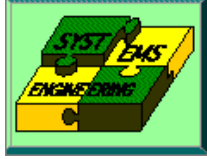
George Mason University



SYST 101: Intro to Systems

Lecture 4:

Jan. 29, 2004

C. Wells, SEOR Dept.

Announcements

- After three weeks we will do our first set of robot trials (Feb 24). Our lab space is in the Central Module, details to be discussed next class.
- Oral presentations on Project I will be on Feb 26

Agenda

- Objective for Today:
  - Homework discussion
  - Project Group Assignments
  - Distribution of Mindstorm Kits
  - Documentation
  - Issues Analysis
    - The “House of Quality”

Group Assignments

- See Excel File
- Identify scheduling (or other) conflicts for the teams
  - Request changes in membership

Lego Kits

- You are financially responsible for the components of the kits.
- “Incompletes” will be given at the end of the semester if major parts are missing and not replaced.

Lego Mindstorm Demo

- In Mindstorm software package.

Project 1 Objectives:

- Start using System Engineering Methodology
- Build a vehicle that will go in either 3 foot diameter circles or 5 foot diameter circles, clockwise or counterclockwise (Instructor's choice at test time).
- Learn Lego robot construction & Mindstorm programming

Goals and Subgoals

- Primary goal
- Secondary goals
- Grading criteria
  - Approach used
  - Robot performance

Documentation

- Provides record of what was done
  - Lessons learned for next time around
  - Confirmation of design, build, and implementation
- Many types of documentation
  - Plans and processes
  - Assumptions and requirements
  - Design drawings
  - Parts lists
  - etc.

Documentation (cont.)

- Documentation will be kept in a lab notebook for each team
  - Meeting dates, times, and attendance
  - Discussions and decisions
  - Robot design and testing
- Will be used to determine participation of the team members for grading

Parts inventory

- Inventory Mindstorm kits
  - Use format provided
  - List quantity of all parts in kits
  - List parts used in project design and those remaining in the kit.
  - Organize parts as shown in the box top drawings
- Request parts if needed
  - Update inventories
- When returning Mindstorm kits re-inventory parts
  - Attached to each other and in proper bin

Issues Analysis

- What's important to achieving goals?
- How does each issue (wheelbase, wheel size...) relate to the goals and subgoals?
- The goals and subgoals are often called the Customer or Stakeholder Requirements.
- The issues that help you achieve these goals are technical requirements.
- The relations from one category to the next must be kept clear throughout the lifecycle.

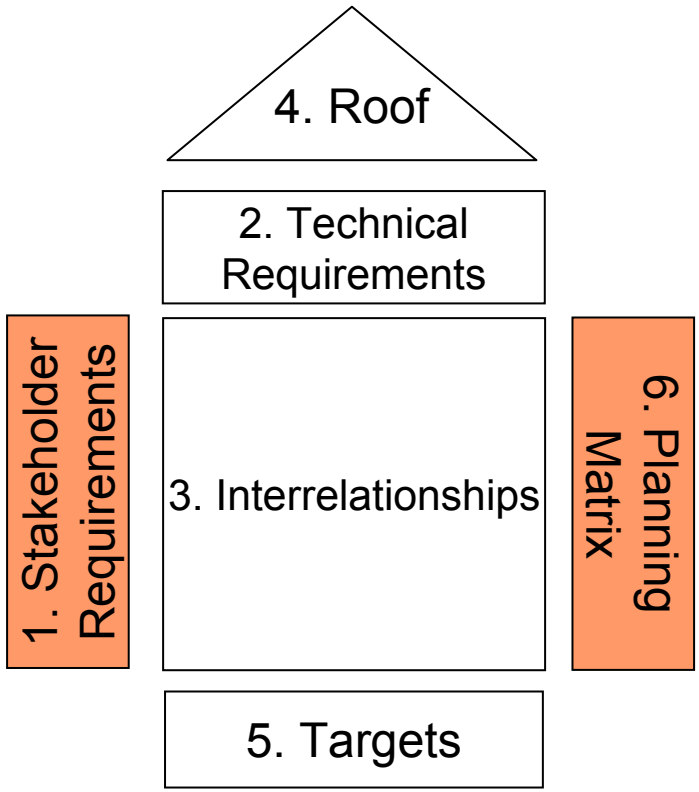
Issues Analysis

- Requires logical and careful thinking about the desired end result, and how you plan to get there.
- May require re-thinking your concepts and plans as you proceed.
- May require mathematical analysis or computer simulation.
  - Calculus, Analytical geometry,

How the SE Curriculum Helps

- SYST 201, 202, 203: Systems Modeling
  - Often, a system is too complex to build and test, so one must build computer models to predict as accurately as possible the performance of design alternatives. How to understand what's important, and how to build models that are accurate and tell you what you need to know. ***Take the lab when you take the course!***
- SYST 301, 302: Systems Methods and Design
  - More rigorous treatment of requirements, functional decomposition and their interrelationships. How to come up with the feasible design alternatives and evaluate them against each other.

House of Quality



1. what does it need to do?

2. detailed aspects that help it do what it needs to do

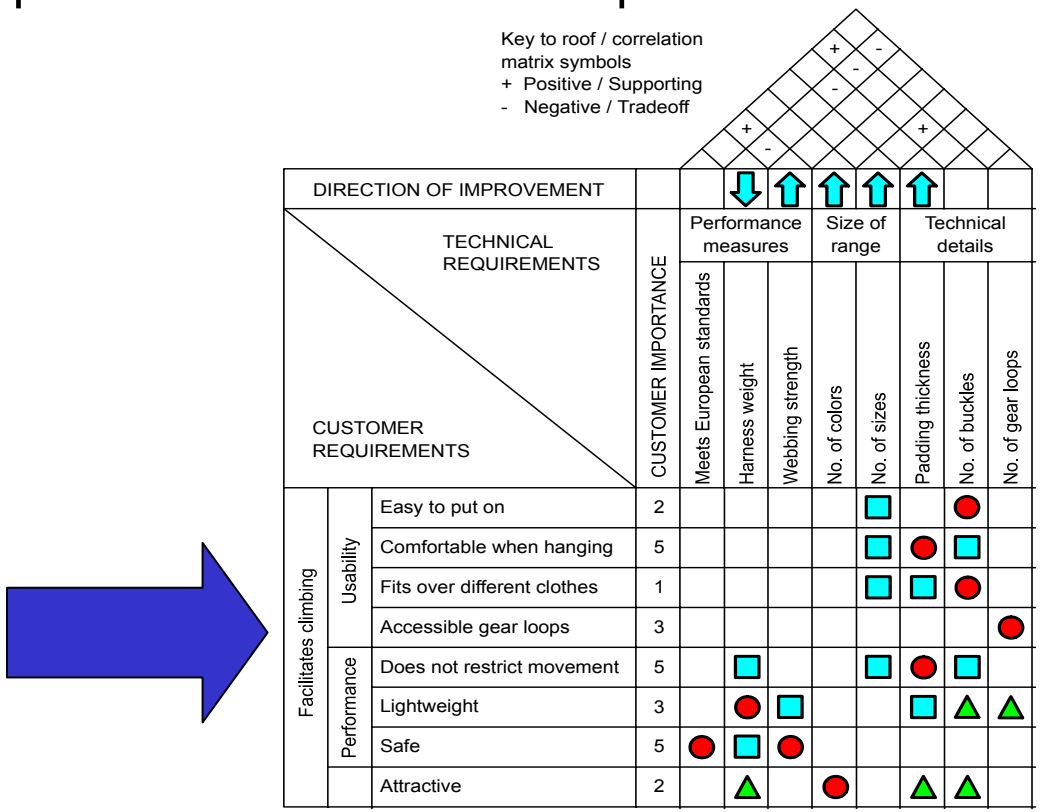
3. how things on list 2 achieve things on list 1

4. how things on list 2 are inter-related

5. Design alternatives

HOQ Step 1

- Step 1: List the customer requirements down the side



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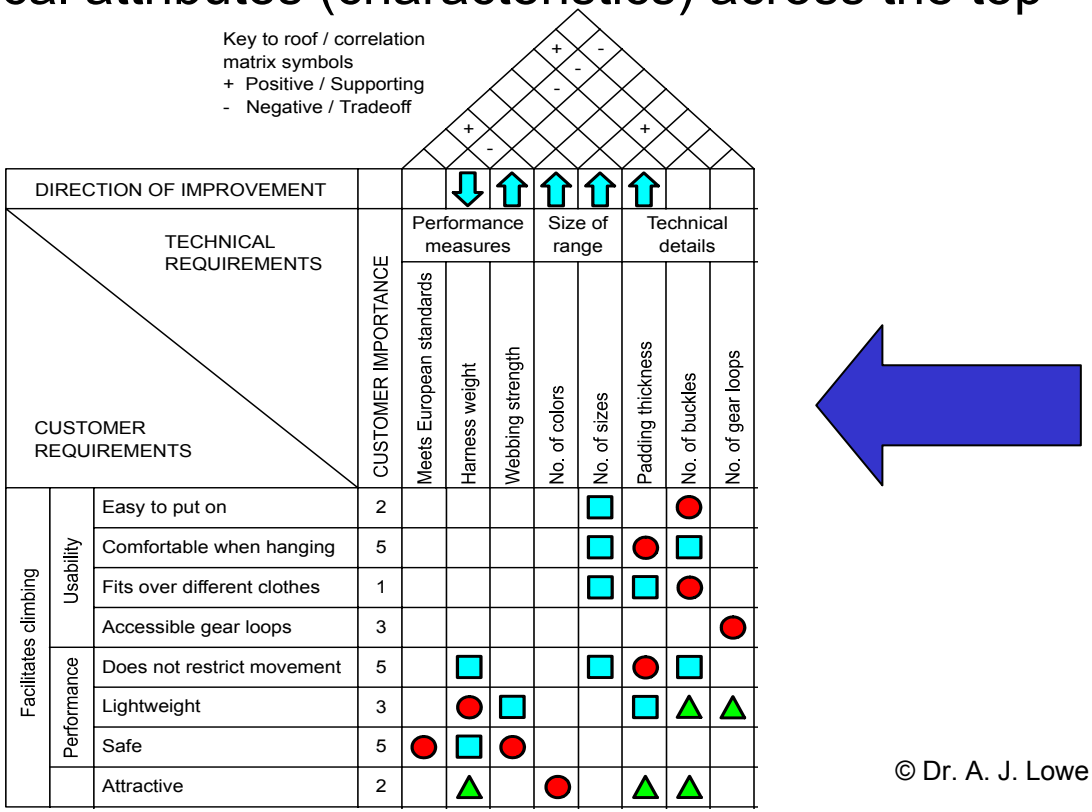
HOQ Step 2

- List the Technical attributes (characteristics) across the top



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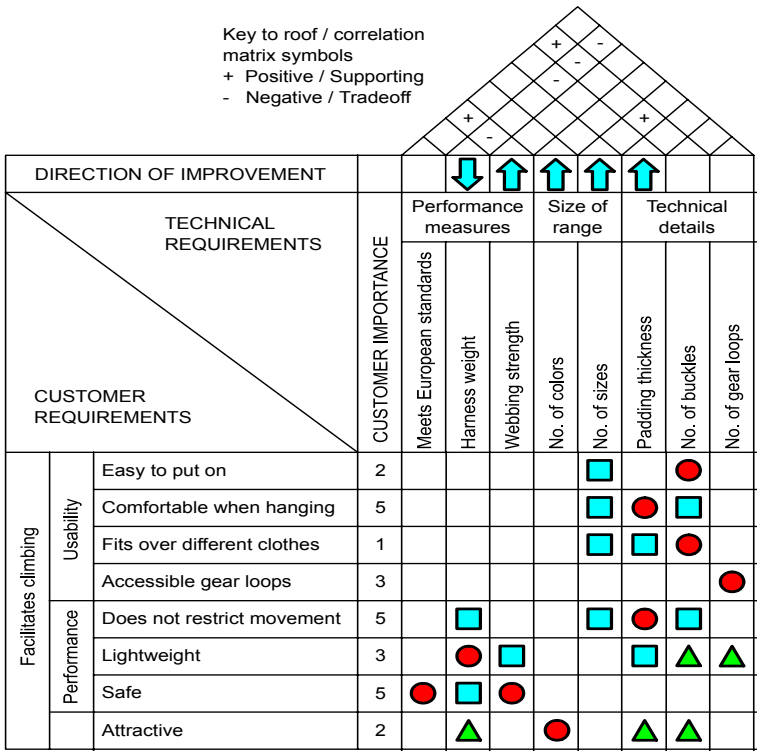
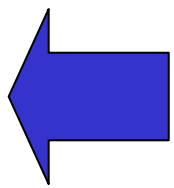
HOQ Step 3

- How does each technical attribute support each customer requirement? Strongly? Weakly?





Key to interrelationship matrix symbols

- Strong interrelationship
- Medium interreltionship
- Weak interrelationship

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Assignments

- Reading
  - Lego Mindstorm Tutorial
    - Install and run the software. Proceed through the tutorial. (completed by all team members by next Thursday)
  - Petroski, Chapter 3 “Pencil Points and Analysis”

Homework

- Individual basis:
  - Perform Step 1 (Customer/Stakeholder requirements) and Step 2 (technical requirements) of the House of Quality for the wooden pencil as discussed in Petroski. Enter these in your own HOQ diagram.
  - Perform Stem 3, (Interrelationships)making your own assessment of strength of the interrelationships between the Customer/stakeholder requirements and the technical attributes, and enter these relationships on your diagram.

Homework (cont)

- Group Basis:
  - Determine initial approach to Project 1
  - Determine initial roles and responsibilities within the group
  - Plan group activities as required
  - Inventory Mindstorm kits and submit inventory