

# **Module 1:** **The Impact of Technology &** **Artificial Intelligence (AI)**

*Chapter 1: The Impact of Technology in a Changing World*

# Part 1: Technology in Society

# Technology in a Global Society

## Impact of Tools of Modern Technology

- ❑ **Social networking tools** enable groups to connect and exchange ideas.
  - Social media platforms like Twitter, Facebook, and Instagram enable people to connect and exchange ideas. These platforms also unite people facing similar problems to fight for social change.
  - For example, the Twitter hashtag #MeToo began to support women facing sexual harassment and assault but evolved to galvanize an international movement. A simple hashtag highlighted an important social issue and was a key means of revealing the widespread problem.
  - Bot accounts, automated programs retweeting news stories and quotes, have been used to create discord around controversial topics in many countries.

# Technology in a Global Society

## Impact of Tools of Modern Technology



Ushahidi, Inc., [www.ushahidi.com](http://www.ushahidi.com)

- Another example of the interaction of technology and society is the software tool Ushahidi.
- The developers made Ushahidi a free platform anyone can use (see Figure).
- It has since been used in several international disasters.
  - ✓ In what other ways may technology help us face times of crisis?

# Technology in a Global Society

## Global Issues (1 of 3)

- **Health care**

- Develop and deliver vaccines
- Increased vaccine production
- Embedded sensors provide important information
- For sports medicine, Computer programs have collected sensor data from impacts on the field, which scientists have analyzed and used to create a new kind of helmet. College programs and the NFL now use enhanced helmets designed to better distribute the impact of collisions.

# Technology in a Global Society

## Global Issues (1 of 3)

- **The Environment**

- Data could alert scientists to new trends

- Example: **Smart Internet-connected water sprinklers**

- These are other technologies used already for saving water in California and other dry areas of the country.

- The sprinkler system checks the weather forecast so it won't use water when rain is coming the next day.

- The system is showing a 30% reduction in water usage.

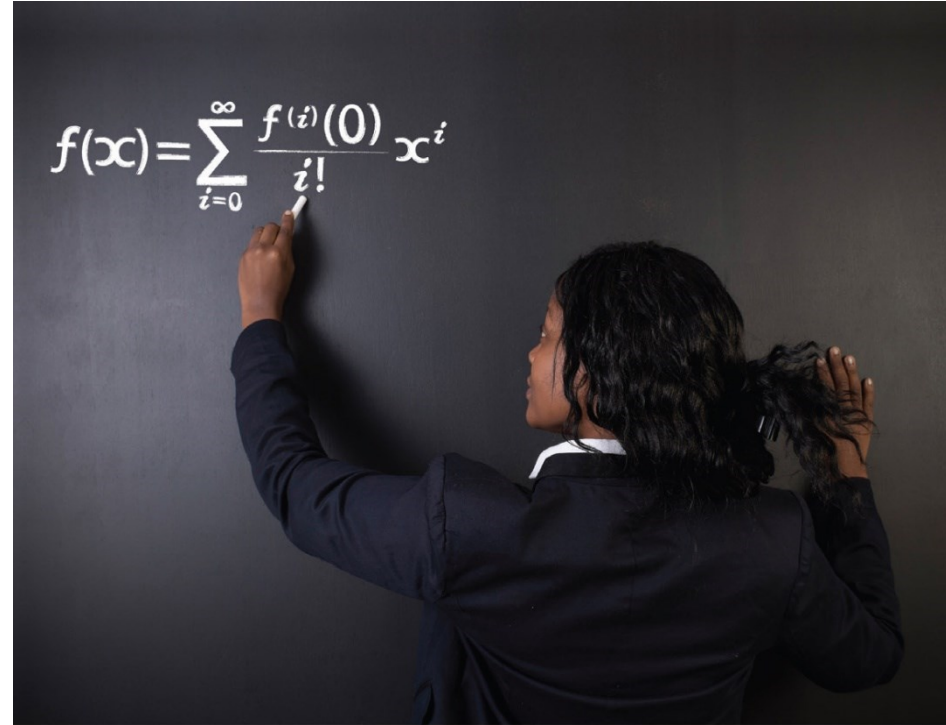
- Need of similar and other sensors in Jordan – one of the poorest in water resources

# Technology in a Global Society

## Global Issues (2 of 3)

- **The Digital Divide**

- Gap exists between levels of Internet access and availability of technical tools
- Prevents the use of all minds to solve the planet's problems



*Alistair Cotton/123RF*

# Table 1.1 shows additional examples of people putting technology into action to impact the world.

## How will you join them?

**Table 1.1** Technology in Action: Taking on Global Problems

Person/ Organization	Global Problem	Technology Used	Action	Find Out More . . .
Start Network	Corruption	Blockchain, a digitized public ledger for recording a series of transactions	Blockchain technology can help track humanitarian aid funds as they flow from donors to recipients.	Start Network: <a href="http://startnetwork.org">startnetwork.org</a>
SolaRoad/ Netherlands	The need for a renewable, nonpolluting energy resource	Solar cells	Solar cells are integrated into the asphalt roadway. They collect solar energy and distribute electricity all day.	Netherlands SolaRoad: <a href="http://solaroad.nl">solaroad.nl</a>
United Nations World Food Programme (WFP)	Issues of hunger for 1 in 7 of the world's population	GIS (geographical information systems) and mobile devices	The WFP can analyze the location and need for food, positioning it where it will help the most.	World Food Programme: <a href="http://wfp.org">wfp.org</a>
Gates Foundation	The threat of global pandemic disease, like Ebola, or weaponized biological warfare	Mobile apps, data analytics, and enhanced global communications	Worldwide organizations like the Gates Foundation are taking steps to build better networks to detect outbreaks and deliver vaccines.	Gates Foundation: <a href="http://gatesfoundation.org">gatesfoundation.org</a>



# Technology Connects Us with Others

## Technology Impacts How and Why We Connect and Collaborate (1 of 2)

- We collaborate for the benefit of others
  - **Web 2.0**
    - Allows easy content contribution
    - Facilitates easy connections with others
  - **Cognitive Surplus**
    - The cognitive surplus was coined to reflect the combination of leisure time and the tools to be creative.
    - The availability of media tools and the easy connectivity of Web 2.0, along with generosity and a need to share, also enable projects like Ushahidi to emerge.

# Technology Connects Us with Others

## Technology Impacts How and Why We Connect and Collaborate (2 of 2)

- **Business**

- Support others' dreams
- Crowdfunding is asking for small donations from a large number of people. Successful Kickstarter projects have included ice chests with integrated blenders, DNA analysis machines that could inexpensively diagnose disease, and many entertainment projects.
- Over \$3.9 billion of business funding has been raised using Kickstarter. Business ideas are not the only projects benefiting from crowdfunding. Sites like GoFundMe allow people to crowdfund to raise money for things such as medical bills or tuition.

# Technology Connects Us with Others

## Technology Impacts How We Consume (1 of 2)

- **Marketing technology** helps us to:
  - Decide what to purchase
  - Actual buying process of goods and services
- **Marketing**
  - QR (quick response) codes
  - Crowdsourcing: Marketers must also be aware of the phenomenon of crowdsourcing—checking in with the crowd’s voice. Forward-thinking companies are using this input to improve their products and services.
    - AT&T, for example, has an app called Mark the Spot that lets customers report locations of dropped calls to help the company improve its coverage.

# Technology Connects Us with Others

## Technology Impacts How We Consume (2 of 2)

- Access Versus Ownership
  - ZipCar
  - Citi Bike
  - Collaborative consumption



*Tim Clayton/Contributor/Corbis Sport/Getty Images*

# The Importance of Computer Literacy

## Computer Literacy

- **Computer literacy**

- Understand the capabilities and limitations of computers
- Know how to use it safely and efficiently
- Avoiding hackers and viruses
- Protecting your privacy.
- Understanding the real risks
- Using the web wisely
- Avoiding online annoyances

# Computer literacy

**Table 1.2** What Does It Mean to Be Computer Literate?



You can **avoid falling prey to hackers and viruses** because you are aware of how they operate.



You know how to **protect yourself from identity theft**.



You can **separate the real privacy and security risks from things you don't have to worry about**.



You know how to **find information and use the web effectively**.



You can **avoid being overwhelmed by spam, adware, and spyware**.



You can **how to diagnose and fix problems with your hardware and software**.

# **Part 2: Emerging Technologies (AI) and Ethical Computing**

# Artificial Intelligence

## Artificial Intelligence Basics (1 of 3)

- **Intelligence** — ability to acquire and apply knowledge and skills
  - Experiences, reasoning, problem-solving, perception, and using language
- **Artificial intelligence (AI)** — systems or machines which perform tasks:
  - AI is a branch of computer science that focuses on creating computer systems that can perform tasks usually associated with human intelligence.
  - By this definition, any computer-controlled device that accomplishes something thought of as “intelligent” by humans is considered AI.



# Artificial Intelligence

## Artificial Intelligence Basics (2 of 3)

- The goal in the 1950s was to create a machine that could think like a human
- The goal now is intelligent answers inspired by the way people think.
- Early examples included expert systems that mimicked doctors in diagnosing illnesses. But this goal has shifted somewhat toward creating machines that generate intelligent output but do not necessarily mimic human thought.
- Central Goals of AI: natural language processing (NLP), perception, knowledge representation, planning, problem-solving, and learning.

# Artificial Intelligence

## Artificial Intelligence Basics (2 of 3)

- Consider visiting the library. You could tell a human librarian your interests, and the librarian could ask you some questions and then recommend books you might like. The Amazon recommendation engine fulfills the same purpose.
- However, the Amazon recommendation engine doesn't mimic a human librarian's thought process but instead analyzes vast amounts of data about you and other shoppers to make recommendations. It provides intelligent results, but it does not arrive at those results the same way a human would.  
But

# Artificial Intelligence

## Artificial Intelligence Basics (3 of 3)

- Major developments contributing to functional AI systems:
  - Artificial Neural Networks
  - Big Data
  - Cloud computing
  - Advances in machine learning

# What has enabled us to deploy effective AI systems

- **Expert systems**, computer programs that mimic the experience of human experts such as doctors or lawyers, were among the first attempts at producing AI. Rules-based systems, software that asks questions and responds based on preprogrammed algorithms, were the first expert systems designed. These systems asked questions (“Do you have a fever?”) and initiated other questions or actions based on the answers (“How long have you had a fever?”) and worked adequately for some settings.
- **Artificial neural networks (ANNs)** are designed based on the structure of the human brain, which is a network of loosely connected neurons. When signals are received by a neuron, it fires an electrical impulse and the signal travels to all the neurons connected to it. In ANNs, digital signals take the place of biological signals. Many modern ANNs feature different layers of neurons that allow many degrees of complexity. ANNs have allowed researchers to tackle complex problems such as speech recognition.

# What has enabled us to deploy effective AI systems

**Machine learning (ML)** is a type of AI that doesn't need to be specifically programmed. Instead, it analyzes patterns in data, then uses the patterns to draw conclusions and adjust the actions of the AI system accordingly. By learning, the AI system can adapt itself and become constantly better at its task. You have interacted with these kinds of systems if you use Alexa, the Amazon voice recognition device. Alexa gathers input from human speech and uses this information to become better at understanding language over time.

**Deep learning (DL)** is a subset of the ML field that describes systems capable of learning from mistakes, just as humans do. DL algorithms can learn from data that is not labeled as “correct” or “incorrect.” The algorithm adapts to improve its final result without being presented with a huge, labeled set of training data. This is known as unsupervised learning.

# Areas of AI - 1

**Natural language processing (NLP):** NLP works to develop AI systems that understand written and spoken words and can interact with humans using language.

**Perception:** AI systems have senses just as we do. AI systems use sonar, accelerometers, infrared, magnetic, and other electronic sensors to gather data. Being able to combine all the data from sensors and then construct information from it is a difficult challenge.

**Knowledge representation:** Knowledge representation involves encoding information about the world into formats that the AI system can understand. Humans possess a vast collection of general knowledge based on their experiences in the world. AI systems need to build knowledge bases to solve problems. Developing a knowledge base and using it efficiently are active areas of research and have been demonstrated effectively by IBM's artificial intelligence computer Watson.

**Planning:** AI systems need to set goals and then achieve them. An AI system might need to plan how to move a blue block out of the way to reach a red one or how to rotate a block as it moves to fit through a narrow opening.

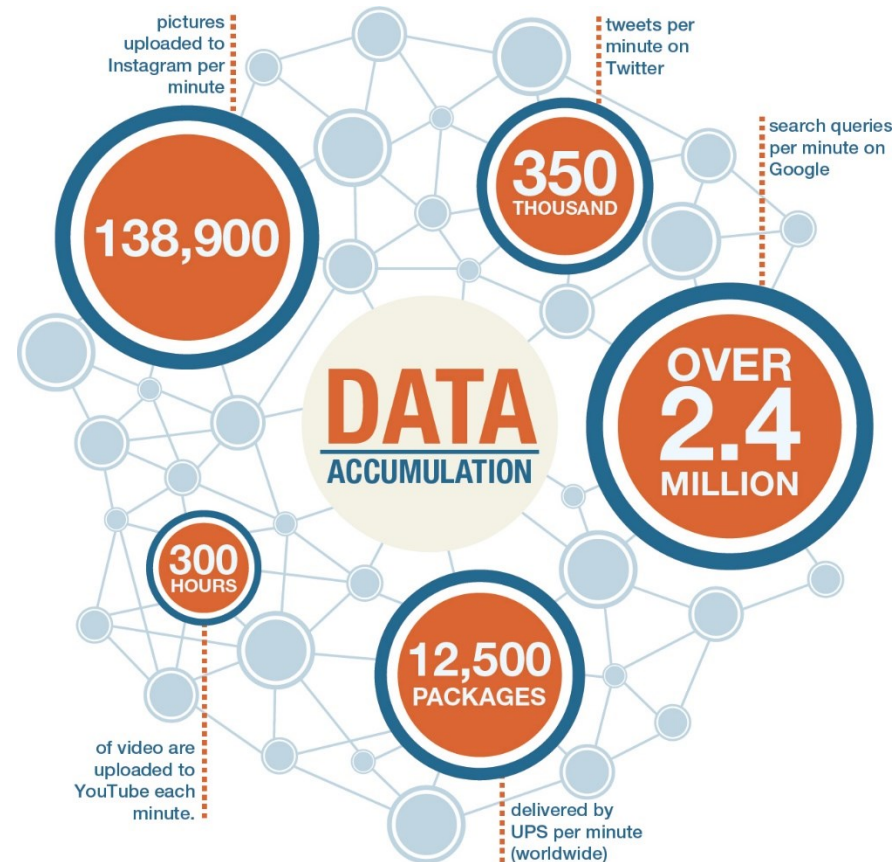
# Working with Artificial Intelligence and Other Information Technologies

## Technology and Career Opportunities (1 of 6)

- **Retail**

- **Data mining**

- Process of searching huge amounts of data for patterns
    - Respond to consumer buying/usage patterns



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# **Working with Artificial Intelligence and Other Information Technologies**

## **Technology and Career Opportunities (2 of 6)**

- **Banking and Personal Finance**

- Uses AI to help spot fraud

- **Transportation Industries**

- Autopilots on commercial airplanes

- Autonomous vehicles

- Robots and Embodied Agents



# Working with Artificial Intelligence and Other Information Technologies

## Technology and Career Opportunities (3 of 6)

- **Education**

- Intelligent personal assistants (IPAs) assist students with their individualized learning plans (ILPs)
- Speed up the grading process
- Plagiarism checkers
- Dashboards



*Visual Generation/Shutterstock*

# Working with Artificial Intelligence and Other Information Technologies

## Technology and Career Opportunities (4 of 6)

- **Law Enforcement**

- Solve crimes
- Search databases
- Computer forensics



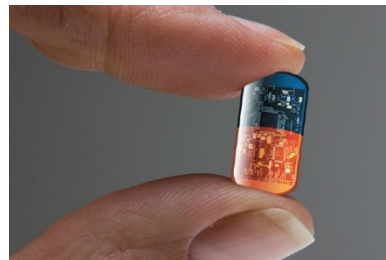
*Pixologicsstudio/Science Photo Library/Glow Images*

# Working with Artificial Intelligence and Other Information Technologies

## Technology and Career Opportunities (5 of 6)

- **Medicine**

- Help doctors diagnose unfamiliar conditions
- Being integrated into patient information systems
- Used to design and construct prosthetic devices
- Digestible microchips transmit information to the doctor



*Image-BROKER/SuperStock*

# Working with Artificial Intelligence and Other Information Technologies

## Technology and Career Opportunities (6 of 6)

- **Psychology**

- MACH—My Automated Conversation Coach
- Affective computing



*Cultura Limited/SuperStock*

# Ethical Computing

## Defining Ethics

- **Ethics** — the study of morals and specific moral choices made
- **Laws** — formal, written standards designed to apply to everyone
- **Unethical behavior** — not conforming to approved standards
- **Amoral behavior** — no sense of right and wrong

# Ethical Computing

## Ethics and Technology (1 of 3)

- **Intellectual Property**

- Work that is the result of someone's creativity and knowledge
- Protected by copyrights, patents, and trademarks

- **Privacy**

- Control and privacy of information will continue to be a fine balancing act

# Ethical Computing

## Ethics and Technology (3 of 3)

- **Social Activism**

- Hacktivism is using computers and computer networks in a subversive way
- Often manifests as Denial of Service (DOA) attacks

- **Automated Robotic Machinery**

- Self-driving cars
- Choose between sets of bad choices