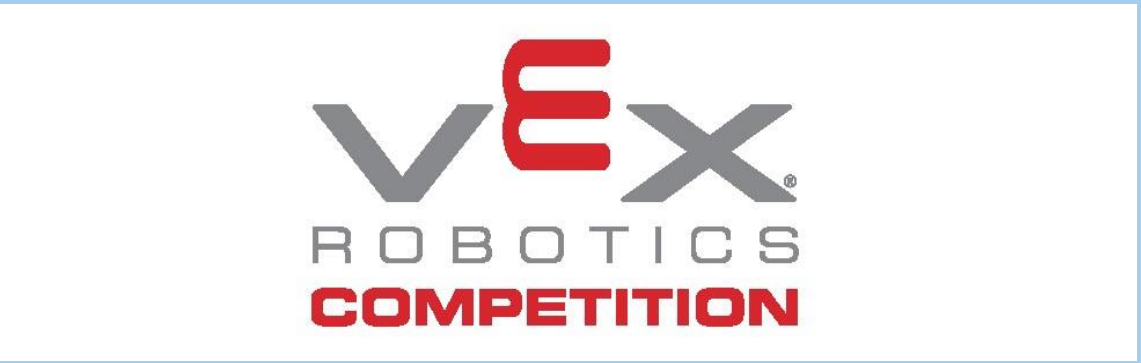
VRC Middle School - Career Readiness Online Challenge



Team name:
TEAM ORION

Names of students who participated:

Vedhika Mathur
Riona Peeris
Tannishtha Mondal
Jessica Yu
Yuqi Deng

Team number:
10173T

Location of team:
Henrietta Barnett School, Central, Square, Hampstead Garden Suburb, London NW117BN

IBM DESIGN

IBM:

The STEM company that our team has chosen is IBM design - International Business Machines. IBM is a global technology company which provides computer hardware, software cloud-based services (services over the Internet/network) and cognitive computing (i.e. technologies based on Artificial Intelligence) to consumers across the globe. They provide products such as computer mainframes, nanotechnology, and various technological services to different users. IBM is also a major global research organization.

Why did we select IBM?

There are many reasons why we decided to choose IBM as our company. An important reason why we chose it was because a parent of a team member works in the company. Not only did this spark an interest in all of us, but also meant that we already had a large amount of insight into the company itself.

Secondly, we thought that by understanding the designing process of this professional company, we could incorporate ideas and processes into our own robot design process.

The hard-disk drive, DRAM, the UPC, magnetic stripe card.

Thirdly, we understood that IBM is quite an influential and historical technological company and can be ranked close to companies like Google and Microsoft. IBM was one of the first ever computer companies during the beginning of the computer age (20th century) and introduced many ideas that influenced the technologies of our PCs today. They were hugely popular in the 1930s-80s and became the largest global producer of computers. They were also major innovators, becoming the first discoverers of AI, and inventing the oldest used programming language, Fortran (still used today). IBM also invented the ATM, (automated teller machine), hard disk drives, floppy disks, and even the magnetic stripe card. We were surprised that these inventions/discoveries had been made by a company so unknown in today's world. Their work (especially recent work to do with AI and software services) and well-known inventions became a genuine interest to us and was another encouragement for us to research and document it.

One of the first IBM PCs

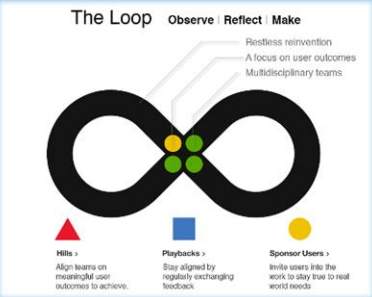
What resources did we use to learn about IBM's engineering design process?

We used a few different resources to research the engineering design process of the professionals of IBM. We did a great amount of online research using the IBM design website. We found different sections and courses there, and used them to take down notes and ideas. We also used our personal connections to get more insight i.e. Tannishtha's dad works for IBM, so we were able to get information from him, and

ask a few questions about his job and any engineering design processes that he might do. There were also a few useful videos about the history and future of IBM on YouTube.

IBM's engineering design process:

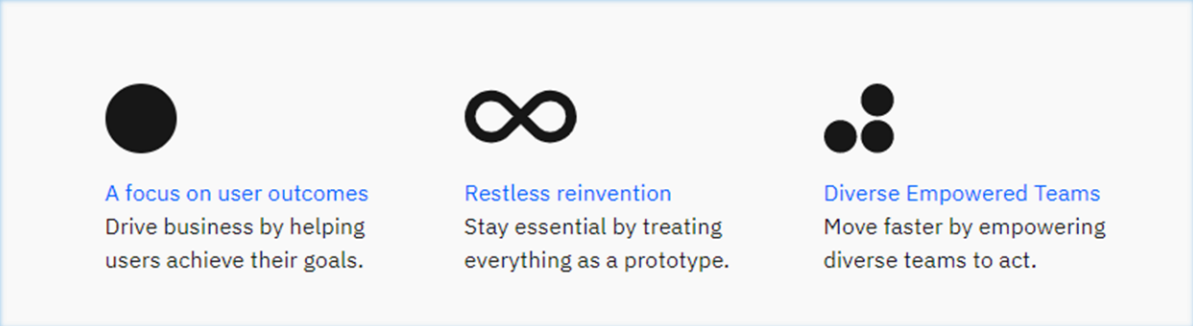
IBM actually has a very efficient system as an engineering design process. They have three main sections called 'the principles', 'the loop' and 'the keys'.



Engineering design process system of IBM

The principles are the core values that IBM looks into at the **start of** the engineering design process:

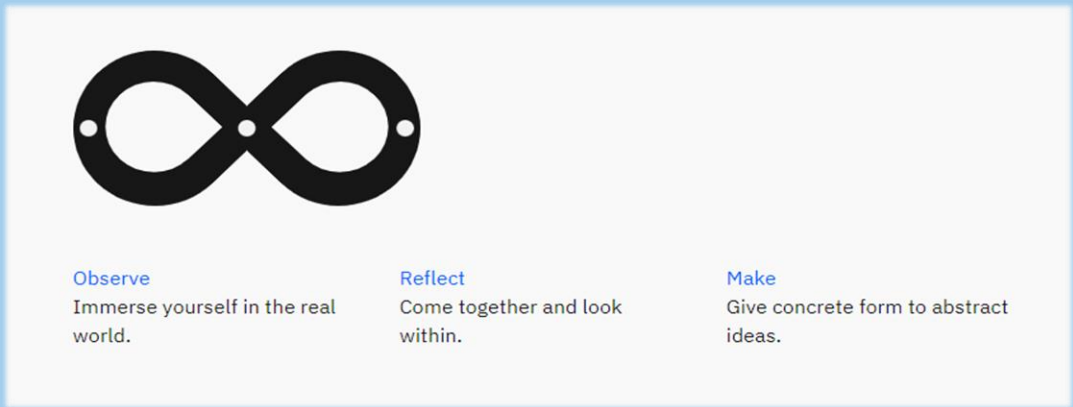
- *A focus on user outcomes*: Identifying the user, expressing their needs, and building empathy for them. This might include tasks like making a persona or empathy board.
- *Restless reinvention:* Keeping all designs as simple prototypes, which allows IBM to quickly respond and reinvent according to changing needs of the user or technological advancements.
- *Diverse empowered teams:* Having people of different backgrounds/perspectives on the same team, brings in unique designs, meaning the whole brainstorming process is broader and faster.



These values are used day-to-day by designers.

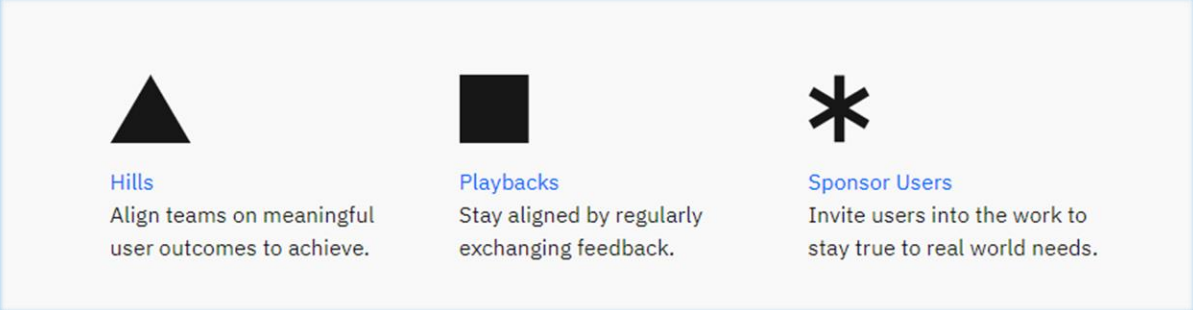
The **middle** of the engineering designing process (the loop):

- *Observing:* IBM continually immerse themselves into the user's world, and understand their wants and needs through questions, feedback, and general observation.
- *Reflecting:* Teams come together and reflect/analyse the findings and agree on possible solutions.
- *Making:* Producing prototypes and models of designs. This leads to finally driving, testing, and giving feedback on these designs.

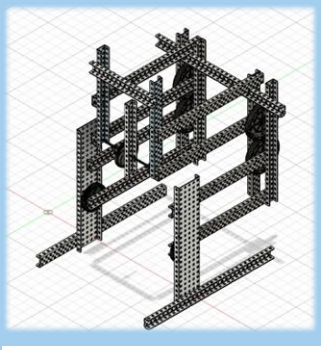


The **end/maintaining** the engineering designing process (the keys):

- They use *'hills'* and 'playbacks' to bring users and teams together to exchange feedback. This allows a regular measure of progress and also uncovers mistakes.
- Using *'sponsor users*' provide teams with deep knowledge on problems, which helps the team to redesign and re-evaluate.



<u>How does IBM'S approach match/differ to our team's approach to an engineering design process?</u>



Example of one of our prototypes on CAD

Our approach to designing and engineering a robot design doesn't greatly differ from the professional approach that IBM uses. Our main strategy is to first brainstorm ideas as a group, while understanding what our robot has to be able to do (i.e. picking up rings and mobile goals). Then we develop on these simple ideas to come up with more complicated designs and merge them together to see if they would work as a complete robot design. Then we take the best solutions and designs and make prototypes of them using CAD (i.e. fusion 360). Finally, we build these prototypes and test them out on the field and make changes accordingly. This process is very similar to 'the principles and 'loop' part of IBM's engineering process. We could however greatly improve our process by including processes such as having 'restless reinvention' and the use of 'playbacks'.

How has participation in VEX prepared us for a future career?

Participating in VEX Robotics has already taught us a variety of new skills that we can use in our future careers. We have no doubt that it will continue to give us experience in many different areas. For example, we are learning skills such as teamwork, time management and communication. It gives us more obscure skills such as problem solving, when working on specific designs, and even the ability to work under pressure (i.e. in competitions). We also think that the entire process of sketching, designing, modelling, and using CAD to process robot designs will also be very important for future careers, especially STEM careers. Even the simple designing skills that we learned, e.g. Calculating gear ratios or learning different types of bar lifts taught us something completely new and could also be very useful to us in the future.