Abstract

All assignments of the course Systems Engineering Fundamentals.
Propose a Non-Lethal Urban Crowd Controller
Discuss the Case

Sketch the **system-of-interest**

Sketch some of the **environment** the system will be operating in

Sketch some of the **system internals**

Draw the **system boundary**
Map the Operational Organization

Make a map with names of individuals in the **operational organization** of one project and its context

Identify the **relationships** of the **project core team**:

- geographical
- organizational
- psychological
Sketch a typical mission and a specific scenario.

The scenario needs to be highly specific:

- numbers (how much, how far, how accurate)
- names (where, who)
- circumstances (when, where)
- actions (what, how)
Identify Stakeholders and Concerns

Brainstorm **stakeholders**

Brainstorm for each stakeholder the **concerns**

Elaborate concerns in 5 to 10 words, make them more specific

Use the **mission** and **scenario** for inspiration
Sketch the system *life cycle*

from idea until decommissioning and recycling.

Identify *stakeholders* per phase or activity
Identify stakeholder needs in terms of capabilities.

Capabilities typically are functions with quantifiable characteristics.

Use the mission, scenario, and stakeholder analysis for inspiration.
Determine 5 to 10 *Key Performance Parameters* (KPP) of the System

Quantify these KPPs

Define the KPPs roughly, using a *Use Case*
Perform a Concept Selection

Make a **decision matrix** for one of the **concept selections**.

- define at least 3 concepts
- define 7 to 10 criteria for selection
- score the concepts against the criteria, for example using a scale from 1 to 5: 1 = very poor, 5 = very good
- recommend a concept with a rationale

<table>
<thead>
<tr>
<th></th>
<th>concept 1</th>
<th>concept 2</th>
<th>concept 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>criterion 1</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>criterion n</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

best, because ...
Show Dynamic Behavior

Model the Dynamic Behavior of the System.

Focus on the Dynamic Behavior that relates to the KPP.

Visualize the Dynamic Behavior with various sketches, diagrams, or graphs (see Visualizing Dynamic Behavior for inspiration).
Make a **system breakdown**

in subsystems and subsubsystems

and a **work breakdown structure**

to assist in organizing the project
sketch the **goods flow**

from (sub) **suppliers**

via **assembly** and **test**

to **customer site**, 

**deployment**, 

and **maintenance**
Assess Risks

Assess *risks*

- *feasibility* of achieving *KPPs*
- *fitness for purpose* in customer context
- *integration configurations* and *testware*
- *supplier* and *logistics* status
- *technology readiness*
- *development* and *resource* status

Determine *probability* and *severity* per risk
Determine an incremental integration sequence to build confidence in the KPP ASAP.

Strive for about 6 main increments.

Reason starting at the end result and then backward in time.

For each increment determine its prerequisites in terms of parts, interfaces, functions, and performance levels.
Transform the integration sequence and the planning from the other perspectives into a PERT-plan.

A PERT-plan focuses on activities and their mutual relations; the logic of the plan. Time and resources are secondary information.
Sketch an *installation* and *commissioning*.