IoT – Logistics

Storage control – easy and reliable

Region Östergötland

IoT - Logistics

- Project partners
  - Region Östergötland
  - Kinda kommun
  - Linköpings kommun
  - RISE (Research Institute of Sweden)
  - Linköping Science park

- Financiers (50%)
  - Strategic innovation programme
    - **Vinnova**
    - Formas
    - Energimyndigheten

Purpose

- Contribute to good technical support for public organizations' logistics chains through real-time control of current inventory balances at the end user storages.

- Test and evaluate IoT technologies to support inventory management and formulate the experiences into the technical part of a procurement document and a guidance how to implement.

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Background

Pick and go

Lack of control…

- We know…
  - what we have purchased
  - what we have in central storage, 40-50%

- We do not know…
  - when an item is used
  - what is the current balance
  - where we can find a missing item

 … imagine the uncertainty in 200 minor storage areas

  New rules for civil defense, three month of independance

Objectives

- Present one or more IoT solutions that measure the real consumption within the region and municipality in real time.

- Simple solutions with the least possible interaction, very easy to use

- Development of functional requirements as a basis for various solutions to measure consumption in real time. Part of procurement material.

- Explore the possibility of a cohesive logistics process for common items between region and municipality.

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Proof of Concept

- Control

- Ease of use

- Real staff testing

- Testing technology, not the actual system

- Three concepts choosen
  - QR-codes and cell phones
  - Load cells
  - AI with camera
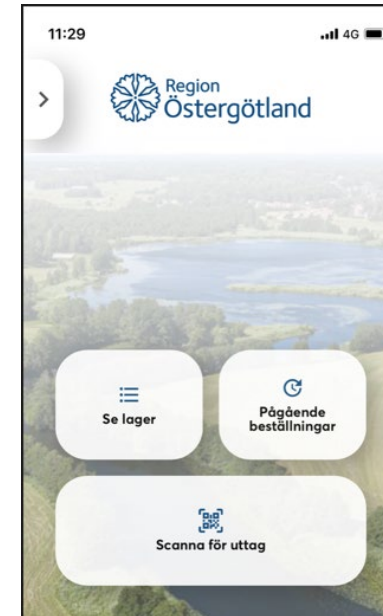
QR-codes

- Pros
  - No new equipment (shelfs, wardrobes)
  - Easy scanners
  - Easy to use?
  - Proven technology
  - Provides documented control if used
  - Cheap per unit and per transaction

- Cons
  - Not so easy to use?
  - Only one hand to work with
  - Extra work for the staff
  - Need marking on shelves with QR code
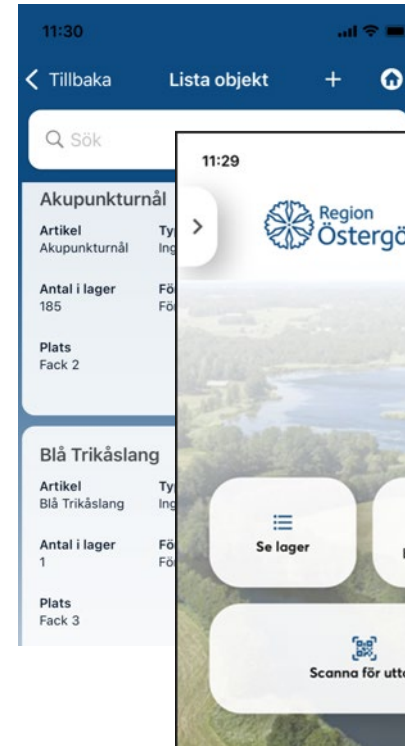
Shelf scales

- Pros
  - No (or very little) interaction with technology
  - Detection on misplaced items
  - Similar to actual work methods, "just pick n' go"
  - Two hands available
  - Always correct balance, even if mistakes in check-in and check-out
- Cons
  - Expensive, needs new infrastructure and inventory.
  - Takes more space for shelfes. May need remodeling.
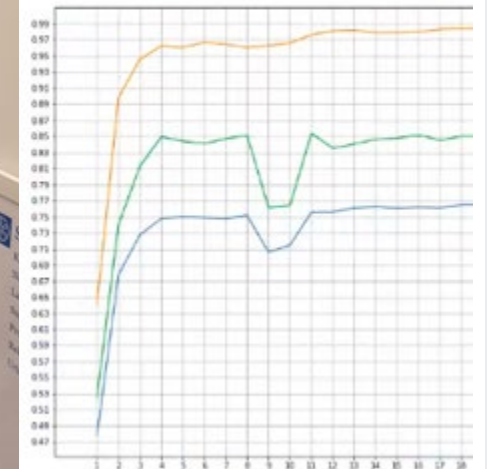
AI camera solution

- Next to be tested, in parallell with student activities

- Selected six types of articles

- Comparing amount before and after, presenting difference
  - Optimal?

  - Unsolved problems
    - How to train new articles?
    - How many articles can be handled in a system?
   - Sensitive to changes in the environment, lights etc.
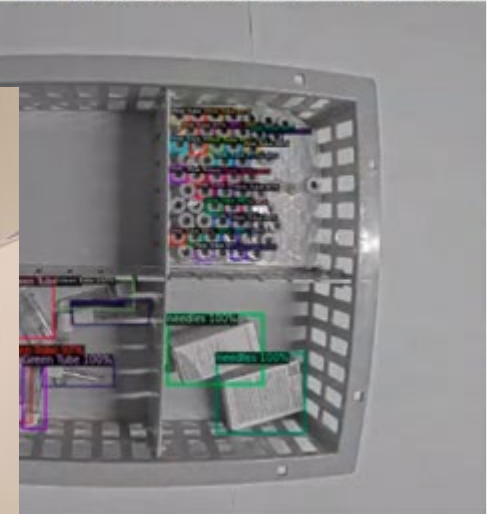
Results, so far…

- SUS, System usability Scale

- Proven method

- Digital Equipment Corporation (DEC), 1986

Strongly disagree — Strongly agree

1. I think that I would like to use this system frequently
2. I found the system unnecessarily complex
3. I thought the system was easy to use
4. I think that I would need the support of a technical person to be able to use this system
5. I found the various functions in this system were well integrated
6. I thought there was too much inconsistency in this system
7. I would imagine that most people would learn to use this system very quickly
8. I found the system very cumbersome to use
9. I felt very confident using the system
10. I needed to learn a lot of things before I could get going with this system
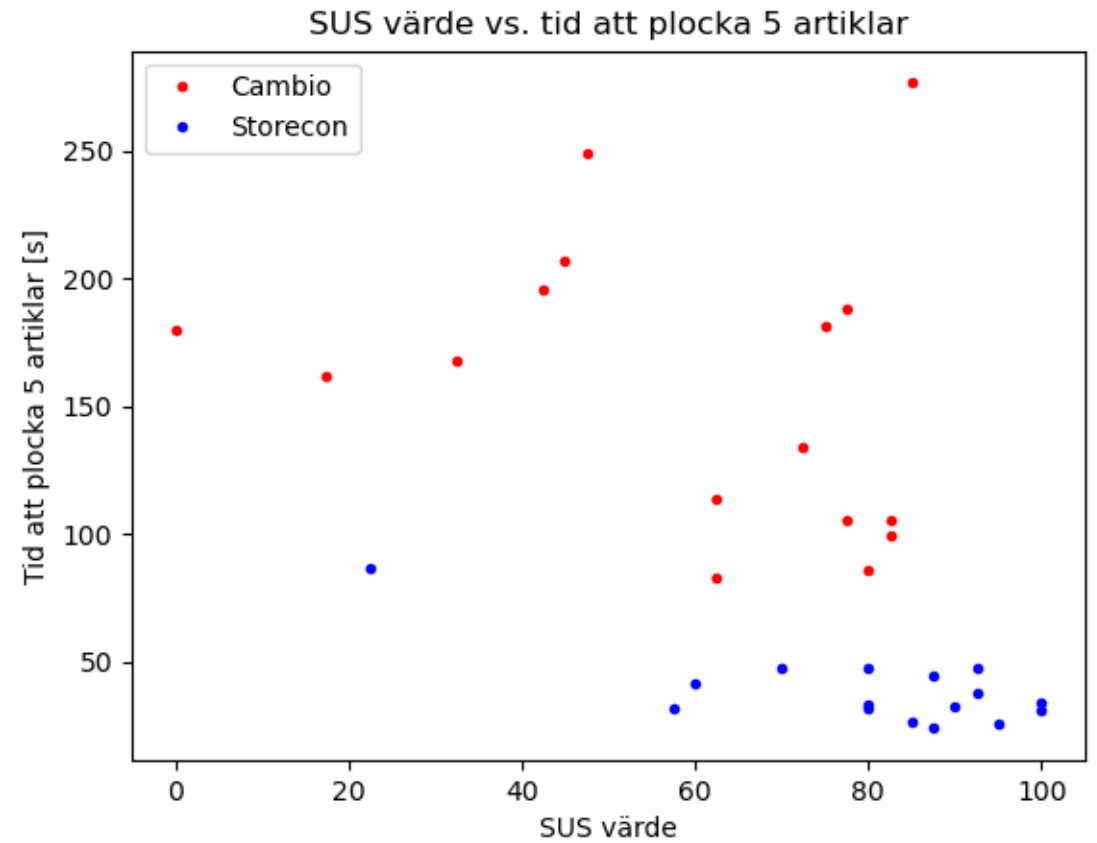
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Results, so far…

- Method
 - Simple calculation formula, add and multiply

- Result value indicates usability
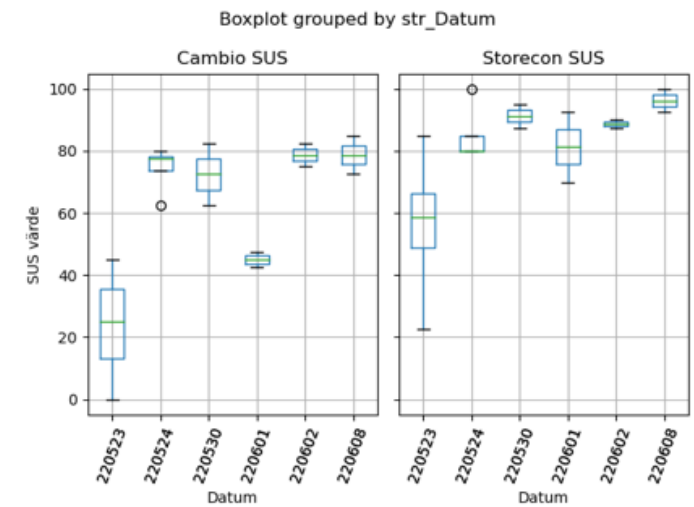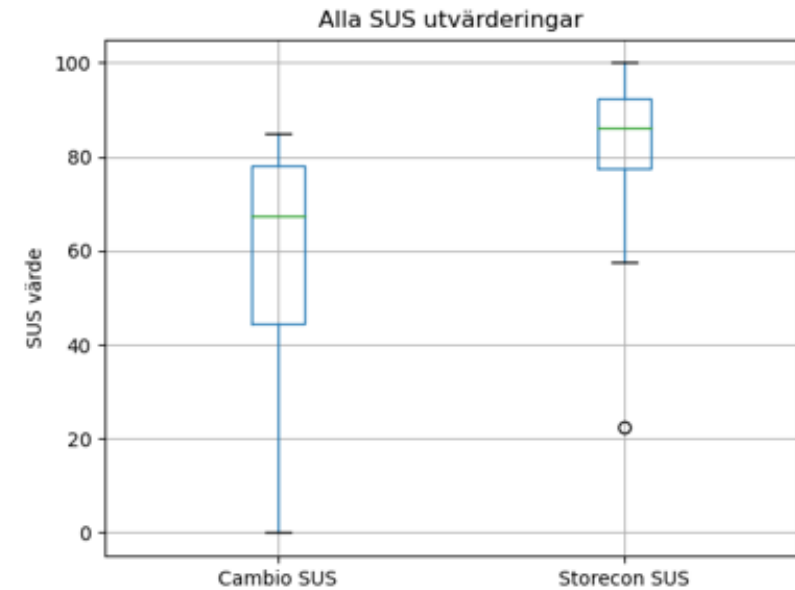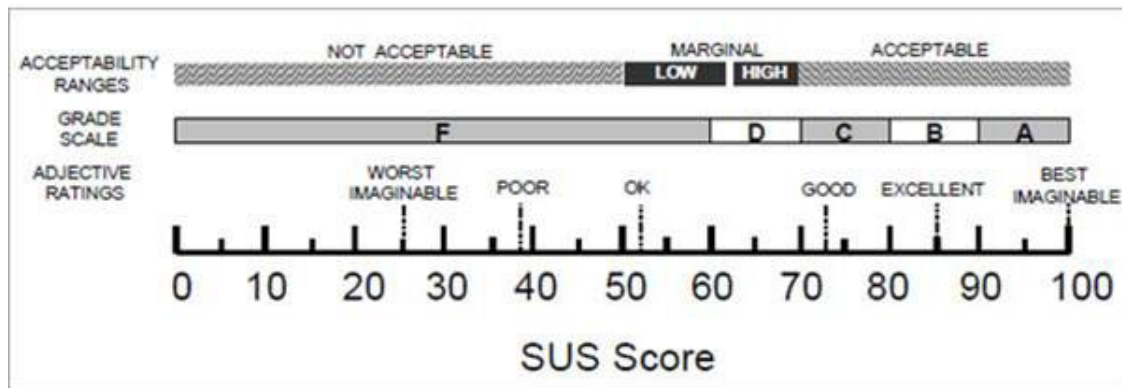
Results, so far…

- Correlation SUS value and time in "pick-5-items" test
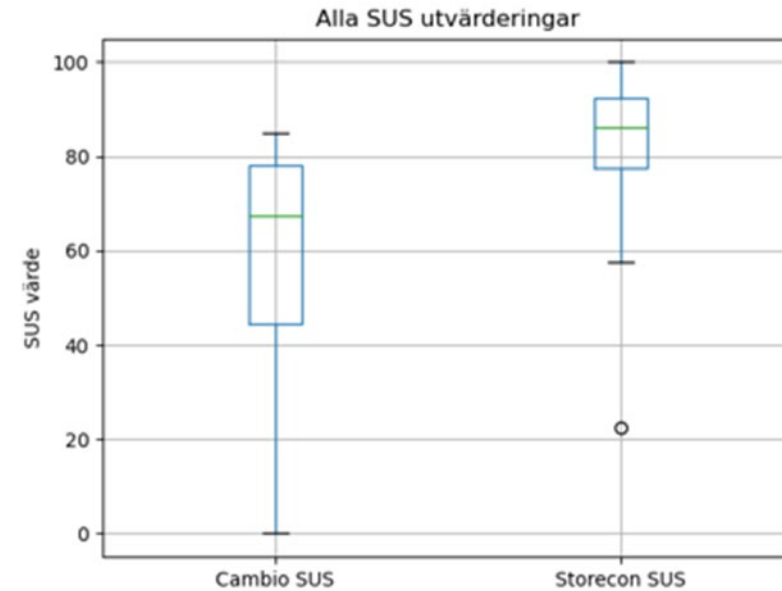

SUS värde vs. tid att plocka 5 artiklar

Your misson

- Develop frontend; Mobile application (web based)

- Develop frontend; Admin GUI (web based)

- API

- Develop backend with some business logics

- 2 groups will be responsible for the backend product and publishing the API

- 2 groups will be responsible for the front end products

- ALL groups will in cooperation define the API, API definition must be maintained
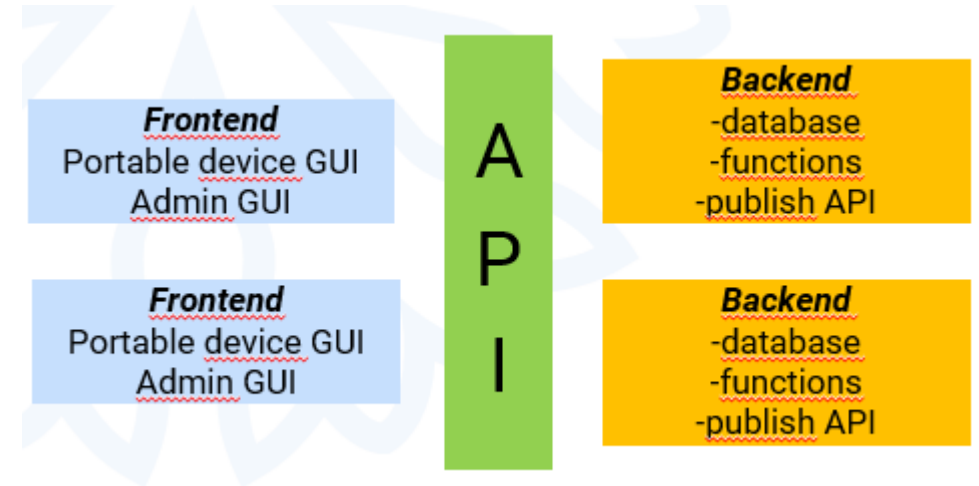
Evaluation

- Your output will be tested in the same way as the PoC with a SUS evaluation. With staff from the hospital. You will compete against Cambio.

- Both frontend groups will be tested against both backend groups

- We evaluate you as a group from a customer perspective on how you perform the task as a group and how you interact with the customer, and that we evaluate the product you leave behind.

- Remember, you are potentially helping us solve a real problem in the public sector, your contribution is valuable.

Questions?

- Good luck!