10/23 Internal workshop (1.5hr)

- Delegate work
    - Basic Understanding - Cristian
    - Stakeholders - Andrew
    - Assumption - Cristian
    - Inputs - Omar
    - Outputs - Andrew
    - Scenarios - Issy and Raul
    - Maintenance Plan - Andrew
    - Training and Documentation - Issy
    - Compliance and Regulation - Omar
    - Acceptance Testing - Raul
    - Contract - Andrew

Requirement Elicitation Documentation

Project Name: Optimization of Port Container Operations
Client: Mr. Keoh
Date: 9/30 - 10/31

10/18 Requirement Elicitation Meeting with Mr.Keogh
Transcript: link

10/7 Fellowup meeting with Mr.Keoh

- Mr. Keoh clarifies operational goals and constraints.
- Mr. Keoh explains solution preferences.

Action Items for the Week:

- 10/8 Document-based Analysis (5hr)
    - Go through document Mr. Keoh provides
- 10/10 Detects potential problems and clarifications from the document (3hr)
    - Identify potential issues and areas requiring clarification based on document review.
    - Gather questions and potential challenges to address with Mr. Keoh.
- 10/11 Internal workshop (1.5hr)
    - Team discussion on identified issues and any additional questions for Mr. Keoh.
- 10/16 Internal workshop (3hr)
- 10/17 Internal workshop (2hr)
- 10/18 Zoom meeting rehearsal (30min)

9/30 First meeting with Mr.Keoh - Understand Mr. Keoh's company, goals, and challenges.

- Mr. Keoh introduces his company and outlines his primary objective—to optimize the loading, unloading, and balancing processes at his Long Beach port.

Research Task for the week

- Domain Exploration(2hr):
    - Review animated videos detailing standard port loading/unloading processes to grasp foundational port operations.
- Regulatory Compliance(2hr):
    - Investigate the Long Beach Port's regulations and policies that impact container handling:
        - Overweight Container Corridor: Routes designated for moving heavy containers, avoiding extensive permitting needs.
        - Weight Compliance in Equipment: Ensures equipment safety with weight limits.
        - Environmental Impact and Compliance: Requirements for transitioning to low-emission equipment.
        - Customs and Cargo Security: Compliance protocols for handling restricted goods.
        - Container Dwell Fees: Charges for containers stored on port premises over a designated period.
- Assumption:
  Pi Tech assumes that Mr. Keoh is already compliant with these policies as part of his port operations.

Requirement Elicitation Meeting Note

Date: 10/18/2024 7pm(PT)
Company: PiTech
Client: Mr. Keogh
Location: Zoom

PiTech Questions:

Question 1: Can we confirm the list of stakeholders?

🟩 **Mr. Keogh's Response:** It's a good list, but you might want to add **Homeland Security or the FBI**, as they occasionally want to audit the log file in cases of smuggling or similar issues. **Insurance companies** might also be involved indirectly.

Question 2: Any vision-related disabilities to account for among employees?

Mr. Keogh's Response: No disabilities to worry about. My employees are in perfect health, as we perform physicals, and they must handle dangerous machinery.

Question 3: Are all employees familiar with basic software applications?

Mr. Keogh's Response: Yes, they can use Excel and PowerPoint. They also use cell phones regularly.

Question 4: Will only one employee use the software at a time?

Mr. Keogh's Response: Yes, only one person operates the crane at a time, and the software is used by a single individual. When they change shifts, the new employee taps the previous one on the shoulder to switch.

Question 5: Can we assume operators will follow software orders exactly?

Mr. Keogh's Response: Yes, you can assume that. The point of the software is to scale the process so we can hire less expensive, less trained employees who will follow instructions blindly.

Boxed Solution Questions:

Question 6: Have you managed situations where trucks arrive late or ships come earlier than expected?

Mr. Keogh's Response: That's not your problem. The crane operator will know if trucks or ships are late before interacting with the software.

Question 7: If both trucks and ships experience delays, how should the system prioritize tasks?

Mr. Keogh's Response: The operator will know beforehand and will manually deal with that. The software doesn't need to worry about this scenario.

Question 8: Should the system flag discrepancies between container labels and the manifest?

Mr. Keogh's Response:

- There is **no direct relationship** between the container's contents and its external label, which may just be painted with the company's name or some other markings.
- 🟩 The only way to identify a container is by its **manifest** and its location on the ship. There are **no identifying marks** on the container itself.
- Containers are often **painted in different colors**, but these colors hold **no significance**.
- As such, the system should not rely on external labels for identification or flagging since the manifest and container location are the only ways to track containers.

Question 9: Are there any government or legal authorities you report to? What information do they need, and how often are reports generated?

- **Mr. Keogh's Response**:
  - 🟩 We are required to provide a copy of the log file to the **TSA** at the end of every year.
  - 🟩 Authorities, such as **FBI** or **law enforcement**, may request the log file anytime through a subpoena.
  - 🟩 Keeping a **perfect log file** is the only legal obligation.
  - No need to maintain medical records or tax records for the system.

Question 10: If a container arrives with visible damage not noted in the manifest but is still functional, how should this be logged?

- **Mr. Keogh's Response**:
  - Employees are trained not to stop operations for visible damage unless significant.
  - 🟩 The employee will hit a button in the software, opening a comment window where they can log a **free text comment** about the damage.
  - 🟩 The comment will be **timestamped** in the log file.
  - No further action is taken unless necessary.

Question 11: How should the system handle situations where container weight exceeds the legal limit?

- **Mr. Keogh's Response**:
  - 🟩 Exceeding the legal weight limit will likely not be an issue.
  - The manifest data has a weight limit of **99,999 kg**, but practically, no truck could support this weight.
  - 🟩 The **ship and crane** can physically handle such weights without any issue, so no overflow concerns exist.

PiTech Questions:

Question 12: Do we need to account for costs related to delayed trucks or special trucks?

- **Mr. Keogh's Response**:
  - The software does not need to consider costs related to delayed or special trucks.
  - 🟩 The software will operate as per the **optimized procedure**, regardless of these external factors.

Question 13: Can we assume that all containers will always be in the stated location and have the stated weight in the manifest?

- **Mr. Keogh's Response**:
  - Yes, you can assume that containers are always in their **stated locations** on the ship.
  - However, the weight might vary slightly, for example, due to **rainwater** or the contents inside (e.g., bananas producing gas and changing weight slightly). Such variations are typically within **3 to 4 kg** and do not pose a problem.

- 🟩 If a container's weight is **significantly different** (e.g., 10,000 kg listed but 72,000 kg in reality), the operator logs this discrepancy, but they do not alter the manifest.

Question 14: Should the system be responsible for ensuring that the manifest is 100% accurate when balancing containers?

- **Mr. Keogh's Response**:
  - The **manifest** is an important legal document, and the **ship's captain** is responsible for ensuring its accuracy. Any mistake on the manifest is costly and could result in job loss for the captain.
  - The system should assume that the manifest is **correct**. It's important for the system to maintain the accuracy of the manifest when changes are made (e.g., after loading/unloading).
  - 🟩 If there is a discrepancy between the **actual weight** of a container and the weight listed in the manifest, the **legal weight** from the manifest is used, not the actual weight. Any differences are noted but not changed.
  - 🟩 When balancing containers, the system should only consider the weight listed in the manifest, not the actual physical weight.

Question 15: Who is responsible for the accuracy of the manifest?

- **Mr. Keogh's Response**:
  - 🟩 The **ship's captain** is responsible for sending the manifest and ensuring its accuracy.
  - The port operator is responsible for emailing the **updated manifest** back to the captain after changes are made.
  - 🟩 The operator should not change the manifest's weight, even if the container's actual weight is different. The **legal weight** from the manifest remains unchanged.

Question 16: Should the system handle discrepancies between the manifest's weight and the actual weight when balancing the ship?

- **Mr. Keogh's Response**:
  - The system should use the **weight from the manifest** when calculating balance, even if it differs from the actual weight.
  - 🟩 If the balance is off due to incorrect data in the manifest, it is not the system's responsibility. The system is legally covered as long as it balances the ship based on the data provided in the manifest.

Log and UI Section Review

Question 17: Should we adopt the IO 8601 standard format for the log file or proceed with the format outlined in the slides?

- **Mr. Keogh's Response**:
  - The **IO 8601 standard** is acceptable but with a minor modification.
  - **Milliseconds** are not necessary in this system, as the operations are not time-sensitive like a **self-driving car** would require. In Mr. Keogh's world, **milliseconds** are unnecessary, and even **seconds** are not crucial.
  - 🟩 The log format should be recorded **down to the minute**, which is sufficient for their needs.

Question 18: Is a light and dark mode necessary for the software?

- **Mr. Keogh's Response**:
  - **Light and dark mode** is not necessary for this software.

Question 19: Are descriptive icons for buttons and input fields necessary?

- **Mr. Keogh's Response**:
  - Mr. Keogh is open to suggestions but doesn't see a strong need for descriptive icons. He mentions that some standard icons, like **cut** and **paste**, are rarely recognized.
  - 🟩 He prefers that the icons be **simple**, **intuitive**, and easy to use, and is willing to accept any suggestions made by the team.
  - 🟩 He leaves the final decision to the team's **public pitch**.

Question 20: Should the platform support multiple languages, given that employees speak different languages?

- **Mr. Keogh's Response**:
  - 🟩 **English** is the only language necessary for the platform.
  - He compares the situation to **aviation**, where all pilots, regardless of nationality, must communicate in English.
  - 🟩 Although employees may be multilingual, the company operates **entirely in English**, and the platform should reflect that.

Question 21: Is there a security concern with allowing any name to be entered during sign-in without requiring passwords or PINs? Would you approve issuing a PIN for each employee instead of allowing free text input?

- **Mr. Keogh's Response**:
  - **No**, issuing a PIN is unnecessary.
  - Mr. Keogh emphasizes that the employees undergo **strict security measures** before entering the work area:
    - They pass through **metal detectors** and **biometric scans** (face and hand).
    - They are greeted by a **security guard** who knows them personally.
    - Only after these checks are they allowed to swipe their card and start climbing the crane.
  - These layers of security make it **impossible for an imposter** to access the crane, so adding a PIN would be redundant and potentially problematic if forgotten.
  - 🟩 Mr. Keogh is comfortable accepting **any name** entered, with no need for passwords, as the **physical security measures** are sufficient.

Question 22: Are you okay with accepting typos or single-character names due to user error?

- **Mr. Keogh's Response**:
  - Yes, any name entered should be **accepted**.
  - Mr. Keogh gives examples such as **“Bono”** or a single-letter name like **"U"** (which is valid for some people).
  - 🟩 The only restriction is that the name cannot be a **number** (e.g., "5"), but a **single alphabetic character** is acceptable.
  - 🟩 Mr. Keogh also highlights that employees have a strong **motivation to enter the correct name** since this is how they get **credited for their work and paid**. This motivation serves as an additional incentive for accurate name entry.

Hardware

Question 23: Can we assume that all machines operating the software will have at least 2 GB of RAM?

- **Mr. Keogh's Response**:
  - **Yes**, all machines will have at least **2 GB of RAM**.

- 🟩 Mr. Keogh mentions he prefers **low-cost machines** like those from **Costco**, which cost around $600. These machines are sufficient for his needs and last a few years.
- However, he is open to considering more expensive solutions (e.g., **GPU** or **Amazon Cloud** subscriptions) if they are absolutely necessary for the software's performance, though he prefers to stick to cheaper options unless justified.

Question 24: Are additional project materials (e.g., onboarding documents) required?

- **Mr. Keogh's Response**:
  - 🟩 Mr. Keogh is primarily concerned with the **onboarding process**. He needs an efficient and streamlined method to **onboard employees** onto the software.
  - 🟩 A **video** or **small presentation** explaining how the software works would be helpful.
  - 🟩 He is less concerned with **technical documentation** (e.g., code) but acknowledges it could be useful if another company takes over maintenance of the software in the future.

Question 25: Will the software be exclusive to Mr. Keogh's company?

- **Mr. Keogh's Response**:
  - 🟩 His **preference** is that the software remains **exclusive** to his company **in perpetuity**.
  - 🟩 However, he is open to discussions where, after a certain period (e.g., **three years**), the team could **open-source** the software or sell it to competitors at a reduced cost.
  - 🟩 Mr. Keogh wants this matter addressed in the **public pitch**, outlining whether the software will be exclusive to him or if it will eventually be available to his competitors.

Question 26: What is Mr. Keogh's preferred method of communication?

- **Mr. Keogh's Response**:
  - Once the project pitch is approved, Mr. Keogh prefers **minimal communication** unless absolutely necessary.
  - If the team faces any **confusion or doubts** during the project, Mr. Keogh encourages them to reach out immediately with **specific questions**.
  - For simple questions, he can typically respond within **two to three hours**.
  - For more complex issues, he suggests setting up a **Zoom appointment** for further discussion, typically within the **next business day**.

Boxed Solution Questions:

Question 27: Do you have a preference for font or color in the software's user interface (UI)?

- **Mr. Keogh's Response**:
  - **No particular preference** for font or color.
  - Mr. Keogh mentions that **high contrast fonts** are important, especially for visibility in bright environments.
  - 🟩 He shares an example from **MATLAB**, where the letters "L" and "1" look identical, which can cause confusion. Avoiding such issues is critical.
  - There are no visually impaired employees, so additional accommodations are unnecessary.

Question 28: Should the software provide estimated times for each step in the loading/unloading process?

- **Mr. Keogh's Response**:
  - 🟩 Yes, the software should **echo the estimated times** for each step, allowing the operator to understand how long each move will take.
  - 🟩 For example, if there are **17 steps**, the software should state the total time and provide the time for each individual step (e.g., "Step 1 will take 9 minutes, Step 2 will take 22 minutes").
  - 🟩 The system does not need to **measure actual times** since operators may take breaks, and the software does not need to track such variations.
  - 🟩 The focus is on providing **estimated times** based on the calculated solution.

Question 29: Who interacts with the software, aside from the port operators?

- **Mr. Keogh's Response**:
  - Only the **crane operator** interacts with the software.
  - No one else, including **ship captains** or **truck drivers**, sees or uses the software.
  - The only exception is Mr. Keogh himself, who retrieves the **log file** once a year during **Christmas or New Year** by climbing up the ladder, saving it on a **USB stick**, and archiving it.

Question 30: How often do the details in the manifest not match the actual containers on the ship, and should the software flag such discrepancies?

- **Mr. Keogh's Response**:

    - **Discrepancies rarely happen**.
    - The **locations and owners** in the manifest always match, so if the manifest states specific items are in certain locations and belong to specific companies, that is true.
    - While the **contents of the containers** may differ slightly (e.g., bananas listed but apples inside), neither the **ship captains** nor the **crane operators** open the containers.15
    - The software should not concern itself with the actual contents, as it could neither know nor care about what's inside the containers.

Question 31: Should the software flag potential inconsistencies between the manifest and the transfer list?

- **Mr. Keogh's Response**:
    - 🟩 The only potential inconsistency would be if a **ship is full**, and the operator attempts to load additional items, which is physically impossible.
    - 🟩 The software should **understand this constraint** and inform the operator if loading more items is not feasible (e.g., exceeding the container capacity).
    - 🟩 Aside from this scenario, inconsistencies between the manifest and transfer list are unlikely.

Question 32: Can we guarantee that the manifest always arrives before the ship docks, or should we accommodate for cases where it may arrive later?

- **Mr. Keogh's Response**:
    - The manifest always arrives as the ship is being tied down.
    - 🟩 There is a guaranteed **15-minute lead time** between receiving the manifest and when the crane can begin operations.
    - 🟩 This lead time allows the system sufficient time to compute moves, even if they are **algorithmically complex**.

Question 33: How often should the system create backups of critical data, and where should these backups be stored?

- **Mr. Keogh's Response**:
    - Mr. Keogh does not require backups for the **manifest** since it is always stored in his **Gmail account**, which serves as his backup system.steps
    - 🟩 He also trusts the **solid-state drive (SSD)** used for the log file, so there is no need for additional backups for the log file.

- 🟩 Mr. Keogh doesn't need to see any intermediate files that the software might generate; it is up to the team how they handle such files internally.

Question 34: If a container label on the manifest does not match the physical container, should the operator be allowed to manually update the manifest or flag it for review?

- **Mr. Keogh's Response**:
  - No, there is no way for inconsistencies to arise because the containers are never physically opened.
  - The manifest is treated as a **legal document**, so operators cannot modify it, even if there are minor errors (e.g., a misspelled name).
  - 🟩 The operator is not allowed to change details such as the **weight** or **text** in the manifest but can **log comments** if they notice discrepancies.

Question 35: Does a heavier container affect the speed of the crane?

- **Mr. Keogh's Response**:
  - No, the crane operates at the **same speed** regardless of the container's weight.
  - Both **empty** and **heavy** containers move at the same speed in this system.

Question 36: Would you like the software to display immediate updates on the ship balance?

- **Mr. Keogh's Response**:
  - 🟩 Yes, the software should provide **step-by-step instructions**.
  - 🟩 It is critical to display moves **one by one**, such as "Move 1 of 17," to avoid confusion or mistakes.
  - 🟩 After each move, the operator should confirm before proceeding to the next move, ensuring they do not **skip** or **repeat** any steps.
  - 🟩 This process applies to both **balance** and **load/unload** operations.

Question 37: How frequently would you prefer updates to the system, and how much downtime can you afford during these updates?

- **Mr. Keogh's Response**:
  - 🟩 Updates should be **infrequent**, as the system operates in a slow-moving business model where constant updates are not needed.
  - 🟩 Ideal time for updates is between **Christmas and New Year** when the port is **closed** for physical and software maintenance. During this time, there are no ships, making it a perfect period for system updates.

Question 38: For animations during the loading/unloading sequences, what level of detail should the system provide?

- **Mr. Keogh's Response**:
  - 🟩 **No complex animations** are needed.
  - 🟩 A simple **grid representation** of the ship (8x12 grid) is sufficient, with two key locations (source and target) **highlighted** during each move.
  - 🟩 No movement animations or arrows are required, just clear indications of **where** to pick up the container and **where** to place it.

Question 39: What happens if a new transfer list with urgent priority is sent during an ongoing operation?

- **Mr. Keogh's Response**:
  - 🟩 Once a move is committed by the operator, it becomes **irrevocable**.
  - 🟩 There is **no option to preempt or undo** a step once it has been started, even if a new transfer list arrives with high priority.

Question 40: How should the system prioritize containers when moving them from the buffer? Should it be based on weight or type?

- **Mr. Keogh's Response**:
  - 🟩 The buffer is rarely used and is generally a sign of a **suboptimal solution**. However, it is necessary for cases where certain containers need to be moved to access others (e.g., bottom row containers in a full ship).
  - There is **no prioritization** based on weight or type. The only factor to optimize is minimizing the **total time** to complete the operations.

Question 41: How should the system handle transfers that do not exist in the manifest?

- **Mr. Keogh's Response**:
  - 🟩 Such a situation is **not possible** since the operator will only be able to select containers that exist in the manifest.
  - 🟩 The operator will visually verify that the 12 trucks present match the 12 items to be loaded/unloaded, ensuring consistency between the physical and digital records.

Question 42: How should the system handle cases where it's impossible to balance the ship, like if there’s only one container? Should manual interventions be allowed?

- **Mr. Keogh's Response**:
  - 🟩 **No manual interventions** are allowed. The system is designed to eliminate the need for highly trained employees, and manual adjustments defeat the purpose of the software.
  - 🟩 If physical balancing (left side = right side weight ±10%) is **not possible**, the system should default to **SIFT**.
  - 🟩 The SIFT algorithm logically balances the ship by removing all containers and reloading them based on their weight (lightest to heaviest, alternating sides). While this method is ideal, the software should attempt to achieve balance with **fewer moves** if possible.

Question 43: What happens if the system crashes mid-operation? Should any information be restored once the system is rebooted?

- **Mr. Keogh's Response**:
  - 🟩 The system is designed to run **continuously** for **11.5 months** without being turned off.
  - 🟩 If the system crashes, when it reboots, it should **look for a log file**. If one is found, the system should recognize that it is **recovering from a crash** and restore the program to its previous state.
  - 🟩 Every **atomic event** should be logged with a **timestamp**, so upon reboot, the system can resume from where it left off.
  - Mr. Keogh compares this feature to how **Microsoft Word** recovers unsaved documents after a crash.day
  - This feature is highly desired, but if it is too expensive or complicated, Mr. Keogh is open to suggestions or alternatives.

Question 44: How should the system respond to invalid inputs, such as attempts to unload non-existing containers?

- **Mr. Keogh's Response**:
  - 🟩 The system should **prevent invalid inputs** by displaying a **color-coded grid** that accurately reflects the containers listed in the manifest.
  - 🟩 If the operator clicks on a grid cell that doesn't correspond to an actual container, the system should block the action and prevent mistakes.

Question 45: How should the system handle duplicate container names?

- **Mr. Keogh's Response**:
    - It's possible for two containers to have the **same name** (identical bit-for-bit, case-sensitive, and including spaces).

    - 🟩 In such cases, the system can **select either one** of the containers when the operator requests it.
    - This is useful when, for example, the system can select a **more accessible** container (e.g., one higher up in a stack) to minimize the effort required to retrieve it.

Question 46: Is the system expected to be in English, and what restrictions are there on the container names?

- **Mr. Keogh's Response**:
    - 🟩 The **manifest** contains the container names, which are simple **strings** of up to **255 characters**.
    - 🟩 These names can include **letters, numbers, and punctuation**, but **no non-ASCII characters** (e.g., Japanese or Spanish characters).
    - 🟩 The names must start with an **alphanumeric character**, and the first character cannot be a space. However, spaces within the name (e.g., "Tacos for Ricos") are allowed.
    - The **transfer list** is processed mentally by the operator, who then communicates actions to the system. The system does not directly interact with the transfer list.

Mr. Keogh's Final Instructions:

- The team is expected to go away and prepare a **public pitch** within the next **7 to 10 days**.
- The pitch should:
    - **Confirm** the team's understanding of the project requirements.
    - **Convince** Mr. Keogh that they can deliver the software on time, maintain it, and meet performance goals (e.g., solve problems in less than 5 minutes for fewer than 10 containers).
- Mr. Keogh advises the team to **manage their time well** to avoid falling behind, and he is available to answer any **quick questions** via email or schedule a **Zoom meeting** for more complex issues.
- The public pitch is a key step, and if the team demonstrates a misunderstanding of the requirements, they may need to **redo** the pitch, which could delay the project.