# 5.1 - 5.6 Video Notes

5.1 Beneficial and Harmful Effects

- Advancements in technology bring with them an assortment of beneficial and harmful effects
- Not every effect of a computing innovation is anticipated in advance
- A single effect can be viewed as both beneficial and harmful by different people or even the same person
- Advances in computing have generated and increased creativity in other fields, such as medicine, engineering, communications, and the arts

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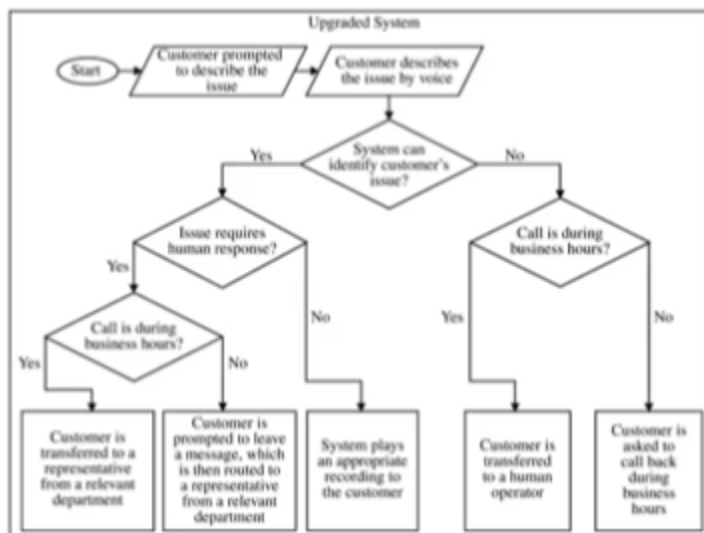
Of the following potential benefits, which is LEAST likely to be provided by the upgraded system?

A. Human representatives will not be needed to respond to some inquiries.

B. The company will be able to provide a human representative for any incoming call.

C. Customers are likely to spend less time listening to information not relevant to their issue.

D. Customers will be unable to mistakenly select the incorrect department for their particular issue.

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- Computing innovations can be used in ways their creators didn't originally intend
  - Responsible programmers try to consider the unintended ways their computing innovations can be used and the potential beneficial and harmful effects of these new uses

- - Sometimes these can even be used in a way that may have a harmful impact on society, the economy, or culture
  - It's not possible for a programmer to be able to tell the future and all the ways something could go wrong
  - The more people rapidly and constantly using an app or innovation, the more chance that there is for it to go wrong or veer off the intended purpose

5.2 Digital Divide
- Internet access varies between socioeconomic, geographic, and demographic characteristics, as well as between countries
  - Socioeconomic - how much money comes into the household per year
    - determine if you have disposable income to buy new devices or you have older ones, or if you have high speed internet or no internet in your house
  - Geographic - if you live where there are few people, there might not have high speed internet
    - When go snowboarding at Vermont, there might have no cell phone reception
  - Demographics include, but not isolated to:
    - Age
    - Religion
  - In some countries:
    - Computers are not that common in rural areas
    - Only a small number of websites
    - The internet is used to protect and advocate the government
    - There is a high level of surveillance on the internet to protect the government
- The "digital divide" refers to <u>differing access to computing devices and the internet, based on socioeconomic, geographic, or demographic characteristics</u>
- The digital divide can affect both groups and individuals

- The digital divide raises issues of equity, access, and influence, both globally and locally
- The digital divide is affected by the actions of individuals, organizations, and governments
- The following actions could be used to help reduce the digital divide?
  - Providing free education and training on how to use computing devices
  - Providing free or low-cost computing devices to low-income individuals
  - Providing networks and infrastructure to people in remote areas

5.3 Computing Bias

- Computing innovations can reflect existing human biases because of biases written into the algorithms or biases in the data used by the innovation
- Programmers should take action to reduce bias in algorithms used for computing innovations as a way of combating existing human biases
- Biases can be embedded at all levels of software development
  - Questions to ask about bias
    - Enhancing or intentionally excluding?
    - Intentionally or Unintentionally?
    - Receiving feedback from a wide variety of people?
- Netflix
  - Explicit data: thumbs, name, address, etc
  - Implicit Data: when you watch, what you binge, show style most popular for you
  - Bias: netflix exclusives are featured ahead, subscriptions
- Hypothetical Loan Company
  - Creating software to assist loan officers, finds trends in successful loans, reject those who don't fit their trends (age, gender, race, ethnicity)

- All software can be biased (unintentional or intentional): casual vs sweaty, YouTube Kids, Facebook vs Instagram vs Snapchat/TikTok, WeChat, Kakao Talk

5.4 Crowdsourcing
- Kaggle: courses in visualizations/TensorFlow/AI/machine learning, competitions (cash prizes, swag, props), and notebooks (code, data, notes)
- Google Public Datasets: free for the 1st terabyte, all-in-one package that uses BigQuery
- Data.gov: US government data, agriculture, energy, water, health
- Your local government: keeps accountability, helps find solutions/trends in the local area
- Distributed Computing: donate spare computing power to help calculations
  - BOINC (University of California, Berkeley) has a variety of projects (math, astrophysics, climate)
- Innovations made possible with crowdsourcing
  - Spotify
    - Collaborative playlists, algorithm, metadata write-in
  - Crowdfunding
    - Kickstarter, IndieGoGo
  - Blockchain
    - Cryptocurrency, other tokens - concert tickets

5.5 Legal and Ethical Concerns
- How the use of computing can raise legal and ethical concerns
- Material created on a computer is the intellectual property of the creator or an organization
  - Intellectual Property (IP) is a work or invention that is the result of creativity to which one has rights
  - Ease of access and distribution of digitized information raises intellectual property concerns regarding ownership, value, and use
- Measures should be taken to safeguard intellectual property
  - Copyright protects your IP and keeps anyone from using it, unless you give them your permission

- - Plagiarism - the use of material created by someone else without permission and presented as one's own (may have legal consequences)
- Some examples of legal ways to use materials created by someone else include:
  - Creative Commons: A public copyright license that enables the free distribution of an otherwise copyrighted work. Thai is use when the <u>content creator wants to give other the right</u> to share, use, and build upon the work they have created
    - It clearly tells others what they can and cannot do with your IP
  - Open source: Programs are made freely available and may be redistributed and modified (encourages open collaboration)
  - Open access: Online research output free of any and all restriction on access and free of many restrictions on use, such as copyright or license restrictions
- The use of material created by someone other than you should <u>always be cited</u>
- Creative Commons, open source, and open access have enabled broad access to digital information
- As with any technology or medium, using computing to <u>harm</u> individuals or groups of people raises legal and ethical concerns
- Computer can play a role in social and political issues, which in turn often raises legal and ethical concerns
- The digital divide raises ethical concerns around computing
- Computing innovations can raise legal and ethical concerns. Examples:
  - The development of software that allows access to digital media downloads and streaming
  - The development of algorithms that include bias
  - The existence of computing devices that collect and analyze data by continuously monitoring activities

5.6 Safe Computing

Personally Identifiable Information

- Personally Identifiable Information (PII): Information specific to an individual
  - Social Security number
  - age
  - race
  - phone number
  - date of birth
  - email address
  - mailing address
  - medical information
  - credit card information

NewPerson@email.net

XXX-XX-XXXX

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- Personally Identifiable Information (PII) can be used by people to steal someone's identity, bank funds, or to impersonate someone in order to gain access to an organization
- Search engines maintain a history of what you search
  - This info can be used to suggest other websites or products you may like
  - Targeted ads and marketing
- PII can be used to enhance a user's online experience, but it can also cause their privacy to be exploited and personal info to be stolen
  - Information placed online can be used in ways that were not intended and may have a harmful impact
  - Travel sites and dozens of advertising and marketing firms have also begun tracking online behavior with cookies
  - Google, Facebook, and Twitter gather more info about user behavior with their share, retweet, and like buttons, along with other personalization features they have on their respective sites
- The picture of you created by all this activity is very detailed and you have very little control over it
- The information placed online is difficult to delete, and when posted to social media, can be used by others and combined with other sources to deduce private information about you, which could lead to harmful consequences
- Authentication measures protect devices and information from unauthorized access
  - Strong passwords
  - Multi-factor authentication
    - What you know

- - ■ What you are
    - ■ What you have
- Viruses are malicious programs that can copy themselves and gain access to systems that they're not supposed to be allowed in
    - ○ Virus scans often prevent malicious code from getting into and affecting your system
- Malware are malicious programs that are often intended to damage a computing system or take partial control over its operation
    - ○ Can infiltrate a system by posing as legitimate programs or attaching itself to legit programs
- Once legit access to a system is gained, it's important to ensure data sent to and from the system remains uncompromised
    - ○ Encryption - the process of encoding data to prevent unauthorized access
        - ■ Symmetric encryption
        - ■ Asymmetric encryption

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    - ○ Decryption - the process of decoding data
- Phishing is a risk to personal safety, and it's an attempt to trick a user into providing personal information online
    - ○ Phishing emails often look like they're from a company you know and trust
    - ○ They trick you into clicking a link or opening an attachment
        - ■ This can cause unexpected harm such a installing a virus or keylogger
- A keylogger - records every keystroke made by a user in order to gain fraudulent access to passwords or other confidential information
- A rogue access point - a wireless network that can give unauthorized access to secure networks