



IBM the Future of Engineering

HAYMARKET, VA

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WHY IBM?

We chose IBM because we are inspired by the work they put in to making the world more productive. IBM makes products such as servers, networking equipment, computers, Artificial Intelligence (AI) and programs that make people more creative. Their AI, WatsonX, is one of the most helpful AI's out there for programming and coding, as it enables people from all levels to write code.

IBM'S ENGINEERING LIFECYCLE MANAGEMENT:

IBM's Engineering Lifecycle Management (ELM) consists of four steps:

- Requirements
- Systems Design
- Test
- Workflow

This helps engineers to create their products. After they complete the cycle they then repeat the steps, which is similar to our engineering process.

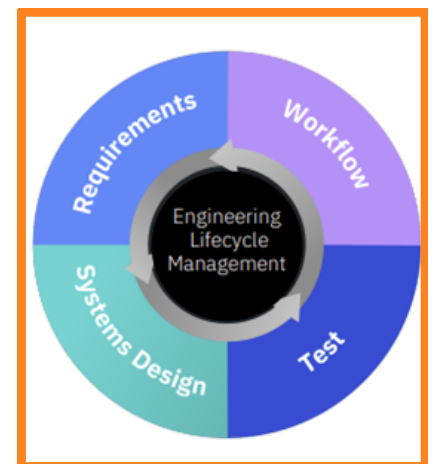


Figure 1: IBM's ELM

OUR DESIGN PROCESS:

Our design process has six steps and is more in depth than IBM's process.

1. Identify the Problem
2. Brainstorm the Solution
3. Select the Best Solution
4. Build and Program
5. Test the Solution
6. Repeat the design process

The next sections will compare our process to IBM's in more detail.

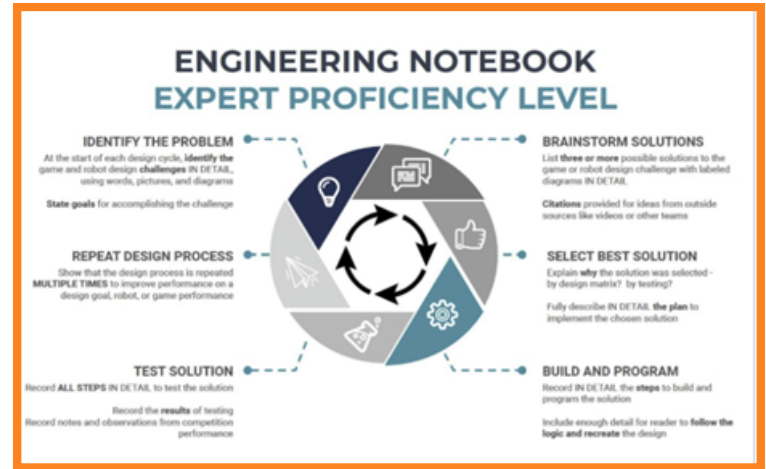


Figure 2: Our Design Process

IBM'S REQUIREMENTS: STEP 1

IBM's Requirement step is similar to our Identify the Solution step. IBM creates a vision document to address needs and goals plus they define and prioritize high-level requirements. This process is shown in Figure 3. This is similar to our process because we identify a few goals on what we should add to our robot. Then we identify specific challenges we need to address to meet our goal, as shown in Figure 4. This helps guide and focus our design cycle.

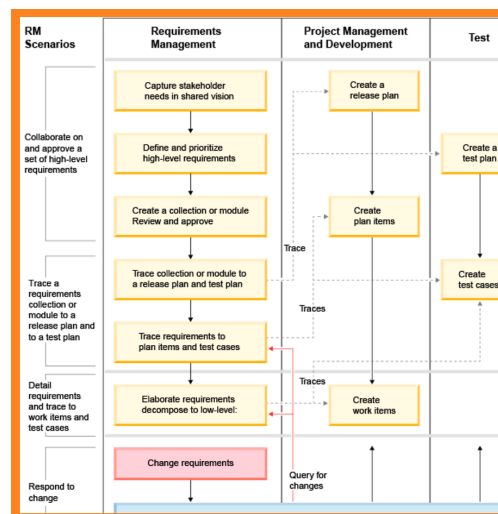


Figure 3:
IBM's requirements process

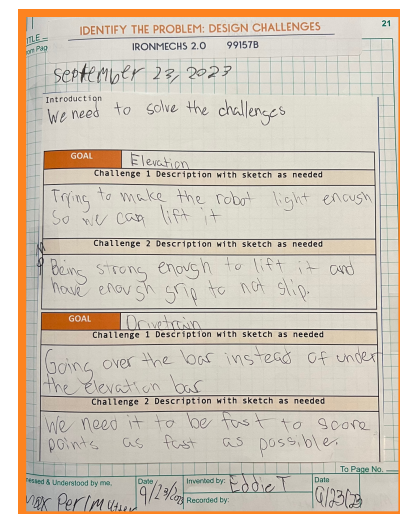


Figure 4:
Our of Identifying the
Solution page for the
Elevation and Drivetrain.

IBM'S SYSTEMS MANAGEMENT:

STEP 2

IBM's Systems Design step is similar to our Brainstorm, Select the Solution, and Build and Program steps. One of those similar aspects is they create digital models to see what their products would look like and evaluate different options before they build the actual product, as shown in Figure 5. We brainstorm to determine all the options, as shown in Figure 6 and we use Vex IQ physical models, as shown in Figure 7. Our IQ physical models help us to evaluate options before we build them in VRC, as shown in Figure 7. This process helps us select the solution by seeing which IQ model works the best.

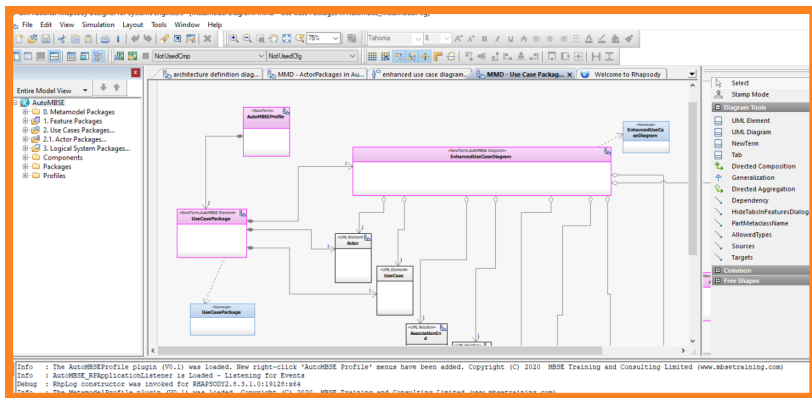


Figure 5: IBMs Digital Models

Project No. **DIAGRAM OR PROTOTYPE THE SOLUTION**

From **Brainstorm, Diagram or Prototype the Solution**


IR0MCHS 2.0 991578

November 18th, 2023

Innovation

We brainstormed different ideas to get a better launcher. Some we saw of the competition which gave us inspiration.

COMPONENT **Launcher**

Idea 1 Name	Description and Picture
flywheel	 <p>speed of flywheel buries triball</p>
Pros	fast, consistent with precise
Cons	placement needs to be accurate motor could bein requirerem
Addresses Challenge 1	foster, doesn't jam
Addresses Challenge 2	doesn't jam intake
References	rac falcon school

Designed & Understood by me. **Edgar T** 11/18/23

Date **11/18/23** Invented by **David F** Drawn by **Aliahs**

Project No. **None**

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Figure 6:
Our Brainstorming options for Flywheel





TITLE		Project No.	41
From Page No.		Book No.	
<p>Build Goal: Build the prototype of the elevator then the base of the pole climbers</p> <p>Builder(s): <u>Daniel, Eddie</u></p> <p>Sketch or Picture of Goal:</p> 			
<p>Build Process, Challenges, and How We Fixed Them:</p> <p>• First, we prototyped our elevation using Vexia parts. We prototyped 2 different types of elevation. I was the drive up the pole prototypes which uses the weight of the robot and the wheels to move up the pole.</p> <p>• The next prototype was a drive up and a locking bar to get up the pole.</p>			
		 <p><u>Drive up</u></p>	
		 <p><u>Locking bar</u></p>	
			
Witnessed & Understood by me,	Date	Invented by:	Date
<u>Max Perlmutter</u>	<u>9/25/2023</u>	<u>Eddie T</u>	<u>9/25/23</u>
		Recorded by:	
			To Page No.

Figure 7:
Our Prototyping
with Vex IQ Models

IBM'S TESTS:

STEP 3

IBM's Test step is similar to our Test the Solution step. IBM has a tool that lets you create your own test plans and set testing objectives to guide the testing process, this is shown as Figure 8. Figure 9 are test pages that we write during the testing of our robot. We define test goals and plan to guide our test process. These help us find problems and test solutions. To ensure it works consistently, we test until we have 3-5 passes in a row.

Another similarity from IBM's test process to ours, is the fact that they are dedicated heavily to testing in order to have a working product. Just like our team with our robot, we test until we have a fully functional aspect whether it is code, the drivetrain, pneumatics, or even our 5-in-1 system which consists of our Blocker, Flywheel, Intake, Anti-Tipper, and Elevation.

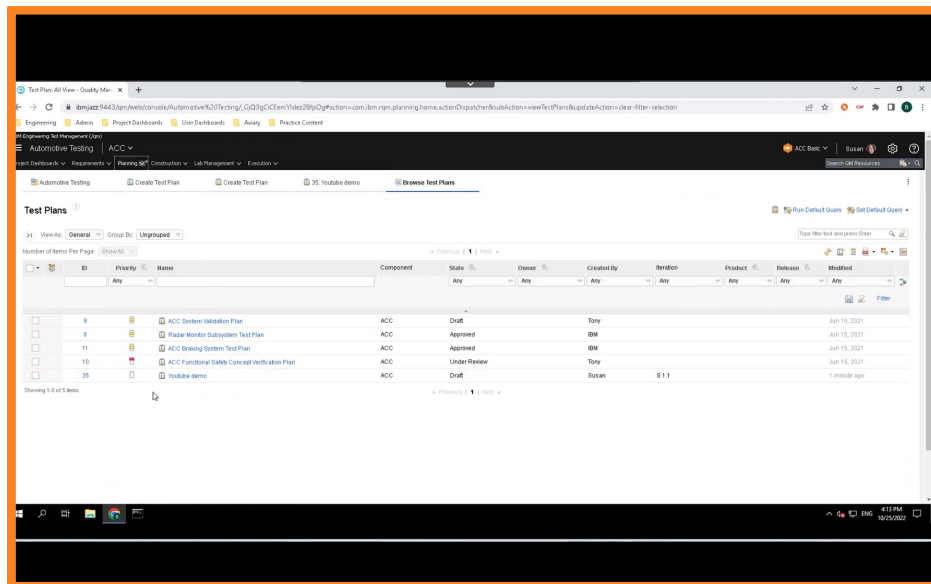


Figure 8:
Screenshot of IBM's format of test plans

100 Project No. _____ TITLE _____
Book No. _____

From Page No. _____

Testing Goal:
Test launcher

Test Plan:
Try different rubber band amounts.

Tester(s):
Adi + Max

Testing:

Test	Pass / Fail	Conclusion
Motor Direction	P	
	P	
	P	
	P	
2 rubber bands	P	doesn't make it over
	F	
4 rubber bands	F	too short, didn't cross
	F	
	F	
6 rubber bands	P	
	P	
	P	too short
Set motor to 100	P	testing still slow
	P	

Test Conclusion:
6 work but slow

Witnessed & Understood by: _____ Date: 10/7/21 Invented by: Eddie Tuttle Date: 10/7/21
Recorded by: _____

Figure 9:
Test page of our launcher

IBM'S ENGINEERING WORKFLOW MANAGEMENT (EWM): STEP 4

IBM's EWM has some similarities and differences to our build and program step. Their EWM is mainly focused on dividing up the work and programming among teams. This is shown in Figure 10 where a task is created and tracked if it is completed. This is similar to our way of dividing up work using the sticky notes that we use to track what we want to accomplish in the meeting, as shown in Figure 11 and 12.

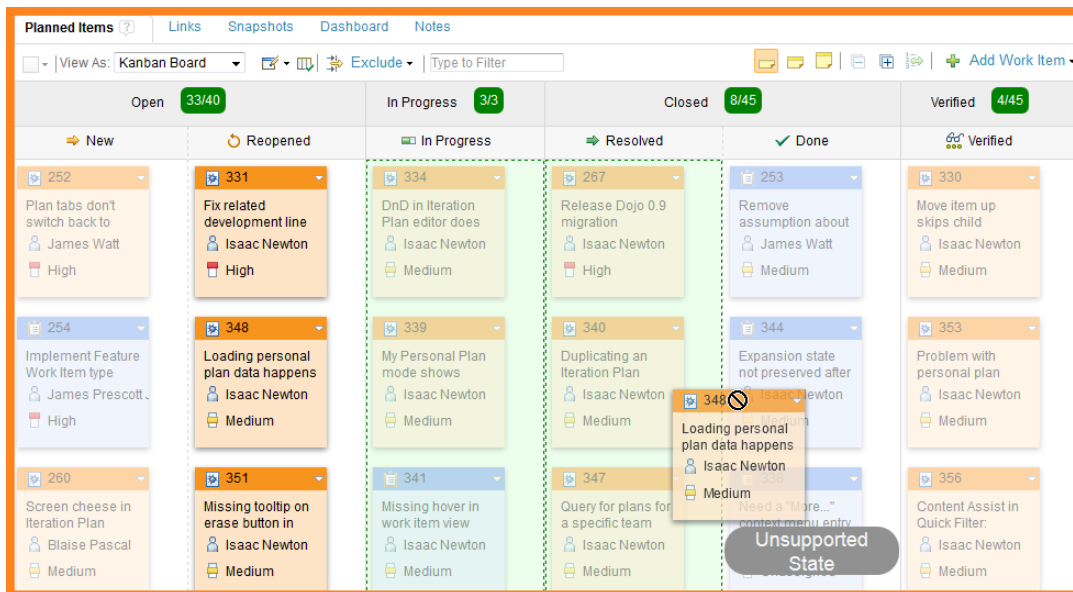


Figure 10:
Task created by an employee at IBM

They also have a code management program where if a coworker were to change the code, it would automatically alert the others to the change. We had challenges with code management so we are trying to use GitHub, it will help us by alerting everyone when a change happens. Which is similar to IBM's program.

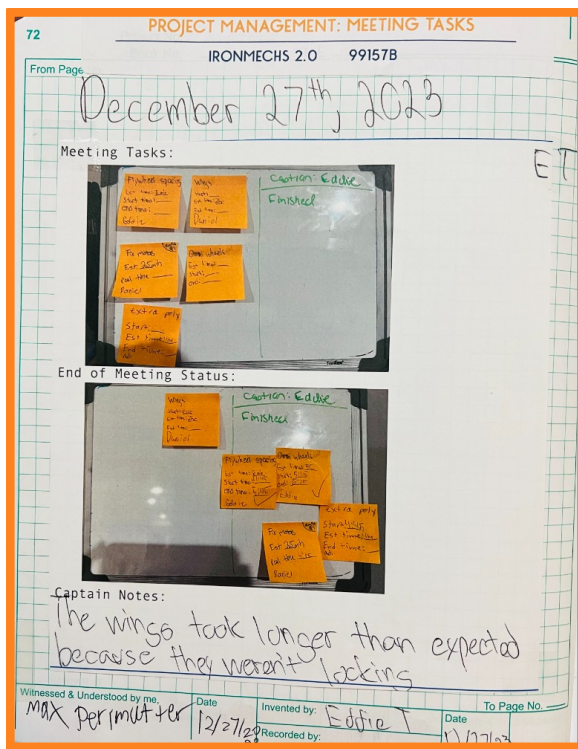


Figure 11:
Our Management with
Sticky Notes

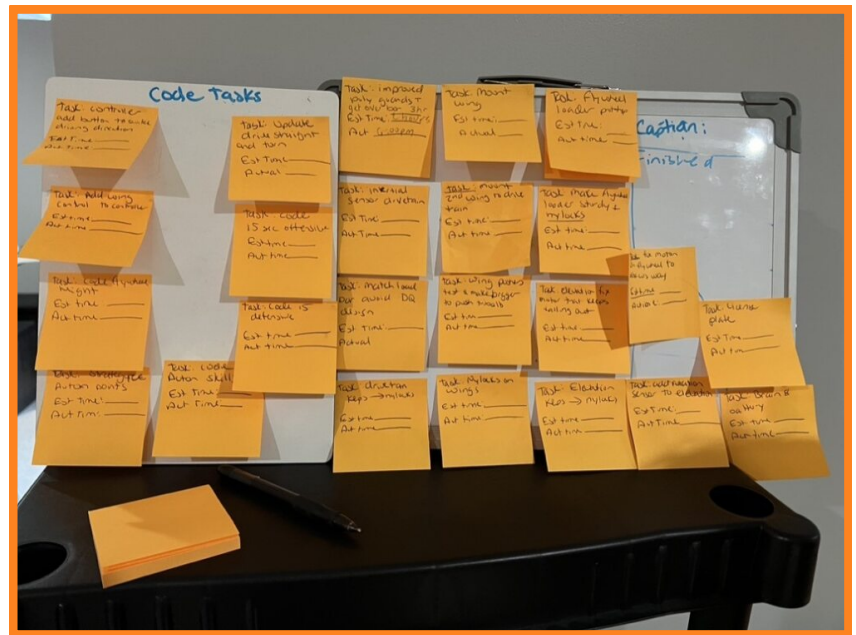


Figure 12:
Sticky notes showing tasks to complete
at the beginning of the day

HOW DOES VEX PREPARE US FOR THE FUTURE?

VEX prepares us for the future because we can qualify for a college scholarship from experience gained through VEX. We can get a job in engineering or designing. VEX is a very useful program that can prepare elementary school students for the future through its IQ Program and middle/high school students with the VRC Program. Both IQ or VRC prepares students for future jobs as they are learning new skills for work.

It can also teach students teamwork amongst coworkers/team members. VEX can also build leadership in students, for example, we have a Team Captain that rotates with every meeting. Finally, VEX can also help with social skills from scouting and judge's interviews at competitions.

REFERENCES:

TEST PLAN

[HTTPS://WWW.YOUTUBE.COM/WATCH?V=S8AWMZ7BDQS](https://www.youtube.com/watch?v=S8AWMZ7BDQS)

IBM ENGINEERING LIFECYCLE MANAGMENT

[HTTPS://MEDIACENTER.IBM.COM/MEDIA/INTRODUCTION+TO+IBM+ENGINEERING+LIFECYCLE+MANAGEMENT/1_423U89FP](https://mediacenter.ibm.com/media/introduction+to+ibm+engineering+lifecycle+management/1_423U89FP)

OUR DESIGN PROCESS

[HTTPS://VRC-KB.RECF.ORG/HC/EN-US/ARTICLES/9662058169495-ADVANCED-ENGINEERING-NOTEBOOK-TECHNIQUES](https://vrc-kb.recf.org/hc/en-us/articles/9662058169495-advanced-engineering-notebook-techniques)

INTRO TO DOORS

[HTTPS://WWW.YOUTUBE.COM/WATCH?V=CZ7BBHACIZA](https://www.youtube.com/watch?v=CZ7BBHACIZA)

STEPS IN THE TEST MANAGEMENT PROCESS

[HTTPS://WWW.IBM.COM/DOCS/EN/ENGINEERING-LIFECYCLE-MANAGEMENT-SUITE/TEST-MANAGEMENT/7.0.2?TOPIC=OVERVIEW-ENGINEERING-TEST-MANAGEMENT](https://www.ibm.com/docs/en/engineering-lifecycle-management-suite/test-management/7.0.2?topic=overview-engineering-test-management)

DOORS DIAGRAM

[HTTPS://WWW.IBM.COM/DOCS/EN/ENGINEERING-LIFECYCLE-MANAGEMENT-SUITE/DOORS-NEXT/7.0.2?TOPIC=GETTING-STARTED](https://www.ibm.com/docs/en/engineering-lifecycle-management-suite/doors-next/7.0.2?topic=getting-started)

SYSTEMS DESIGN PROCESS

[HTTPS://WWW.IBM.COM/DOCS/EN/ENGINEERING-LIFECYCLE-MANAGEMENT-SUITE/DESIGN-RHAPSODY/9.0.0?TOPIC=RHAPSODY-SYSTEMS-ENGINEERING](https://www.ibm.com/docs/en/engineering-lifecycle-management-suite/design-rhapsody/9.0.0?topic=rhapsody-systems-engineering)

PROCESS STEPS IN WORKFLOW MANAGEMENT

[HTTPS://WWW.IBM.COM/DOCS/EN/ENGINEERING-LIFECYCLE-MANAGEMENT-SUITE/WORKFLOW-MANAGEMENT/7.1?TOPIC=OVERVIEW-ENGINEERING-WORKFLOW-MANAGEMENT](https://www.ibm.com/docs/en/engineering-lifecycle-management-suite/workflow-management/7.1?topic=overview-engineering-workflow-management)