonstrates how large datasets inform policy.
 3. Big data has reshaped industries, society, and daily life.
 4. Governments use big data to allocate resources efficiently.
 5. Teachers use adaptive learning methods to improve student progress.
 6. Policymakers monitor social welfare programs to support communities.
 7. Companies implement privacy and security strategies to protect personal data.
 8. Researchers predict disease outbreaks using large datasets.
 9. Streaming platforms recommend content based on users' preferences.
 10. Organizations drive innovation through data-driven decisions.

Task 7. Fill in the blanks with the correct linkers from the list.

<i>moreover</i>	<i>despite</i>	<i>as a result</i>	<i>whereas</i>	<i>in order to</i>	<i>such as</i>
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1. Big data improves education, _____ it also supports personalized learning.
2. _____ collecting and analyzing data has many benefits, it also raises privacy concerns.
3. Governments use big data for many purposes, _____ traffic management and health care delivery.

4. Big data helps policymakers monitor climate trends _____ respond to disasters effectively.
5. Streaming platforms recommend content based on user preferences, _____ they increase engagement.
6. Some algorithms are designed to improve efficiency, _____ they may introduce biases.
7. Researchers study social mobility using large datasets, _____ they aim to improve policy outcomes.
8. Organizations invest in infrastructure and trained staff _____ implement big data solutions successfully.

Task 8. Replace the underlined words/phrases with more formal or academic equivalents.

tackle	identify	fosters	exacerbate	rigorous consideration of
adjust	substantial	in accordance with	determine	formulate

1. Big data **drives** innovation across multiple industries.
2. Implementing big data solutions can be **expensive**.
3. Algorithms may **perpetuate** inequalities.
4. Organizations must balance opportunities with **careful attention to** privacy.
5. Hospitals use big data **to find out** health trends and improve treatment.
6. Governments rely on big data **to make** decisions about resource allocation.
7. Education is being transformed by methods that **change according to** student needs.
8. Collecting and storing data presents **big** challenges for non-profit institutions.
9. Policymakers use big data **to deal with** social and environmental problems.

10. Streaming platforms recommend shows **based on** user preferences.

SPEAKING

Task 1. Reflect on the following issues. Use active vocabulary from the article to present your opinion.

1. Do you think personalized learning through data analytics is better than traditional teaching methods? Why?
2. Should health organizations be allowed to use patient data for research if anonymity is guaranteed? Why/why not?
3. How can big data contribute to tackling global challenges such as climate change?
4. In what ways can big data reduce social inequalities, and in what ways might it increase them?
5. How do you see big data shaping our daily lives in the future? Will the impact be more positive or negative?

ACADEMIC WRITING

Task 1. Study the guide on how to interpret and present statistical data [19].

Guide: How to Describe and Present Statistical Data

1. Introduce the Data Source

- Begin by telling your audience **what the data is about, where it comes from, and its time frame.**
- *Useful phrases:*
 - “The data illustrates/shows/compares ...”
 - “According to a survey conducted by ... in (year) ...”
 - “This chart provides information on ... over the period ...”

E.g., “According to Statista, global data generation is expected to reach 163 zettabytes by 2025.”

2. Identify the Type of Data Presentation

- Tables
- Bar/line/pie charts
- Infographics
- Percentages, ratios, or absolute numbers

Phrase starter:

- “The bar chart highlights ...”
- “The line graph demonstrates a trend in ...”
- “The pie chart breaks down the proportion of ...”

3. Describe Trends and Patterns

Focus on **direction** (increase, decrease, stability), **speed** (rapidly, gradually), and **degree** (slight, sharp, dramatic).

- *Verbs*: rise, grow, increase, climb, double, decline, drop, decrease, plummet, fluctuate, remain stable
- *Adverbs*: steadily, slightly, significantly, dramatically, sharply, marginally

E.g., “Data consumption has increased dramatically, almost doubling every two years.”

“Email usage remained relatively stable, while social media activity grew steadily.”

4. Compare Data

Highlight similarities and differences.

- *Useful phrases*:
 - “In comparison to ...”
 - “X was twice as high as Y.”
 - “While A rose steadily, B experienced a sharp decline.”

E.g., “In 2012, only 2.5 exabytes of data were generated daily, whereas by 2025 the figure is projected to be 163 zettabytes.”

5. Highlight Key Numbers

Use **percentages, ratios, and exact figures** to strengthen your point.

- *Phrases:*
 - “An increase of 45% ...”
 - “One out of three respondents ...”
 - “Reaching a peak of ...”

E.g., *“Approximately 90% of all data generated worldwide remains unused, known as dark data.”*

6. Interpret the Data

Don’t just state numbers – **explain what they mean** and why they matter.

- *Useful phrases:*
 - “This indicates that ...”
 - “The findings suggest a shift toward ...”
 - “The data reveals a correlation between ...”

E.g., *“The fact that 66% of companies report cost reductions with Big Data suggests that analytics has a strong impact on efficiency.”*

7. Conclude with Insights

Summarize the overall pattern or implication.

- *Phrases:*
 - “In conclusion, the data highlights ...”
 - “Overall, the trend shows ...”
 - “This underlines the importance of ...”

E.g., *“Overall, the statistics confirm that Big Data is both a powerful driver of innovation and a significant challenge in terms of privacy and infrastructure.”*

Task 2. Study the statistical data presented in this table. Read the interpretation of the data from the table. Order the paragraphs in accordance with the guide. Match the paragraphs (1-7) with the headings (A-G).

A. Introduction

B. Data Identification

C. Trends Description

D. Data Comparison

E. Data Interpretation

F. Key Numbers Highlights

G. Conclusion

Big Data: Industry Adoption and Impact

Category/Sector	Statistic Data	Sources
Overall Business Adoption	Over 97% of businesses have invested in Big Data; only ~40% are effectively using analytics	DemandSage
Retail	88% adoption; enabling inventory and personalization improvements	Zipdo
Healthcare	70% adoption of predictive analytics among hospitals	Zipdo
Education	66% of universities investing in personalized learning via Big Data	Zipdo
Manufacturing	Downtime reduced by 20-25%; supply chain efficiency improved by over 30%	Zipdo
Finance & Banking	Fraud detection with up to 90% accuracy; sector holds 26% of total Big Data investments	WifiTalents
Decision-Making	52-60% of organizations report improved decision-making due to Big Data	Gitnux

Challenges	63% cite data quality issues; 56% cite talent shortages	Gitnux
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1. Overall, the statistics highlight that Big Data is not only a **powerful driver of efficiency and innovation**, but also a **challenge in terms of utilization and data quality**. With **63% citing quality issues** and **56% facing talent shortages**, the future impact of Big Data will depend on addressing these limitations.
2. The data reveals **rapid adoption across all major industries**, but the **depth of usage and efficiency varies**. For instance:
3. **Retail** shows strong adoption (**88%**) with a focus on **inventory and personalization**.
4. **Healthcare** is using Big Data in **70% of hospitals**, particularly for **predictive analytics**.
5. In comparison, the manufacturing and finance sectors demonstrate some of the most tangible impacts of Big Data. In manufacturing, the use of analytics has led to a 20–25% reduction in downtime and an improvement of over 30% in supply chain efficiency. Meanwhile, in finance and banking, Big Data plays a critical role in fraud detection with accuracy rates of up to 90%, and the sector accounts for 26% of total global Big Data investments, highlighting its leading position in adoption and application
6. **Education** is catching up, with **66% of universities** investing in **personalized learning systems**.
7. According to multiple industry reports (DemandSage, Zipdo, WifiTalents, Gitnux), Big Data adoption is widespread but not always efficient. Over 97% of businesses have already invested in Big Data solutions. However, only around 40% of them are making effective use of analytics.
8. Over **97% of businesses** have already adopted Big Data solutions, yet only about **40%** are using them effectively, revealing a significant efficiency

gap. Adoption levels vary by sector: **retail leads with 88%**, followed by **healthcare at 70%** and **education at 66%**. In manufacturing, Big Data contributes to a **20–25% reduction in downtime**, while in finance, it enables **fraud detection with up to 90% accuracy**. Overall, between **52% and 60% of organizations** report that Big Data has improved their decision-making processes.

9. This indicates that while Big Data is **widely recognized as essential**, its **real benefits** appear most clearly in industries with **operational and financial pressures**. The **gap between adoption and effective use** suggests that many organizations still lack the expertise or infrastructure to fully exploit analytics.

(adapted from: Big Data Industry Statistics) [18]

Task 3. Study the statistical data presented in the table below. Interpret and present this data in the format of a polished, coherent text. Stick to the recommendations given in the guide.

Big Data in Education: Adoption and Impact

Category	Category	Source / Notes
Market Size 2023	\$22.1 billion	Global market value
Projected Market 2027	\$47.82 billion	CAGR 20.79%
Projected Market 2033	\$115.7 billion	CAGR ~18%
Real-Time Analytics Adoption	83% of school districts	Up from 68% in 2021
Personalized Learning Adoption	66% of universities	Implementation of adaptive learning systems
Predictive Analytics Use	Identify at-risk students & reduce dropout rates	Higher education applications

Challenges: Data Quality	63% of institutions	Data quality issues reported
Challenges: Skilled Staff Shortage	56% of institutions	Lack of trained personnel for analytics

[25; 32; 38]

NB! CAGR – Compound Annual Growth Rate.

CASE STUDY

<https://homebusinessmag.com/blog/gaming/how-casino-industry-leverage-big-data-maximize-profits-customer-retention/> [24]

The Role of Big Data in the Casino Industry

Background

The casino industry relies heavily on creating an engaging and attractive environment to maximize profitability. Eye-catching interiors and well-planned layouts play a crucial role in attracting and retaining gamblers. However, managing these aspects requires significant investment, and budget allocation must be optimized to ensure maximum returns.

The Role of Big Data

Casinos worldwide have begun implementing **Big Data analytics** to manage operations more efficiently and enhance revenue streams. Big Data provides actionable insights that help managers make informed decisions regarding casino design, customer engagement, and operational efficiency.

Applications of Big Data in Casinos

1. Game Popularity and Allocation

Big Data tracks newly launched and popular games, enabling managers to **increase the number of high-demand machines** and optimize floor space to maximize customer engagement.

2. Space and Layout Management

Analytics help determine **where machines should be positioned or rearranged**, ensuring the casino floor is optimized for accessibility, visibility, and customer flow.

3. Transaction Monitoring and Loss Prevention

By keeping detailed records of **transactions and game activity**, Big Data enables casinos to **prevent losses** and identify trends that could impact profitability.

4. Customer Engagement and Retention

Insights derived from Big Data enable casinos to **personalize experiences, foster loyalty, and encourage repeat visits**, ultimately driving long-term revenue growth.

Impact and Outcomes

Casinos using Big Data have reported **significant revenue growth** and improved operational efficiency. By leveraging analytics, they can **invest strategically in games, design, and customer engagement**, ensuring sustained profitability over the years.

Step 1. Case Study Insight

Objection: Identify key points of the case.

1. List the main ways Big Data is used in casinos according to the case study.
2. Find and explain the meaning of these terms from the text: *analytics, profitability, engagement, transaction monitoring, and operational efficiency.*

Step 2. Case Study Analysis

Objection: give insight into the causes and effects of big data applications in casinos.

1. Explain how Big Data helps casinos increase revenue. Use at least three examples from the case study.

2. If a casino notices that one game is losing popularity, how could Big Data help the management respond effectively?
3. Compare traditional casino management without Big Data to management using Big Data. What are the key differences?

Step 3. Application and Problem-Solving

1. **Design a Strategy:** Imagine you are a casino manager. Suggest **three ways** you would use Big Data to improve customer engagement.
2. **Predict Outcomes:** Based on the case study, what might happen to revenue if Big Data analytics were not used?
3. **Decision-Making Exercise:** Given a limited budget, prioritize the following activities using Big Data insights. Explain your choices.
 - purchasing new machines
 - redesigning interiors
 - marketing promotions

Step 4. Critical Thinking

Objection: consider related issues and future trends.

1. Discuss potential ethical issues with using Big Data to track customer behavior in casinos.
2. Predict how Big Data might further transform the casino industry in the next 5–10 years.

CASE STUDY 2 (OPTIONAL)

<https://www.worldhappiness.report> [53]

<https://news.gallup.com/poll/612125/happiest-country-earth.aspx> [41]

The Data Behind Happiness

Interpreting Gallup's Global Insights (2010–2025)

Background

Imagine you are analysts for an international NGO preparing a report on “*Happiness and Well-being Trends 2010–2024.*” Gallup’s World Poll data

provides measurable indicators like life evaluation, social support, health, and freedom. Your task is to select one region (or variable), analyse trends, and present your findings through both written and spoken communication. In other words, you are tasked with moving beyond simple rankings to find the “story” behind the numbers.

Step 1. Divide your group into teams of 4-5 people.

Step 2. Use the **Gallup World Poll** and **World Happiness Report** datasets (2010–2025) for your research.

Step 3. Select a Focus: Choose either one **Region** (e.g., Central & Eastern Europe) or one **Variable** (e.g., The relationship between *Generosity* and *Life Evaluation*).

Step 4. Analyse Trends: Identify a significant change or correlation that occurred between 2010 and 2025. Use your technical skills to identify outliers, shifts, or predictive patterns.

Step 5. Deliver Results:

- **The Research Summary:** A technical but accessible 2–3 page document.
- **The Presentation:** A 5-minute briefing that explains *why* these trends matter for future policy.

Research Guidelines (Technical Requirements)

To satisfy the “Analytics” component, your research must include:

- **Data Visualization:** At least two original charts (e.g., a time-series line graph showing regional shifts or a scatter plot showing the correlation between GDP per capita and Happiness Score).
- **Metric Interpretation:** You should explain the weighting of at least three Gallup variables: *Social Support*, *Healthy Life Expectancy*, *Freedom to make life choices*, *Generosity*, or *Perceptions of Corruption*.

- **Comparative Analysis:** Compare your chosen focus against the “**Dystopia**” baseline used by Gallup

Deliverables & Format

Deliverable A: The Research Summary (2–3 Pages)

- **Abstract:** 150-word summary of findings.
- **Introduction:** Problem statement and choice of region/variable.
- **Methodology:** Brief description of data handling (e.g., “We utilized Python for data cleaning and focused on the 2010-2024 longitudinal subset”).
- **Discussion:** Interpreting the “Human” side of the data in professional English.
- **References:** Proper APA/IEEE citation of Gallup and secondary sources.

Deliverable B: The Briefing (5 Minutes)

- **Hook:** Start with a compelling data point.
- **The “What”:** Clear visualization of the trend.
- **The “So What”:** Real-world implications for the NGO.
- **Q&A:** 2 minutes of defending your data choices.

Assessment & Grading Rubric

Criteria	Weight	Emerging (Developing)	Proficient (Target)	Exemplary (Advanced)
Data Literacy & Analytics	30%	Basic description of data; visuals are unclear or redundant.	Accurate interpretation of variables; clear, labeled visualizations.	Sophisticated analysis; identifies non-obvious correlations or shifts.
Academic Writing (ESP)	30%	Informal tone; significant	Professional/neutral tone; clear	Precise technical

Criteria	Weight	Emerging (Developing)	Proficient (Target)	Exemplary (Advanced)
		grammatical errors; poor structure.	paragraphing; standard technical vocab.	English; seamless flow; perfect use of transitions.
Communicative Effectiveness	20%	Reads from slides; lacks eye contact; exceeds time limit.	Engages audience; clear pronunciation; effective use of visual aids.	Persuasive and charismatic; handles complex questions with ease.
Research & Documentation	20%	Minimal sources; incorrect citation format.	Reliable sources used; consistent citation (APA/IEEE).	Wide range of sources; critical evaluation of data limitations.

PROJECT WORKS TOPICS

Cybernetics & Computer Science

1. Norbert Wiener's Legacy: How cybernetics laid the foundation for the Information Age.
2. Milestones in Computer Science: A visual timeline of key discoveries and inventions.
3. Cybernetic Insights into Supply Chain Disruption During the COVID-19 Pandemic.
4. Norbert Wiener's Predictions: Cybernetics, Automation, and the Future of Humanity.
5. The Emergence and Influence of Cybernetics.

Artificial Intelligence

6. Alan Turing and the Turing Test: Relevance in the age of ChatGPT and generative AI.
7. AI in Drug Design: Case studies on how AI speeds up the search for new medicines.
8. Bright or Dark Future of AI: A debate-based project with real-world examples.
9. Ethics of the relations with AI and its influence on the conscious of a human-being.

Internet in the Digital World

10. Ethics of Online Communication: Guidelines for respectful and safe digital interaction.
11. The Evolution of the Internet: From ARPANET to 5G and beyond.
12. Social Networking Sites: Balancing benefits (connection, knowledge) and pitfalls (privacy, addiction).

Cyber Security & Networks

13. Cybercrime Today: Typology, case studies, and prevention methods.

14. Telemedicine and Telecommuting: Prospects for digital work and healthcare.
15. Cyber hygiene and information security in the educational environment.

Robotics

16. Asimov's Laws vs. Reality: Do modern robots follow ethical principles?
17. Robotics in Everyday Life: Applications in medicine, industry, and household tasks.

Big Data

18. Cloud Storage Security: How safe is our personal and corporate data?
19. Big Data in Society: Benefits and challenges of data mining in decision-making.

E-Commerce, Green Tech & Future Advances

20. Smart Houses and Green Technologies: How AI can make our homes eco-friendly.

Recommended resources for the project works:

Cybernetics & Computer Science

1. **Ashby, W. R. (1956).** *An introduction to cybernetics*. Chapman & Hall.
2. **Mindell, D. A. (2002).** *Between Human and Machine: Feedback, Control, and Computing before Cybernetics*. Johns Hopkins University Press. (Focuses on the historical evolution of feedback systems).
3. **Pangaro, P. (2021).** *Cybernetics: Offering a Future for Artificial Intelligence*. Journal of Forbes. (Explores how Wiener's legacy is essential for modern AI ethics).
4. **Wiener, N. (1948).** *Cybernetics: Or control and communication in the animal and the machine*. MIT Press

Artificial Intelligence

5. **Bostrom, N. (2014, updated 2024).** *Superintelligence: Paths, Dangers, Strategies*. Oxford University Press. (Key resource for Topic 9 regarding AI influence on human consciousness).
6. **Mitchell, M. (2019).** *Artificial intelligence: A guide for thinking humans*. Farrar, Straus and Giroux.
7. **Russell, S., & Norvig, P. (2021).** *Artificial intelligence: A modern approach* (4th ed.). Pearson.
8. **Suleyman, M. (2023).** *The Coming Wave: Technology, Power, and the Twenty-first Century's Greatest Dilemma*. Crown. (An essential read on generative AI and the future of synthetic intelligence).

Internet & Digital World

9. **Berners-Lee, T. (1999).** *Weaving the web: The original design and ultimate destiny of the World Wide Web by its inventor*. Harper.
10. **Galloway, S. (2022).** *Adrift: America in 100 Charts*. Portfolio. (Visual data on the evolution of the digital economy and internet connectivity).
11. **Zuboff, S. (2019).** *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*. PublicAffairs. (Perfect for Topic 12 on privacy pitfalls in social networking).

Cyber Security & Networks

12. **Greenberg, A. (2022).** *Tracers in the Dark: The Global Hunt for the Crime Lords of Cryptocurrency*. Doubleday.
13. **Schneier, B. (2015).** *Secrets and lies: Digital security in a networked world*. Wiley.

14. **Schneier, B. (2024).** *A Hacker's Mind: How the Powerful Bend Society's Rules, and How to Bend them Back*. W. W. Norton. (Advanced insights into systemic security and digital trust).

Robotics

15. **Ford, M. (2021).** *Rule of the Robots: How Artificial Intelligence Will Transform Everything*. Basic Books. (Useful for Topic 17 on robotics in industry and household tasks).

16. **Siciliano, B., & Khatib, O. (Eds.). (2016).** *Springer handbook of robotics* (2nd ed.). Springer.

Big Data

17. **Mayer-Schönberger, V., & Cukier, K. (2013).** *Big data: A revolution that will transform how we live, work, and think*. Eamon Dolan/Houghton Mifflin Harcourt.

18. **Laudon, K. C., & Traver, C. G. (2024).** *E-commerce: Business, technology, society* (17th ed.). Pearson.

19. **Kaku, M. (2011).** *Physics of the future: How science will shape human destiny and our daily lives by the year 2100*. Doubleday.

PROJECT WORK GENERAL REQUIREMENTS

1. The project is presented in visual form.
2. Slides should not be text-heavy; use short phrases, bullet points, and visuals instead of long paragraphs.
3. Presentation should not exceed **7–10 minutes**.
4. Presentation should involve the following obligatory parts: Introduction; objectives: *main body with key issues highlights, conclusion, references (resources used)*

5. Slide-Specific Guidelines

Title Slide – project title, your name, group index, and date.

Introduction Slide – brief background/context, relevance of the topic. Why this issue is important.

Objectives Slide - clear and concise aims of the project (2–4 bullet points). State expected outcomes.

Main Body (3–5 slides) should obligatorily embrace:

- **problem Overview:** briefly explain the issue and its scope;
- **key issues/challenges:** highlight 2–3 core problems;
- **your vision/analysis:** show your unique perspective;
- **proposed Solutions:** practical and realistic recommendations.

Conclusion Slide: recap key points, summarize insights and possible solutions, suggest future steps or recommendations.

References Slide: cite all sources (APA/MLA/Harvard format depending on requirements). Use at least 3–5 reliable references.

6. Prepare speaker notes (do not read directly from slides).
7. Practice timing to stay within the limit.
8. Be ready to answer 2–3 questions at the end.

PEER ASSESSMENT OF PROJECT WORK

Peer assessment is an opportunity to help your groupmates improve their work while developing your own critical thinking and evaluation skills. Please follow the steps below.

Requirements

1. **Respect** – feedback must be constructive, polite, and specific.
2. **Objectivity** – assess the work, not the person. Avoid personal comments.
3. **Balanced Feedback** – include both strengths and areas for improvement.

Instruction for Students

1. **Watch the Project Presentation Carefully** – Take notes on key points or what stands out (both strong and weak points).

2. **Use the Rubric/Criteria Provided Use the Rubric (Scoring)**

For each criterion (Content, Structure, Creativity, Language, Presentation):

Circle or tick the score that best describes the project:

- **4 = Excellent**
- **3 = Good**
- **2 = Fair**
- **1 = Needs Improvement**

Be fair and objective. Base your score on the **work**, not the person.

3. **Write Feedback in Two Parts:**

- **Strengths** (What was done well? **Be Specific** – Instead of “Good work,” write “The introduction clearly states the purpose and makes the reader interested.”)
- **Suggestions** (What can be improved? Be constructive: “*Consider adding more recent sources to strengthen your argument.*”)

4. **Avoid Bias** – Do not let personal relationships influence your evaluation. Focus on the project, not the student.

Keep comments **polite and supportive**.

Remember: **balanced feedback** means noticing both strengths and areas for growth.

5. Submit via group chat after the presentation.

Your role is not only to grade, but also to give feedback that helps your peers improve and motivates them.

Peer Assessment Rubric for Student Projects

Project Title: _____

Reviewer Name: _____

Criteria	Excellent (4)	Good (3)	Fair (2)	Needs Improvement (1)	Score
Content & Knowledge	Deep, accurate, insightful, well-researched	Accurate, minor gaps	Some inaccuracies, limited depth	Major gaps, superficial	—
Structure & Organization	Clear, logical, easy to follow	Mostly clear, minor issues	Somewhat disorganized	Hard to follow	—
Creativity & Innovation	Highly original, creative solutions	Some originality, creative ideas	Limited originality	Minimal creativity	—
Language & Style	Very clear, correct grammar, academic tone	Mostly clear, minor mistakes	Understandable, some errors	Frequent mistakes, unclear	—
Presentation/Design	Visually engaging, professional	Clear, some design issues	Basic, could improve	Distracting or weak visuals	—

Total Score: ____ / 20

Written Feedback

Strengths:

1. ...
2. ...

Suggestions for Improvement:

1. ...
2. ...

Sample of the written review:

Presentation Review: Key Milestones in Computer Science

Strengths:

1. Key Figures and Innovations: The presentation successfully identifies significant developments in the history of computing technology, especially having to do with those who created some of the original computer technologies, including Ada Lovelace (who wrote the first computer program) and Alan Turing (who conceived of the Turing machine).

2. Contextual Examples: It includes interesting multiple examples of real-world advances made with the use of computing technology, with reference to the Turing-Welchman Bombe machine in the breaking of the secret Nazi code, as well as the invention of the first computer “bug”.

Room for Improvement:

1. Missing Synthesis in Conclusion: While the goal was to show how milestones connect to today’s technology, the final slides focus mostly on future technologies. A stronger conclusion would explicitly bridge the gap between 19th-century programs and 21st-century software.

2. Lack of Detail: A list of the most significant technological advances was formatted using bulleted points (such as “Invention of Transistor” and “Integrated Circuits”); however, the bulleted lists contain insufficient information (i.e., text) outlining why each of the innovations was revolutionary (i.e., miniaturization, increased speed).

AUDIOSCRIPTS

UNIT 2.

Norbert Wiener - Wiener Today (1981)

https://www.youtube.com/watch?v=cdu16JAzgw8&list=RDCMUCAxD-HZ7VQT3NhsU5Ky99CQ&start_radio=1

There are many quite ordinary things in electronics that we take for granted. For example, a microphone, I speak into a microphone, and my voice is amplified. What happens there is that the sound of the speakers is affecting the microphone, and that in turn makes the speakers louder, and so we get a feedback problem.

In each of these programs, I want to focus on the central idea of one of the great thinkers who have shaped our minds. What is that central idea, and is it still relevant today? Norbert Wiener was concerned with thinking about feedback systems. A type of thinking that is immensely important to society today, or to any complicated society.

Suppose we had a water tank and the water tank is being filled from this pipe or tap. Now, in that tank we have a ball, which is floating on the water, and over here there is a little stopper. Now, as the water rises, so the ball rises, and this stopper is forced upwards and eventually shuts off the water, so the effect of the rising water acts to shut off the water in a feedback effect.

Let's look at another feedback effect, in fact, the situation which Norbert Wiener was dealing with when he first started thinking about feedback systems. This is an aircraft that is coming into a bomb, and down here we have an anti-aircraft gun, which is trying to shoot down that airplane, and it shoots, and it misses. Now the extent of its miss, that gap as it were, is feedback to alter the aim of a gunner. So the gun now points in that direction, and this time it shoots, and it's successful, and it shoots down the airplane. Those are two simple examples of feedback systems, but they apply to many situations.

Let's look at feedback systems in the abstract now. We have A, which affects B, and B affects C, but the effect of C is a feedback to alter A. Now, supposing

we were to increase A, and this causes an increase in B, which causes an increase in C, and if the feedback is positive, then that causes an increase in A, which causes an increase in B and C, and A again, so we get a positive feedback or an explosive system.

Let's look at the alternative. We have A, B, and C again, but this time we are going to look at negative feedback. An increase in A causes an increase in B, which causes an increase in C, but this time the effect of C on A is to remove the increase, so now we get a stable system, a negative feedback system. So we get positive feedback, negative feedback, stable systems, unstable systems, but those are just lines and drawings.

Let's look at this type of feedback thinking in terms of actual people – a boy and a girl. I believe that traces of this kind of thinking can be found in our daily lives. The boy and girl have played different scenes for us, illustrating different types of thinking. In this scene, we see how the feedback principle operates in the area of interpersonal relationships.

[Showing a video with boy(B:) and girl(G:) conversation]

B: When I look at you, I can see that life's treating you really well.

G: That's true. Guess why?

B: Because you're in love, aren't you?

G: In love? Who should I be in love with?

B: You tell me. Why don't you say 'I love you' to me?

G: Because it wouldn't be quite true. I think I'm in love with love itself, not with you or with anyone else in particular.

B: Oh, I see. So when you're feeling this way, you're happy and delightful, and everyone falls in love with you.

G: It's a sort of cycle.

B: A cycle that goes on and on. And I'm caught up in it because I love you.

G: It works the other way around, too. When I'm depressed, I get moody, and everyone avoids me. So I get lonely and even more depressed. Then people avoid

me altogether. It's a sort of vicious circle. When you're feeling good, everything works to make you feel better and better. But when you're feeling bad, everything conspires to make you feel even worse.

B: It doesn't work that way for me.

G: Well, it does for me.

B: That's because you're emotionally unstable.

G: I can't do much about that. I'll have to learn to live with it.

B: But you don't have to. You could look for a situation that you're familiar with, and you could predict their influence on you. This would give you some emotional stability, because you would know in advance how they would affect you.

G: Sounds pretty theoretical to me.

B: But it isn't. I mean, you could take any social structure. With a family, for example, it should work within that structure. Whenever you are depressed, they will try and cheer you up. And whenever they're depressed, you would try and cheer them up. And because everybody communicates with each other in their ups and downs, they automatically help each other to find emotional stability.

G: I've never thought of my family as an emotional stabilizer. So you mean I should marry to create a stabilizing situation for myself?

B: Of course, everyone does. Nothing new. I mean, look around you. Our entire social system works like that.

G: Yes, you mean that if you're rich, people will lend you money and give you credit, which allows you to become even richer. But if you're poor, people won't even give you a job. So, you become even poorer, and then it's impossible to get a job.

B: That's right. If you're rich, it's easy to marry someone who's as rich as you, and that makes you even richer.

G: But that doesn't work the same way with intelligence. Because if you're intelligent, you're probably intelligent enough to marry someone who isn't, so

you don't get into competitive arguments. That keeps intelligence from running away with itself in the kind of vicious circles we've been talking about.

B: You know, you're right. The more a girl rejects me, the more attracted I become to her. So, I want her more, and then she rejects me even more. And this goes on and on.

G: Perhaps knowing the situation, you should stop seeing the girl. Then gradually you would forget her, so breaking the cycle.

B: Then perhaps no one would ever get married. But we are in an unstable system. And if you're in an unstable system, then you can rise to the dizzy heights of love, hopes, and everything else. To heights where everything's possible.

G: But quite everything.

Inclusion of Norbert Wiener, the American physicist and mathematician, among the great thinkers in this series may seem surprising at first. But it was Wiener who concentrated our minds upon and who developed ideas which may have more impact in this century, and in the centuries to come than any other line of thought. These ideas concerned complex systems, control systems, stable systems, and unstable systems. Why are some situations stable? Is it just because they are not moving, or are there certain dynamic aspects of stability? What are the basic principles of complex dynamic systems? If we are going to deal with the world in the future, we are going to have to understand complex and ever more complex systems of this sort.

[Showing a video-conversation with Professor Wiener]

- Professor Wiener, are you surprised to find yourself among the great thinkers?
- Should I be?
- I don't know, I have no idea how often you are included among the great thinkers in the history of mankind.
- I'm not sure whether I deserve that honor.

- You certainly had a very successful intellectual career starting from your childhood. As a child, you were considered something of a prodigy. This undoubtedly had an effect on your character and later on influenced the course of your scientific career. You strove to be the best at everything you did, and you became known for your great ambition.
- Yes, that's absolutely true, and as far back as I can remember, I always wanted to be a philosopher and a mathematician, and one of the best, in fact.
- You unquestionably reached that goal.
- I took over where others left off, and collected information and labeled this field cybernetics – the name comes from the Greek word for steersman. Cybernetics, though, may not be at all simple to understand at first glance.
- I noticed that you call it cybernItics, I have always called it cybernEtics.
- Well, I have been known to do things differently.
- Perhaps you could explain it simply? Maybe by explaining the system used for aiming with anti-aircraft guns. Wasn't this your contribution to the war against Hitler?
- It was really a very simple problem to solve, you could almost say trivial. Every Hunter who has ever taken an aim at a flying bird instinctively knows the trick. It's just a question of making use of certain available data, concerning the aircraft itself and the gun's own properties. When you have this data, it's possible to determine the exact place at which you have to aim in order to hit the plane, which is, of course, still moving.
- You aim ahead and then anticipate the movement of the target?
- Yes, but it's not as simple as that. You have to allow for any possible maneuvers by the pilot himself as well.
- In this connection, do you develop the mathematical theory of predictability?
- Yes, that's right. The technical limits of the aircraft and the physiological possibilities of the pilot had to be considered. These two factors form the basis for my statistical calculation of probability.

- Was it technically possible to accomplish this?
- With all due modesty, yes, it does seem to have worked.
- How is all this an example of a cybernetic problem?
- Both artillery and aircraft are components of one single dynamic system. Their relationship to each other is continuously changing, altering with the motion of the aircraft. A cybernetic problem is always connected with the control of a dynamic system.
- How would you set about solving a cybernetic problem?
- Through feedback. Through the transmission of information between the individual elements of the system.
- Could you give another example of a feedback system?
- Take control of the blood flow. A self-regulating control system par excellence. It is of vital importance to animals which live in cold regions, such as the Arctic Wolf. This sensor measures the temperature of the wolf's unprotected footpad. In this experiment, the animal's foot will be immersed in a bath of antifreeze to simulate the conditions of the Arctic winter, at a temperature well below the freezing point of the cells. The bath is cooled by dry ice. The animal is losing heat very rapidly to the cold bath. Yet, within seconds, the foot temperature levels off just above freezing and remains there indefinitely. Rather than constricting the blood vessels, the wolf has pumped more warm blood from the trunk to the foot to keep it from freezing. The animal is controlling its blood flow so precisely that only the exact amount of blood needed to keep the foot from freezing is allowed to leave the trunk. This, then, is the cybernetic way of looking at things. As you see, it is by no means just a limited theoretical aspect with no practical application. On the contrary, cybernetics, coupled as it is with mathematical control methods for solving new problems, can be applied to all aspects of science and technology.
- Does your thinking approach also apply to economics?

- Indeed, it does, to some extent, it always has. Higher demand leads to higher prices, but if the price rises, then the demand decreases. That's the ordinary law of supply and demand. The same holds for the labor market as well. Wage increases that are excessive lead to unemployment, and this, in turn, is supposed to reduce wage demands.

- Why then doesn't this seem to work anymore?

- Because the connecting links and their associations are really affected by psychology. With strong labor unions or good unemployment benefits, the fear of unemployment is less than it was, and so that link is weakened. In many cases, the wage demands are not seen as the cause of inflation, but as a result of inflation. Since money has already lost its value, demanding a higher wage is not automatically going to lead to more unemployment.

- So the problem with a free market is that we can never be certain of the links or of their nature when these occur within the minds of individuals.

- That's true enough, but the basic principles of cybernetics still apply. It only means that we have to apply them to people as well, rather than to imagine that economics is something that happens outside people, according to certain mathematical laws.

- What are the limits of the application of cybernetics to economics or human affairs?

- The same difficulty applies to all mathematics. If you could define the relationships exactly before you set out, and then translate them into mathematical symbols, the mathematics would work perfectly. But it is in choosing those relationships and defining them that we have the problem. Nevertheless, we are going to have to understand ever more complex systems if we are to deal with the future. Without that understanding, there may be no future.

Earlier in the program, we heard how Wiener first developed his feedback concept when he was trying to help anti-aircraft gunners to hit enemy planes.

Here we have a video game which simulates the shooting down of spacecraft. Let's play that game.

[Showing a video game]

So my aim improved as I became better able to use the feedback I was getting from the screen. We often forget how much feedback there is in ordinary everyday life. You wouldn't think there was much feedback in filling a cup of coffee, but there is. And I was once given the following problem by an institute for the blind. It seemed that the young boys and girls in the institute were in the habit of holding their fingers in the cup of coffee to be sure that they did not overfill the cup. And if the coffee was hot, there were a lot of burnt fingers. They were lacking in visual feedback, so it was necessary to provide some other sort of feedback. For example, we could have put something that floats into the cup and then hold the finger above the cup, fill the cup up, and as the cup fills, the cork rises. When it touches my finger, I stop filling it with coffee, take the cork out, and pass the jug on to the next person.

But that perhaps may be a little messy, so let's look at another way of providing feedback. This time, what I do is I get a long drinking straw, and I hold it near the end, and I hold that in the cup, and I blow down it while I fill the cup. As soon as I hear the bubbling sound, I know that the level of the coffee has reached the end of the straw, so I stop pouring and pass the jug on to the next person. So visual feedback in this case, which most of us take for granted, but some people can't.

Let's observe the curious behavior of this pendulum. I'm going to get it swinging. Let's see what happens. It seems to slow down, and then it starts up again, gets faster and faster, and then it starts to slow down again. What's happening? Well, here we can see that there's a yellow drinking straw linking this pendulum to that pendulum, so this pendulum acts on that, and the feedback from that pendulum interacts with that one, and so backwards and forwards, action and feedback. A nice example of feedback.

[Showing a video about family]

Back to the lives of an ordinary family. We can imagine a situation and a conversation in which Wiener's concept of feedback is applied, even though it is not directly described in that manner.

[Conversation from video (father(F:), mother(M:) and a son(S:) with his sister(s:))]

F: Isn't it your sports day next week?

S: Oh, only the trials. The sports day is not for a month.

F: Oh well, I'm sure you'll make it. You're always good at running.

S: I'm not so sure.

M: More?

S: Oh, no thanks. I've had enough.

s: You sure have.

S: Oh, shut up, pest. I'm trying to keep in shape for the trials.

s: Keep in shape? Are you kidding? You've got so out of shape in the last few months, I bet you can't get into last year's running shorts.

S: Oh, what do you know?

s: Anyway, I saw you just this morning guzzling down two whole bars of chocolate.

M: Oh, really, you shouldn't. You know there are far more calories in chocolate than in a normal meal.

S: Well, I get so hungry in the mornings. Always around 10 o'clock.

F: Maybe his blood sugar level's too low.

M: Could be.

s: Oh, nonsense. It's just because Susan won't go out with him.

M: Susan? Who's Susan?

s: Oh, a girl in his history class.

F: Ah, all is revealed. The boy is in love.

S: It's not true. And even if it was, which it isn't, what would eating a couple of bars of chocolate have to do with liking somebody?

s: A couple of bars? Anyway, Susan isn't interested in you. She only likes real athletic types.

M: Look, your brother's only a few pounds heavier than he was last year, and it doesn't show. You're just being mean and rude, and I don't like it.

s: Sorry.

F: No, let's get to the bottom of this. Now, the son is attracted to a girl. All goes well for a bit. Then the girl changes her mind. Son becomes frustrated. Starts eating sweets. He gets overweight. The girl, who only likes athletic types, rejects son because he's overweight. So, the son eats more and more and exercises less and less.

S: I still get exercise.

F: Yes, but not as much as you used to.

S: Anyway, it works both ways. Why can't she just fall in love with me? Then I'll stop eating, and I'll be back to normal in no time.

M: All I have to say, if she doesn't like you the way you are, she's not worth it.

F: Oh, no, it's not quite as simple as that, my dear. Now, let me put it another way. A, our son is unsuccessful in love because he's overweight. That is, he eats too much. B, he eats too much because he's unsuccessful in love. So, A causes B and B causes A, and so on and on and on and on in a cycle until somehow you manage to change the setup.

S: Well, how do I do that?

F: Well, your sister has told you what Susan thinks. I mean, surely you're intelligent enough to change the setup.

M: I have got a good idea. One that will get you back together with Susan and have you in shape for sports.

S: Oh, I'll try anything if it works.

M: Good. From today on, you can do all the chores.

F: Oh, yes.

M: And I can wash the dishes. Then tomorrow, you can mow the lawn, and you can..

F: You can wash my car.

S: Oh, come on.

In that family scene, we see one sort of feedback where something causes something, and then that feedback increases or decreases the cause. But Wiener was interested in feedback for control, in order to make something happen exactly as he wanted it to happen. Wiener did not invent feedback because it had been used by engineers and others before Wiener. But Wiener made it into a science, made it into a mathematical form.

Let's see how feedback affects the world.

[Showing a video]

A classic mechanical example of feedback is James Watts ball governor for the steam engine. As the speed of the shaft increases, the balls are flung outwards by centrifugal force. This information is fed through a mechanical linkage to the steam valve, so shutting off the steam. This allows the engine to slow down, the balls slow down, sink towards the shaft, and the engine can now speed up again and reach a stable speed.

Paris, London. The end of the 70s. On the gold market, the price rises because people buy. And the more people buy, the higher the prices go. More people buy gold, and this in turn causes the price to rise yet again. The sales go down, and the price slackens off. People are afraid that the whole market will collapse, so they panic and want their profit. They sell out, and this causes the price to drop even further. More people sell out, so again we see this effect of feedback, the effect of an action, causing the action or changing the cause of the action.

Kitty Hawk, North Carolina, 1903. The Wright brothers were the first to fly because they developed a system of control that depended on feedback. Everyone

else was trying to build stable planes. The Wright brothers built an unstable plane but developed a control system.

In space, 1980. We can send spacecraft containing people across 250,000 miles of space and bring them back again because we have developed accurate control systems. A new breakthrough in space flight. A test model of an American space shuttle is taken 7,000 meters high and released. The world's first spacecraft, equipped with wings and landing gear, starts its gliding descent to a landing. We control spacecraft and their direction in space, the living conditions in space, as well as soft landings on the Moon and rendezvous in space. These control systems allow the correct behavior to be preset and then adhered to. Furthermore, if things go wrong, then corrective action can be taken using the same control systems. A dried salt lake in the Mojave Desert of California, the landing place. The sole purpose of this test is to determine if it's possible, after a flight in space, to land a spacecraft softly on the Earth.

How can we evaluate the contribution made by Wiener to our thinking today? Well, it would be difficult to overestimate that contribution. The thinking started by Wiener with his concern for feedback systems is likely to have a much greater impact on society than the word games of traditional philosophy.

Society is complex and made up of a number of different elements. All these different elements are interacting and affecting each other in various ways. So, we get a number of complex systems, a number of interactive systems. Now, unless we can understand feedback systems, circular systems, stable systems, unstable systems, then we're not going to begin to cope with the complexity of society. And that was where Wiener started the thinking that we need to deal with that situation.

But there is another aspect. In the organizational revolution, which has already started, though many people may not have noticed it, much of the thinking is based on feedback and control systems.

Let's look at the evolution of work. In the beginning, there was manpower. And if you wanted to pull a heavy load, why did you just pull it along? Then came the Industrial Revolution. And here we developed engines for doing our work. We could pull along a load on wheels, and of course, we still acted as drivers to make sure the load went where we wanted it to go.

Now, we get to the next stage. We may still have our tractor, and we may still pull along the load, but this time it doesn't need a driver. The driver can be sitting somewhere in the shade, having a good time, and doesn't need to be driving it, because with control systems and automation, the work will be done without the need for human intervention.

So, if we could summarize the contribution of Wiener, we could say he marks the beginning of a whole new chapter in human evolution.

UNIT 3.

Audio 1.

Secret agents from the GCHQ department are tasked with stopping ransomware attacks, which is when hackers steal data, lock computer systems, and demand a ransom. So, they're dealing with at least one incident every day. Well, the National Cyber Security Center's working with Marks and Spencer after its IT system was shut down earlier this year, you may remember. Well, the BBC's Panorama program has also been told that 2025 is likely to be the worst year on record for ransomware attacks. BBC Panorama's Richard Bilton has more.

When the attack comes, it can be hard to spot. "We always got a handover from the night supervisor. So, first thing you get out of bed in the morning, cup of tea, bang up the email. The night supervisor had sort of written on there that he had suffered some challenges through the night with some ser, you know, computer systems not working quite properly".

In 2023, K&P was running 500 trucks, most under the brand name Knights of Old. A ransomware gang locked their computers and stole their data. This message appeared: “For now, let's keep all the tears and resentment to ourselves and tried to build a constructive dialogue.” The gang demanded a ransom to put things back, but KMP didn't have the money. The company went bust because the hackers had worked out an employee`s password.

- Have you ever told them?
- No.
- Why?
- Would you want to know if it was you?

Disruption at Marks and Spencer`s operations after a cyberattack over Easter is still continuing.

It's been a summer of cyberattacks. M&S and the Co-op both breached. It means high pressure in here. This is the front line. Panorama has been given access to the National Cyber Security Center, part of GCHQ. These are spies fighting cyber gangs.

- It's incredibly common. I mean, we get in at least one report a day of an organization being encrypted. There are so many attackers out there targeting organizations all the time that, you know, all you need to do is lip up once and they might find a chance that they can get in.
- As we stand at the moment with ransomware, are the criminals winning?
- I don't think I'd say the criminals are winning.
- They're doing well, though, aren't they?
- The criminals are doing well. At the end of the day, we see so many cyberattacks that aren't successful. You know, sadly, it isn't a surprise when one or two do get through and they create the scale of impact that we've seen.

If prevention fails, another team steps in. This unit from the National Crime Agency is helping Marks and Spencer. Recently, four people were arrested.

- It's incredibly busy. The demand has increased significantly year on year. I predict it's going to be the worst year on record for ransomware attacks in the UK, for sure.

Ransomware is the growing lucrative crime that threatens us all.

- Well, Richard Bilton joins us now. Fascinating and important investigation there. Just tell us how you got access to be able to see what exactly the security services are doing.

- I mean, I I've been interested in ransomware for a while and so I approached the National Cyber Security Center last winter, but then subsequently Marks and Spencer, you know, the co-op, there've been these big attacks and it's brought the issue into the foreground. And I think the people in the NCSC thought: "Look, this is a massive threat and people need to know the scale of it." I mean, their message is quite clear. You heard it in that piece which is, you know, we will do all that we can to provide a first layer if you like to make sure people are safe of ongoing attacks or try and prevent them and make the system more robust, but in the end it's down to companies to protect themselves. Like if you had a warehouse full of goods, the police might advise you on the best way of protecting that warehouse, but, ultimately, it's down to you. and they think, generally, as a nation and they're backed up by reports from people like the National Audit Office, as a nation we're probably not doing enough at the moment we need to do a lot more.

- And you say the nation needs to do a lot more. So, how grave is the threat then?

- I mean, it's a sort of terrifyingly that real, I think, if you talk to people who know about this world, they will just casually say that we are quite near a national incident. So, the national audit office said that the threat was severe and advancing quickly. That was their words. A parliamentary joint committee suggested that we were quite close to a catastrophic incident. I mean, under siege is a big expression, but there are attacks all the time. And, so, the NCSC part of GCHQ, they're doing their job, they would say as a sort of lair. And they say we don't know whether this is true, but they tell us that they fend off more, far more

than we actually see in the end. But our level in this country of cyber defense is low. We've seen very big companies, like Marks and Spencer and co-op, they have been laid low by these attacks. So, 19,000 ransomware attacks on UK businesses last year. Industry sources say the average demand is about 4 million pounds a year. Talk to people who know about this world and they'll tell you a lot of companies pay and we never get to hear about it. They just pay and make it go away. So, this is a genuine threat and, of course, all our data is wrapped up on the internet. This is not some different thing about companies that we shop in. It's about all of us. All of us give hand our data over. If that company is then breached then we're all in it.

- It's a really interesting subject, isn't it, Richard? Do we know more about who the hackers are?

- Well, we sort of do. I mean, the thing about internet hackers is you really don't know who you're dealing with. So, there are a series of gangs. Akira was the gang that were in that piece that you just saw. But somebody else might attack and use that name. You don't know who you're dealing with for sure. Generally speaking, what makes it hard for the security services and for the investigators is this is a threat that's overseas. Often countries like Russia or North Korea or Iran where it's very hard to reach out there. You know, these attacks take place in areas where you just can't try and prevent them and some of those might be geopolitically orientated. So, there'll be direct attacks. There has been a sort of recent space of attacks and this expression "Scattered Spiders" which people might have heard of. You know, "Scattered Spiders", that the authorities say, is a name that the media has given these people. But they represent a sort of different brand of attacker, we are told, which is English-speaking kind of people who came through gaming. So, they got into gaming, cheats, worked out how to break the system, and that got them in. Part of the thing that I find amazing about hacking is it often isn't as basic as computer geeks rewriting code. We know from the M&S attack that that was effectively a blag. Somebody bluffed their way into a system. You

know, pretended not about M&S, but generally the blagging works. You say: "Look, I've forgotten my password. Can you get me in?" And then you get a weak link. You're in and then you're in the system and you can do damage. So, that is a different kind of threat, but, generally, the gangs are overseas and then there is this sort of new threat from English-speaking countries.

- Yeah, it's really fascinating. It's great to see another investigation from you on this subject, Richard. We always appreciate having you on the BBC News Channel.

-Thank you.

Audio 2.

I'd like you to consider for a moment that there are about 6,900 languages spoken on our planet daily, and these thousands of languages serve thousands of cultures, from the smallest community to the largest continent. Now, even with this vast diversity among our global population, we have some alternative languages and methods for communication that are understood by everybody. For example, the world has mathematics. If I have one apple and somebody gives me another apple, I have two apples. This is understood worldwide without fail.

Now, as of today, the largest culture by far is that of the Internet user. With 7.6 billion humans on Earth, around 3.6 billion of us are online and communicating with each other and institutions daily. Thus, another common language we all share but most don't realize is the networking protocols that the Internet runs on and the social media platforms that tie us together – and emojis; we can't forget the emojis.

But what our internet culture tends to lack is a common understanding, to foster true, true understanding about cybersecurity and threats online. Outside of hardcore cybersecurity and IT people like myself, most people don't understand the language that is Nerd. And so, it is my job to be the best Nerd-to-English translator I can be in order to help the world stay safe online. So, without further ado, here are my five laws of cybersecurity that are designed to do just that.

Law number 1: “If there is a vulnerability, it will be exploited. No exceptions.” Consider for a moment that when the first bank was conceived of and built, there was at least one person out there who thought: "I want to rob that." In the more modern era, since the first computer bug was discovered, hackers good and bad have been looking for ways to get around the laws and framework that govern a computer system, a program, or even our society in general. Now, think about this for a second. There are those out there who will literally try and hack absolutely everything within their capability. Now, this could be the more basic exploit, like the person who figured out how to cover their car's license plate to go through an automatic tollbooth for free, or this could be a more obscure, such as infecting a complex computer network to derail an entire illegal nuclear weapons program, which actually happened in the mid-2000s. Finding ways around everything for both good and bad purposes is so ubiquitous today, we even have a term for it: life hacking.

And with this, we’ll move onto the second law: “Everything is vulnerable in some way.” We cannot assume that anything is safe, nor is anything off the table for hacking anymore. We've seen a series of massive breaches by corporations that literally spend millions annually on cyber defense strategies. From enormous retailers to gigantic health insurance providers, these corporations hold millions of records on virtually everyone in the United States and fall under multiple government-compliance laws for data security – yet here we are. And we can go straight out of left field or even more obscure for examples of this law.

So, for decades, we’ve just assumed our computer processors are safe and harmless, just doing the job that they were meant to do. At the beginning of 2018, it was discovered that these technological workhorses are carrying a serious mass of vulnerabilities that would allow a malicious hacker to wreak havoc on all of us. From minor to major, law number 2 is really inescapable.

Before we go on to law number 3, I'd like everybody in the audience to look under your seat for something that my team put there. If you can. All right. Did anybody find anything? No? All right. You guys can stop now. You guys can stop now.

I want to go on to law number 3: “Humans trust even when they shouldn't.” And I'm sorry to make you all part of this talk, but it really helps to underscore my point here: trust, quite frankly, sucks. Now, we need trust in our lives. We can't have a society without it. And we have positive expectations of our technology and those people that help us with it. We expect the light switch is going to flip on the light when we turn it on. We expect the mechanic we pay to fix our car to actually fix it and not rip us off. But we have to question the technological infrastructure and online people around us. This is our greatest vulnerability in cybersecurity.

Now, because of trust, people fall for phishing scams. They believe the \$20 anti-virus they bought for their computer will turn it into Fort Knox; it will not. They also believe that the form they're filling out online is legitimate; it sometimes isn't. And it sounds weird to say that we have to combat trust, but we have to if we're going to survive in the nonstop hacking that takes place.

And with this, we can move onto law number 4: “With innovation comes opportunity for exploitation.” The world is full of brilliant people: Alexander Graham Bell invented the telephone that made the world a whole lot smaller. Bill Gates created a global computer operating system that got humanity on the same technological page. Mark Zuckerberg created a social media platform used by billions daily to share our lives.

However, with these evolutions in innovation and our technology come certain exploits. Now, we live in the age of IoT, or Internet of Things, and by virtue of this, our lives have hopefully been made a little easier. New, unique, innovative products are constantly being made to help us live in our homes or drive our cars or even improve our health.

However, one of the biggest examples of innovation exploitation is IoT hacking. In 2016, a virus known as Mirai infected millions of IoT devices worldwide and then weaponized them against targets, creating some of the largest band width attacks the Internet has ever seen. As the world continues to develop and create amazing new technologies, we cannot forget the lesson of law number 4.

And finally, law number 5: “When in doubt, see law number 1: If there is a vulnerability, it will be exploited. No exceptions.” Now, this one isn't a cop out; it's really not. Every single issue with cyber security and our technology stems from a vulnerability of some kind. If we ever forget this, we are doing nothing but asking for trouble. Our ability to properly defend ourselves comes from understanding that human nature itself makes these laws immutable. And when we start thinking like a hacker is when we can actually stop them. So, here's to our new, common language that hopefully helps us and the world stay safe online.

UNIT 4.

We all use smartphones, but have you ever wondered how much data they generates in the form of texts, phone calls, emails, photos, videos, searches, and music? Approximately 40 exabytes of data gets generated every month by a single smartphone user. Now, imagine this number multiplied by 5 billion smartphone users. That's a lot for our mind to even process, isn't it? In fact, this amount of data is quite a lot for traditional computing systems to handle. And this massive amount of data is what we term as "big data".

Let's have a look at the data generated per minute on the internet. 2.1 million snaps are shared on Snapchat. 3.8 million search queries are made on Google. 1 million people log on to Facebook. 4.5 million videos are watched on YouTube. 188 million emails are sent. That's a lot of data!

So, how do you classify any data as big data? This is possible with the concept of five Vs: Volume, Velocity, Variety, Veracity, and Value. Let us

understand this with an example from the healthcare industry. Hospitals and clinics across the world generate massive volumes of data. 2,314 exabytes of data are collected annually in the form of patient records and test results. All this data is generated at a very high speed, which attributes to the velocity of big data.

Variety refers to the various data types such as structured, semi-structured, and unstructured data. Examples include Excel records, log files, and X-ray images. Accuracy and trustworthiness of the generated data is termed as “Veracity.” Analyzing all this data will benefit the medical sector by enabling faster disease detection, better treatment, and reduced cost. This is known as the “Value” of big data.

But how do we store and process this big data? To do this job, we have various frameworks such as Cassandra, Hadoop, and Spark. Let us take Hadoop as an example and see how Hadoop stores and processes big data. Hadoop uses a distributed file system known as Hadoop Distributed File System to store big data. If you have a huge file, your file will be broken down into smaller chunks and stored in various machines. Not only that, when you break the file, you also make copies of it, which goes into different nodes. This way you store your big data in a distributed way and make sure that even if one machine fails, your data is safe on another.

MapReduce technique is used to process big data. A lengthy task A is broken into smaller tasks B, C, and D. Now, instead of one machine, three machines take up each task and complete it in a parallel fashion and assemble the results at the end. Thanks to this, the processing becomes easy and fast. This is known as parallel processing.

Now that we have stored and processed our big data, we can analyze this data for numerous applications. In games like Halo 3 and Call of Duty, designers analyze user data to understand at which stage most of the users pause, restart, or quit playing. This insight can help them rework on the storyline of the game and improve the user experience, which in turn reduces the customer churn rate.

Similarly, Big Data also helped with disaster management during Hurricane Sandy in 2012. It was used to gain a better understanding of the storm's effect on the east coast of the U.S. and necessary measures were taken. It could predict the hurricane's landfall five days in advance, which wasn't possible earlier. These are some of the clear indications of how valuable Big Data can be, once it is accurately processed and analyzed.

So, here's a question for you: Which of the following statements is not correct about Hadoop Distributed File System (HDFS)?

- A. HDFS is the storage layer of Hadoop.
- B. Data gets stored in a distributed manner in HDFS.
- C. HDFS performs parallel processing of data.
- D. Smaller chunks of data are stored on multiple data nodes in HDFS.

Give it a thought and leave your answers in the comment section below. Three lucky winners will receive Amazon gift vouchers. Now that you have learned what big data is, what do you think will be the most significant impact of big data in the future? Let us know in the comments below. If you enjoyed this video, it would only take a few seconds to like and share it.

EXAM TEST SAMPLE

Part 1. READING

Task 1.1. Read the text and choose the correct answer (A, B, C, or D).

THE TECHNOLOGICAL SINGULARITY: NAVIGATING THE POST-HUMAN ERA

The concept of the “Technological Singularity” – a hypothetical point in time at which technological growth becomes uncontrollable and irreversible, resulting in profound changes to human civilization – has evolved from science fiction to a serious academic debate. At the heart of this transition lies the convergence of artificial intelligence, cybernetics, and nanotech.

Professor Alistair Thorne argues that the primary catalyst for the Singularity is not merely faster processing speeds, but the development of **recursive self-improvement**. An AI capable of redesigning its own architecture would trigger an “intelligence explosion,” far surpassing human cognitive capacities within weeks or even hours. However, Thorne cautions against a purely “hardware-centric” view. He posits that the true challenge is the *Alignment Problem*: ensuring that the goals of a super-intelligent system remain congruent with human values.

Critics of the Singularity theory, such as Dr. Elena Vance, maintain that we are hitting a “complexity ceiling.” She suggests that while data processing power grows exponentially, our ability to map the functional nuances of the human brain remains rudimentary. Vance argues that until we achieve a breakthrough in **neural-interfacing**, the gap between biological and synthetic intelligence will remain insurmountable.

In response, many research institutions are shifting focus toward **IA (Intelligence Amplification)** rather than standalone AI. By integrating cybernetic implants with the human neocortex, they aim to create a hybrid intelligence. This approach seeks to bypass the risks of a “rogue AI” by keeping the human element at the center of the feedback loop.

1. What is the fundamental catalyst for the “Singularity” according to Professor Thorne?

- A) The exponential increase in hardware processing speeds.
- B) The development of AI systems capable of recursive self-improvement.
- C) The complete replacement of biological neurons with nanotech.
- D) The transition of the concept from science fiction to academic debate.

2. Which of the following best describes the “Alignment Problem”?

- A) Synchronizing the clock speeds of different processors within a global AI network.
- B) Ensuring that a super-intelligent system’s objectives do not conflict with human ethics.
- C) Mapping the functional nuances of the human brain to fit synthetic architectures.
- D) The physical alignment of cybernetic implants within the human neocortex.

3. What is Dr. Elena Vance’s primary argument against the imminent arrival of the Singularity?

- A) Scientific funding is currently hitting a “complexity ceiling.”
- B) Data processing power is no longer growing at an exponential rate.
- C) Current technology is too rudimentary to bridge the gap with the human brain.
- D) The risks of "rogue AI" have made researchers too cautious to proceed.

4. How does IA (Intelligence Amplification) differ from standalone AI development?

- A) It focuses on creating a hybrid intelligence by keeping humans in the loop.
- B) It aims to bypass the need for any neural-interfacing breakthroughs.
- C) It prioritizes the speed of calculations over the safety of the system.
- D) It relies exclusively on cloud computing rather than onboard cybernetic implants.

5. What is the overarching purpose of shifting research focus toward IA, according to the text?

- A) To accelerate the arrival of the “intelligence explosion.”
- B) To mitigate the potential dangers associated with independent super-intelligence.
- C) To prove that the “complexity ceiling” mentioned by critics does not exist.
- D) To reduce the reliance of modern robotics on decentralized cloud databases.

(each 1) ____ /5

Task 1.2. Read the text below. Choose from (A-H) the one that best suits each space (1-5). There are two choices you don’t need to use.

CYBERNETIC ARCHITECTURES IN MODERN ROBOTICS

Modern robotics has transcended the era of simple pre-programmed instructions. Today’s autonomous systems rely on complex cybernetic architectures **(1)** _____. These systems utilize “Deep Reinforcement Learning,” where an agent learns to make decisions by receiving “rewards” or “penalties” based on its interaction with the environment.

The efficiency of such a system is largely dependent on its sensors, **(2)** _____. These sensors must provide high-fidelity data to the controller, which then calculates the necessary adjustments to the system’s actuators. If there is a latency in the feedback loop, **(3)** _____, leading to what engineers call “mechanical oscillation” or system instability.

Furthermore, the integration of cloud computing allows robots to offload heavy computational tasks. Instead of relying solely on onboard processors, **(4)** _____. This collective intelligence allows a single robot to benefit from the experiences of thousands of others. However, this connectivity introduces significant security risks, **(5)** _____.

A. as the integrity of the feedback loop can be compromised by external hacking

- B.** which acts as the primary interface between the digital controller and the physical world
- C.** that mimic the neural feedback loops found in biological organisms
- D.** the robot may fail to compensate for environmental changes in real-time
- E.** which is essentially a decentralized database for autonomous agents
- F.** the machine can access massive neural networks via high-speed wireless links
- G.** despite the fact that most robots still require human intervention
- H.** because the hardware is unable to handle the sheer volume of sensory input

(each 1) ____ /5

Task 1.3 You should spend about 20 minutes on Questions 1–16, which are based on the Reading Passage below:

AI-ENABLED BLACKMAIL AND THE RISE OF DEEPPAKE CRIME

A. The rapid progress of generative Artificial Intelligence has created entirely new categories of digital crime. Deepfake audio and video can now be produced within minutes using open-source tools that require almost no technical expertise. Criminals are increasingly using synthetic media to impersonate CEOs, pressure employees into transferring funds, and manipulate victims into giving away highly confidential information.

B. One of the most worrying trends is the growth of personalised blackmail attacks. Criminals can scrape social media to construct psychologically convincing narratives about a victim’s past relationships, hobbies, political preferences, private fears, and vulnerabilities. They then create deepfake videos or audio that show the victim doing or saying things that never actually happened — and threaten to release them publicly unless money is paid. The psychological pressure is compelling because the threat feels real, even if the content is fake.

C. Companies across Europe are reporting a growing number of incidents in which criminals combine deepfake impersonation with social engineering techniques. Many attacks no longer focus on hacking software systems – instead,

they hack the human mind. This shift is dangerous because even well-secured organisations can now be compromised through the manipulation of individual employees rather than traditional cyber intrusion.

D. Law enforcement agencies struggle to keep up with this new threat. Traditional legal frameworks were designed for crimes involving physical identity or physical materials. When the evidence itself is artificially produced, it becomes difficult to determine authenticity, blame, jurisdiction, and legal responsibility. Investigators argue that the pace of criminal innovation is currently faster than that of regulatory response.

E. Some governments are considering the introduction of mandatory provenance signatures – digital verification markers that confirm whether audio, image, or video originates from an authentic source. However, such systems require global standardisation. If only a small number of states implement them, criminals will simply operate from different jurisdictions where the regulations do not apply.

F. The deeper ethical question is whether societies can preserve trust at scale once identity itself becomes technically modifiable. If voice, face, and behaviour can be simulated on demand, then the idea of “seeing is believing” collapses. Experts warn that the result may not only be more crime, but also more public confusion, conspiracy thinking, and polarisation — where nobody knows what is genuine anymore.

Task 1.4 Choose the most suitable headings for paragraphs A-F:

1. Criminals target the human mind	2. The problem of legal adaptation	3. New forms of psychological extortion
4. Simulated identities destroying trust	5. Proposed international solutions	6. Easy access to deepfake tools

(each 1) ____ /5

PART 2.

USE OF ENGLISH

Task 2.1. Read the text below. For questions (1-10), choose the correct answer (A, B, C, or D).

THE EVOLUTION OF DISTRIBUTED LEDGER TECHNOLOGY

The (1) _____ of blockchain technology has fundamentally altered our perception of data integrity. Unlike centralized databases, where a single (2) _____ controls the flow of information, a DLT (Distributed Ledger Technology) (3) _____ the data across a vast network of nodes. This ensures that no single point of failure can (4) _____ the entire system.

Each transaction is (5) _____ into a block and secured using advanced cryptographic (6) _____. Once a block is added to the chain, it becomes virtually (7) _____, meaning it cannot be altered without changing every subsequent block. This level of (8) _____ is particularly valuable in sectors like supply chain management and decentralized finance (DeFi). However, the (9) _____ costs of maintaining such a network—specifically the electricity required for "Proof of Work"—have raised environmental (10) _____.

1. **A** emergence **B** eruption **C** instance **D** outcome
2. **A** terminal **B** entity **C** unit **D** element
3. **A** allocates **B** disseminates **C** dissipates **D** disposes
4. **A** jeopardize **B** suspend **C** fracture **D** nullify
5. **A** inscribed **B** encrypted **C** translated **D** encoded
6. **A** slogans **B** algorithms **C** indexes **D** variables
7. **A** immutable **B** steadfast **C** stagnant **D** resilient
8. **A** transparency **B** clarity **C** visibility **D** disclosure
9. **A** substantial **B** superficial **C** minor **D** excessive
10. **A** anxieties **B** concerns **C** disputes **D** insights

(each 1) ____ /10

Task 2.2. ERROR IDENTIFICATION: Identify the 10 grammatical or lexical errors in the following text and provide the correct forms.

In the field of cybernetics, the concept of homeostasis play a crucial role. It refers to the ability of a system to maintain it's internal stability despite changes in the external environment. If a system fails to regulate itself, it will eventually ceased to function. Modern AI systems are becoming more better at simulating this process, but they still lacks the intuition of a human being. Many scientist believe that we are on the verge of create a true artificial consciousness. However, there are many ethical questions whom must be addressed before such technology is deployed. For instance, who will be responsible if a autonomous system makes a fatal mistake? Beside, we must consider the impact on the job market. Unless we don't implement strict regulations, the transition to an automated society could be chaotic.

1. _____ -> _____
2. _____ -> _____ ... (up to 10)

(each 1) ____ /10

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Ілюстрації в навчальному посібнику «Academic English for Cyber Profies. Part 1» використані відповідно до п. 2 ч. 1 ст. 22 Закону України «Про авторське право і суміжні права» як ілюстрації у виданнях навчального характеру в обсязі, виправданому поставленою метою, а саме: для унаочнення навчального матеріалу.

НАВЧАЛЬНЕ ВИДАННЯ

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Оксана Степанечко

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ПРОФЕСІОНАЛІВ
ЧАСТИНА 1**

B2 – C1

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