

Caterpillar Inc. Challenge 2018-19

Introduction: Caterpillar Inc.

Caterpillar Inc. is an American corporation which designs, develops, engineers, manufactures, markets and sells machinery, engines, financial products and insurance to customers via a worldwide dealer network.

Caterpillar is committed to providing products and services that enable our customers to be more profitable using our products than those of our competition. We are committed to product quality and reliability. For our customers, this means confidence in availability, in avoiding unexpected downtime and in the longevity of the product. Customers can be confident that they can start a job, that the product will be working, and that its residual value will minimize total cost of ownership.

Making Sustainable progress possible is our motto and we make it happen through innovation and collaboration. Caterpillar employees have turned their passion for product development into innovations that create customer value and make the world a better place.

Caterpillar Inc. Challenge

At Caterpillar, Inc., we are passionate about working with the students in our communities who will be the innovators and entrepreneurs of the future. In that spirit, we are proud to support and provide mentors for the ISTI STEM Challenge, which will allow high school students to provide fresh ideas and solutions for meaningful real-world challenges.

Predicted Problem Statement:

CAT would like your help to shape the future of CAT's business. You will choose an industry, a technology, and a business segment in order to identify and help solve a real problem they are facing. You will have to understand who CAT works with, current and emerging CAT technologies, and how CAT operates their business, both internally and externally. Your innovation should impact the people, equipment, technology, and outcomes of the company, and be feasibly marketed by Caterpillar Inc.

To tackle this problem statement from Caterpillar, you will become a direct report to a team of Caterpillar mentors and can select the direction of your exploration and problem solving by selecting from each category below:

You will choose an industry, a technology, and a business segment in order to identify a pressing problem and create a solution.

A. Select a CAT industry to focus on:

- a. Construction
 - i. Caterpillar offers a full line of industry-leading construction equipment to handle any job. Innovative technologies increase machine efficiency and operator productivity.
- b. Mining
 - i. Caterpillar provides the broadest line of surface and underground mining equipment in the industry, including mining trucks, hydraulic mining shovels, rotary drills, and motor graders.
- c. Solar
 - i.
- d. Agriculture
 - i. Caterpillar provides a wide range of agriculture equipment and solutions to help ag producers improve productivity and efficiency to maintain profit margins.

B. Choose a technology to create or refine:

a. Wearables:

- i. This option allows you to design and innovate a model or working prototype of a wearable technology. What technologies will be present and how will they work? What problems will these technologies solve? How will data flow from inception to insight?
- ii. Make sure to take emerging or existing technology into account to keep your idea grounded in reality.

b. Devices on machines:

- i. Machines already exist and are sitting on job sites. Remanufacturing a machine to incorporate a tracking system would not be practical or cost-effective. Consider ways to track large machinery using a device separate from the machine itself.
- ii. Develop a prototype of this tracking device. The possibilities are practically limitless, from infrared cameras, to inventory tag readers, to Bluetooth device trackers, etc.
- iii. Think about the ways you might track a large asset around a construction or mining site that could several hundred square miles in size. Does the technology have a long enough distance range to track the machine? If the device is attached to the assets, how can you ensure it is rugged enough to withstand weather? What are the benefits of a removable tracking devices?
- iv. Consider using raspberry pi for programming.

c. Mobile apps:

- i. Storyboard and create a wireframe and working prototype application. The focus will remain on the app itself, and should take into account sensor or remote technology.

- ii. Possible tools: Android Studio, MIT App Inventor, Arduino kit.
- iii. Design, build, and present the app in a professional manner, considering sales and marketing.

C. What type of problem are you helping CAT solve?

- a. Productivity
- b. Safety
- c. Sustainability

D. Define your target audience/ business segment. At what level of CAT's business are you solving this problem? Who are you solving this problem for?

- a. Enterprise - CAT internal departments, i.e. HR, legal, marketing, sales
- b. Dealer - Those who are selling the CAT machines and products
- c. Customer - Machine operator, CAT engineer, etc.

Organize your project into the below phases, allocating specific time to each:

Phase I: Research current Caterpillar industries and technologies. Understand what is already being done in this area, and where the future of each industry and technology is moving. Choose the industry, technology, and problem type you want to focus on.

- Come up with a plan - who will be mentor point of contact, who will come up with the initial design, how many weeks will you spend on each phase
- Weeks 1-2

Industry Resources:

- [Cat - Products & Services](#)
- [Ten Ways Caterpillar Changed the World](#)
- [Cat - Industry Solutions](#)
- [Cat - Construction Industries](#)
- [Cat - Jobsite Solutions](#)
- [Cat - Telematics](#)
- [Article - The Rise of Telematics](#)
- [Article - IoT Revolutionizing Safety in Construction and Mining](#)
- <https://construction.trimble.com/resource-center/infographics>

Phase II: Define your target audience/ business segment. Consider if you want to address the needs of the enterprise (Caterpillar as a company), the dealers (companies that sell Caterpillar products), or the customers (construction site workers, machine operators, engineers, etc.).

- Initial pitch - prepare a pitch to your mentors explaining your team's focus
- Weeks 2-3

Technology Resources:

- [Cat - Mining Surface Technology](#)
- [Cat - Technology](#)

- [Cat - Next Gen Products](#)
- [Make Any Android App Easy Enough for Grandpa](#)

Phase III: Focus on design/redesign, building, or wire-framing your product/service/app.

- Share this with your mentor weekly, even if things remain the same
- Weeks 4-6

Design Resources:

- <http://perfectedtech.com/step-step-guide-planning-app/>
- <http://www.dtelepathy.com/blog/design/learning-to-wireframe-10-best-practices>
- <http://mashable.com/2010/07/15/wireframing-tools/#JEUegIDJbZqU>
- <http://uxmag.com/articles/storyboarding-in-the-software-design-process>
- <http://mashable.com/2010/07/15/wireframing-tools/#iZWZzYiZCZqo>

Phase IV: Implement/build your idea.

- This should happen in tandem with starting to understand the communication of your idea back to your mentors.
- Weeks 6-9

Resources for Lean UX and Lean Startup Methodologies:

- <http://theleanstartup.com/principles>
- https://en.wikipedia.org/wiki/Lean_startup
- <https://marmelab.com/blog/2016/02/12/build-measure-learn.html>
- <https://marmelab.com/blog/2016/01/15/lean-startup-the-idea.html>
- <https://marmelab.com/blog/2016/01/22/lean-startup-risky-business>
- <https://marmelab.com/blog/2016/01/29/lean-startup-first-problem-interview-with-cloudscreener.html>
- <https://marmelab.com/blog/2016/01/20/lean-startup-lean-canvas.html>
- <https://marmelab.com/blog/2016/01/27/lean-startup-designing-a-problem-interview.html>
- <https://marmelab.com/blog/2016/02/05/lean-startup-designing-personas.html>

Device Building Resources:

- <https://www.raspberrypi.org/>

Diorama Building Resources:

- https://construction.trimble.com/sites/default/files/literature-files/2017-01/022482-3523_Connected_Site_A2_0516_LR.pdf

App Development Resources:

- <http://appinventor.mit.edu/explore/>
- <https://developers.google.com/maps/>
- <https://developer.android.com/studio/index.html>

Phase V: Marketing and presentation. How will you pitch your idea/market your product in a professional way?

- Allow 3 weeks or more for this part of the process. Refine your presentation, practice, and polish!
- Weeks 10-12 +

Resources for Pitch Creation:

- <https://guykawasaki.com/the-only-10-slides-you-need-in-your-pitch/>
- <http://creatly.com/blog/diagrams/use-gantt-chart-plan-project/>
- <https://www.columnfivemedia.com/how-to-create-a-brand-identity>
- [Search Google Patents](#)

Student Expectations:

As part of this experience, students will assume the role of “employee” and will be direct reports of the Caterpillar mentors, the project “managers”. To ensure the ultimate project is a success, students agree to:

- Create a Gantt Chart or Project Timeline that includes all anticipated deadlines and submit to the mentors for approval.
- Designate roles within their group, and select one classmate as Communications Manager. The Communications Manager will be responsible for organizing communication with the mentors on MME and for uploading all documents and content to MME.
- Share questions and updates on MME at least 24 hours prior to any schedule video calls.
- Proactively communicate with mentors and provide updates on project status at least once per week.
- Post one or two sentences on MME to summarize the actions/tasks for each team member after every team meeting. The mentors can then provide feedback and track team progress.
- Be dedicated team members and actively contribute to their group’s project.

Mentor Expectations:

As part of this experience, mentors will assume the role of “manager” and will be direct supervisors of the students, the “employees”. To ensure the ultimate project is a success, mentors agree to:

- Provide consistent feedback on MME, within 48 hours of student posts.
- Attend video conferences and proactively reach out to students.
- Visit the school at least once, host students at Cat at least once.
- Connect students to subject matter experts at Cat (if necessary).
- Be dedicated mentors and actively contribute to the student projects’ success.

Things to consider:

In order to imagine and develop a solution, you will need to consider the following questions about leveraging the power of new and existing technology and design:

Which challenge do you want to tackle?

- Conduct user observations. What issues and challenges are unearthed? What problem could you solve with new technology? Survey those around you as well.
- Identify your area of focus: Jobsite of the future diorama, prototype of a tracking device, or creating a tracking app.
- Identify users in order to narrow your focus. Do you want to create a jobsite of the future diorama, prototype a tracking device or create a tracking app to solve a problem? There are many ways to focus on a target audience.
- Apply principles of Lean Startup and Lean UX frameworks to any solution you choose to implement. That means, customer personas and journey maps apply whether you are creating an application, device or model.

What are the issues and pain points?

- What tracking devices and apps are currently available?
- Research new technologies and designs being created. What direction is jobsite management moving in? Are there areas you can improve on?
- To what extent would current solutions meet your criteria for a successful solution?

What novel solutions could a large machinery tracking device or application provide?

- Reimagine existing technology
- Brainstorm and ideate new possible solutions
- Prototype new phone designs, mods, and mobile apps
- How will you measure and test success in your design?
- How could you pitch and market this new product?
- What is the potential of your product and what are the limitations?
- What benefits can asset tracking provide to prevent theft, improve safety and enhance operational efficiency including lowering refueling costs?

What are technical issues to consider in the process?

- What is the availability and reliability of networks for your users?
- How far do various technology tracking systems work?
- What are the privacy issues for your users?
- What broader implications and applications are uncovered in your design process?
- What might be the costs associated with developing, implementing, and marketing your solution?
- What governmental regulations and legal issues might come up in your design and implementation?

How will your solution be marketed/sold/distributed?

- What freemium models and payment plans might be applicable?
- How will users learn about your app or product, what is your user acquisition strategy?