2a.

3D printers are progressively changing the world and the economy through their nearly unlimited capabilities. These machines are intended to allow anyone using them to take a digital 3D model and convert it into a tangible 3D print. If you can 3D model something or find a 3D model of something, 3D printers can print it. The computational artifact shows the process of taking an idea to produce a physical object, such as small trinkets, artistic models, or even fully-functional parts.

2b.

I created my computational artifact by using paint.net, an image editing software. Initially, I found the images used in the computational artifact on Google Images, then copy and pasted them into paint.net, giving each one their own layer. After carefully positioning each image, the text boxes and title were added by first creating the backing boxes, and then adding the text on top. Next, the arrows were created using paint.net's shape tool on another layer, then positioned logically. Finally, I exported the computational artifact as a PNG and converted it into a PDF via Microsoft PowerPoint.

2c.

The capabilities of 3D printers allow them to be extremely versatile. According to Liz Long, the use of 3D printers in businesses is economically beneficial, allowing businesses to save both time and money by providing a significantly cheaper alternative to molds. Long notes that VOJD, a firm that specializes in making accessories and jewelry from 3D printing, fabricated a custom umbrella handle that only cost them a several hundred dollars, whereas using molds could cost over $10,000. 3D printing allows companies to rapidly prototype their designs and produce real-life models for a significantly cheaper amount than other prototype options, proving itself to be economically beneficial. However, 3D printing does also yield harmful effects. Anyone with a 3D printer could possibly design and print anything, even weaponry. Even worse is that the models can be distributed via the Internet, so anyone with a 3D printer could print out weaponry extremely cheaply. In 2013, Cody Wilson released files for a 3D printed gun alongside his company Defense Distributed, instilling fear to society and introducing a new facet to the gun control debate (Source).

2d.

In order for 3D printers to be able create prints from digital 3D models, they must be given specific instructions that the printer can understand, also known as g-code. G-code contains the specific instructions on how to build the model layer by layer and manifests itself in many different files, including the .gcode, .x3g, and .form file types. Once the 3D printer receives the g-code, it will calibrate its settings according to the g-code and move to begin producing the print layer by layer. The g-code entirely controls what the printer ends up printing, so any malicious modification to the g-code will negatively affect anything relating to the print.

This raises some serious data security concerns, especially in businesses that use 3D printing for models or end products. A study from New York University shows that some tiny errors that hackers can place in 3D prints, including changing print orientation and fine defects, can not be detected by monitoring systems (Di Fiore). This would possibly make these prints much more susceptible to mechanical failure and may even result in real-world damage or cause industries to back away from 3D printing.

2e.

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