

participant guide

Scenario Based System Analysis: System Definition from the Human Perspective

Lesson 1: Introduction

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Introduction

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Introduction



Course Objective

- Create an effective Operational Concept definition and/or document using a systematic and disciplined method for a given product or process.



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Notes:



Participant Introductions

- Name
- Business Unit
- Location
- Number of years working with Rockwell Collins/ Industry
- What you hope to accomplish by taking this course

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Ground Rules

- Attendance is required
- Please turn off all cell phones during the class
- Participate
- Use of computers / checking e-mail

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Logistics

- Breaks (one 15 minute break at about 10:00)
- Restrooms

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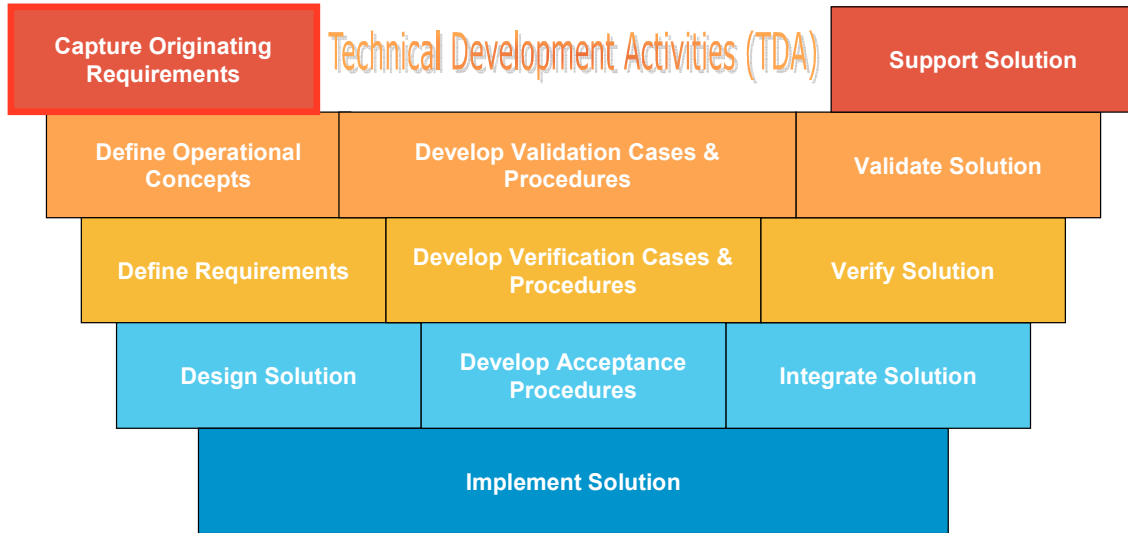
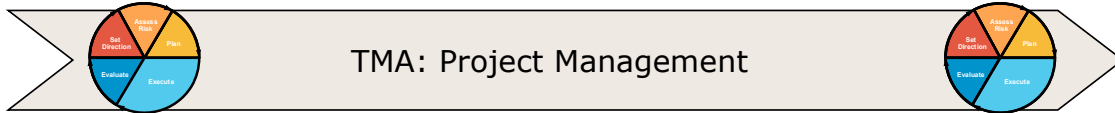
Agenda

| Time | Agenda |
|---------------|---|
| 15-20 minutes | Lesson 1: Introduction |
| 45-60 minutes | Lesson 2: Overview and Context |
| 60-75 minutes | Lesson 3: Operational Concept Methodology (Ex. 2) |
| 15 minutes | Break |
| 60-75 minutes | Lesson 3: Operational Concept Methodology (cont.) |
| 30-45 minutes | Lesson 4: Operational Concepts Style Guide |

Notes:



Prerequisite Knowledge



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Notes:

Define Operational Concepts

Lesson 2: Overview and Context

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Overview and Context



Lesson Objectives

- Explain why an Operational Concept definition may be an effective tool in the successful engineering of systems.
- Define operational concept
- Describe the relationship of an operational concept to other engineering activities
- Describe the benefits of operational concepts
- Describe uses for storyboards and use cases
- Define use cases and scenarios
- Identify the components of a basic use case



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Notes:



Ops Concept Story



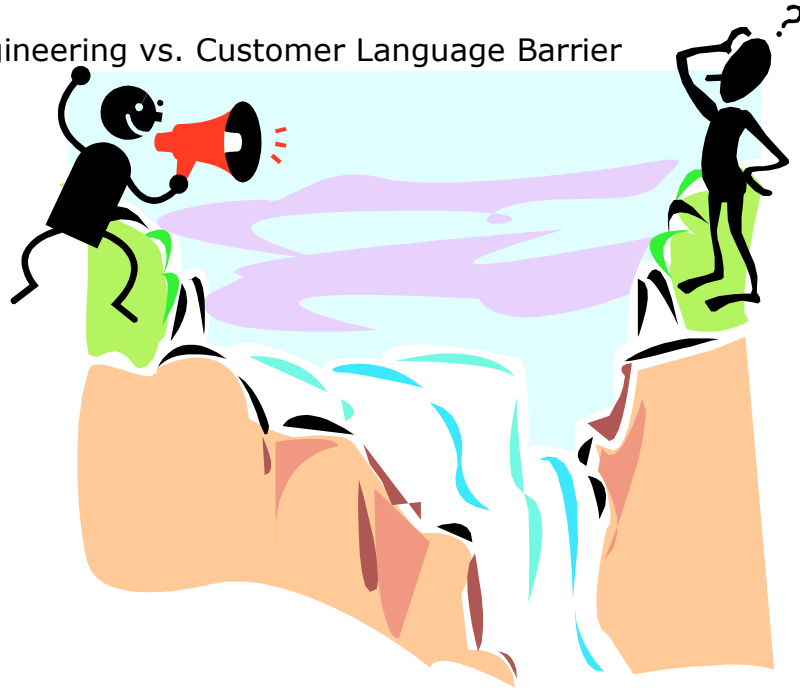
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Notes:

Communication Barrier

- Engineering vs. Customer Language Barrier



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Notes:

Story-Telling Culture

- Natural Language of People is Storytelling – relating personal experiences or passing down someone else’s story from own knowledge



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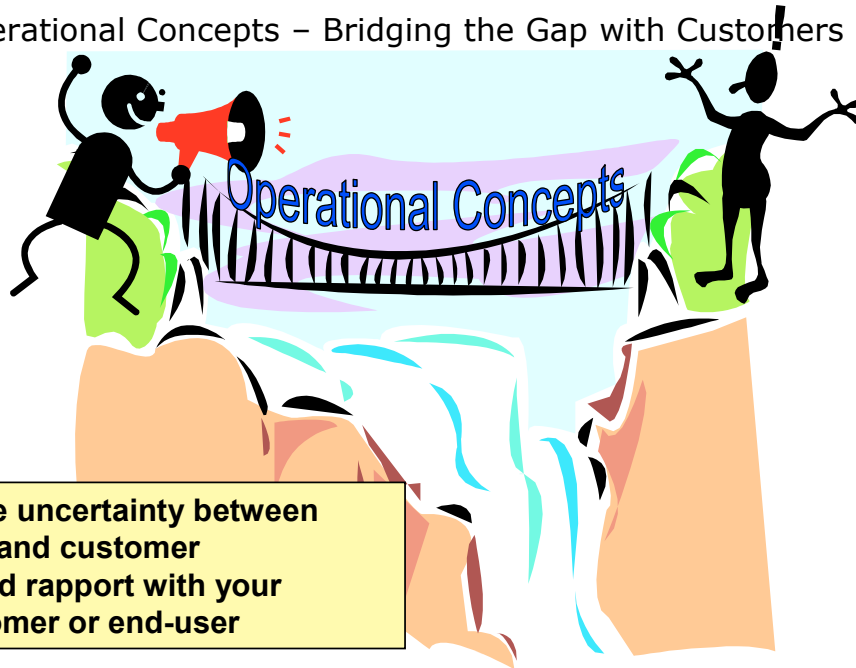
Notes:

Operational Concepts – Telling the Story



Operational Concepts Storytelling

- Operational Concepts – Bridging the Gap with Customers!



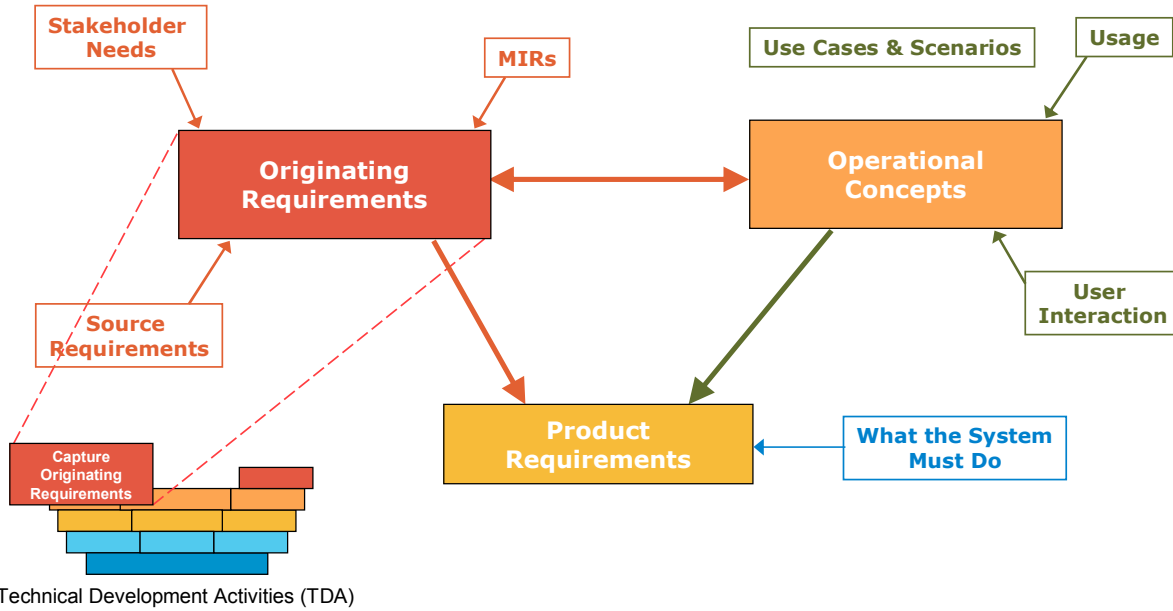
• Minimize uncertainty between engineer and customer
• Build rapport with your customer or end-user

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Notes:



Where do Operational Concepts fit in?

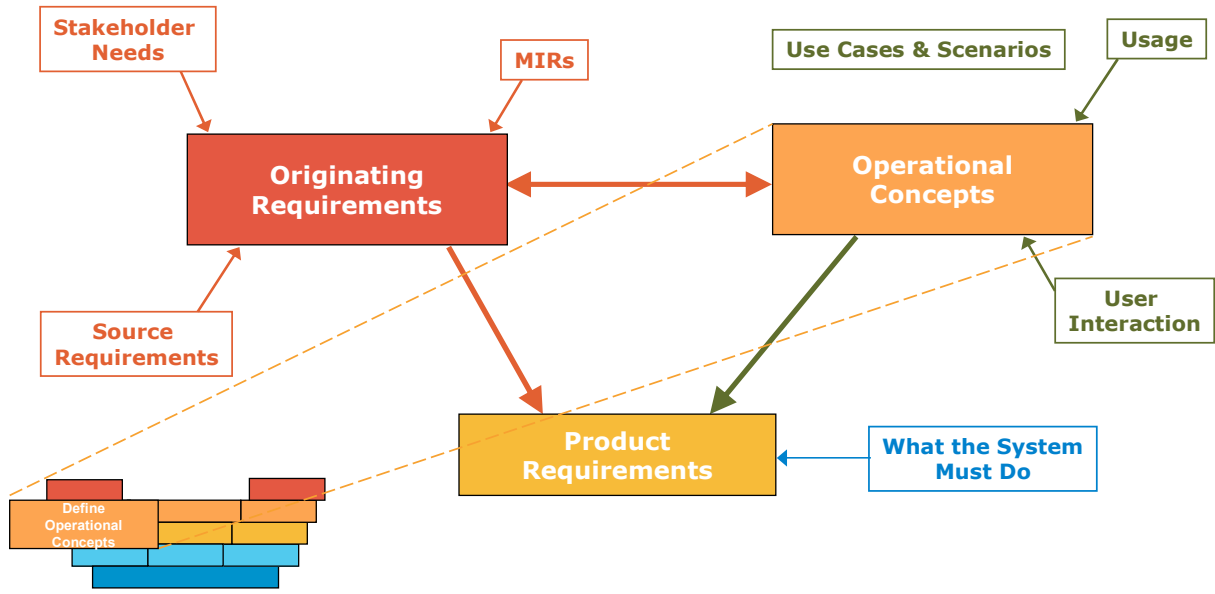


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Notes:



Where do Operational Concepts fit in?



Technical Development Activities (TDA)

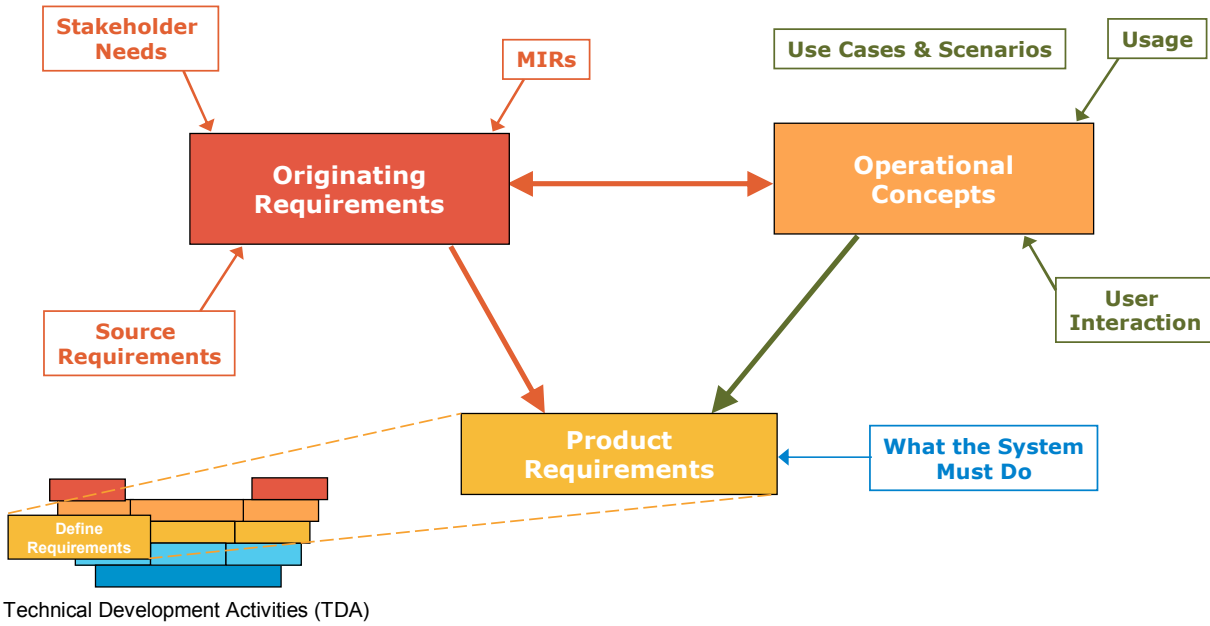
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Where do Operational Concepts fit in?



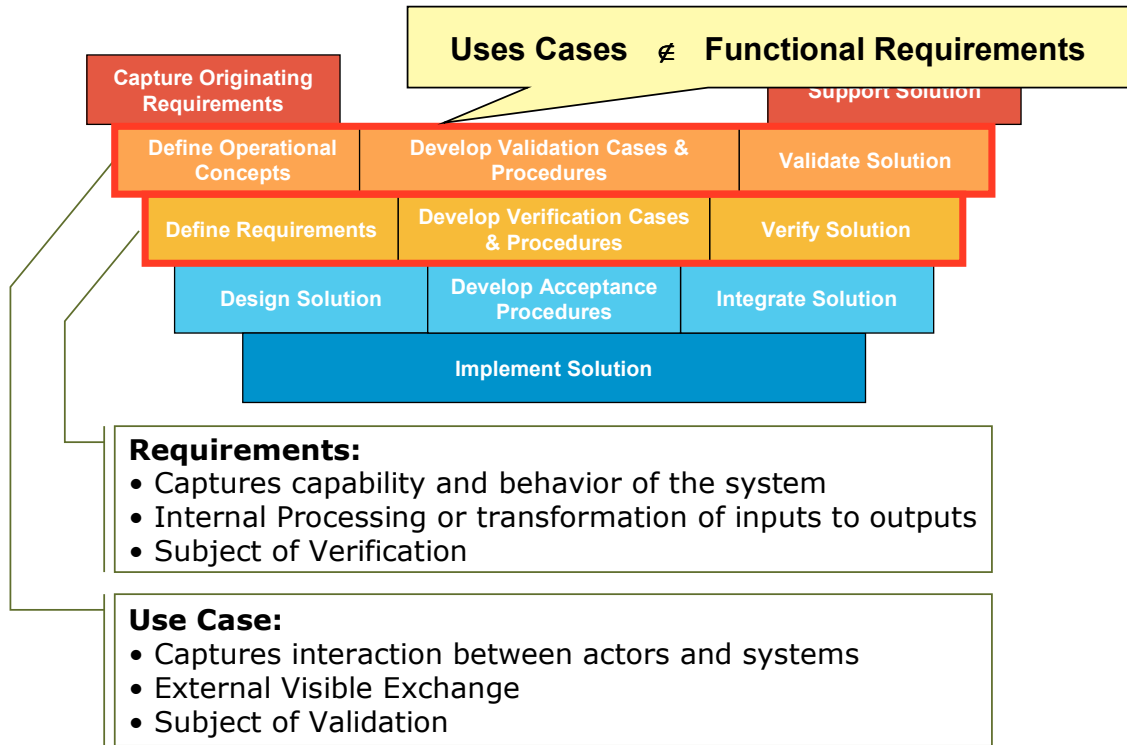
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Use Cases vs. Functional Requirements



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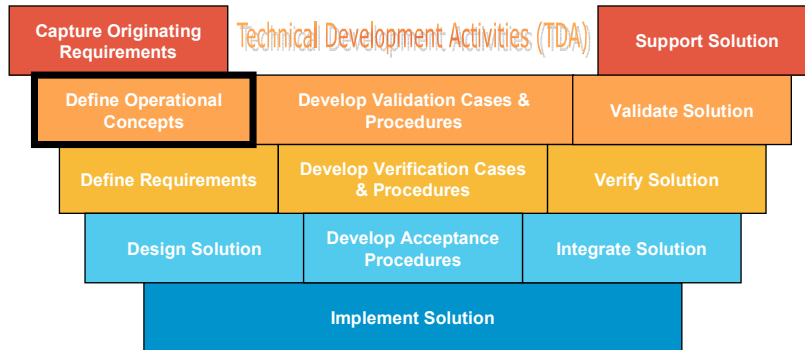
Notes:



Define the Operational Concept Verification vs. Validation

• Ops Concept use cases provide excellent basis for Validation!

- Validate System
 - Demonstrate that the 'right' system has been created, i.e. is fit for purpose; is the right thing
 - User-in-the-Loop Use Case Exercises – hands-on activities to see if user can perform intended operation
- Verify System
 - Demonstrate that the system, as made, is 'right', i.e. fulfils the specified requirements; the thing is right
 - Engineering demonstration to prove mathematical and logical correctness



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Notes:



Benefits of Operational Concepts

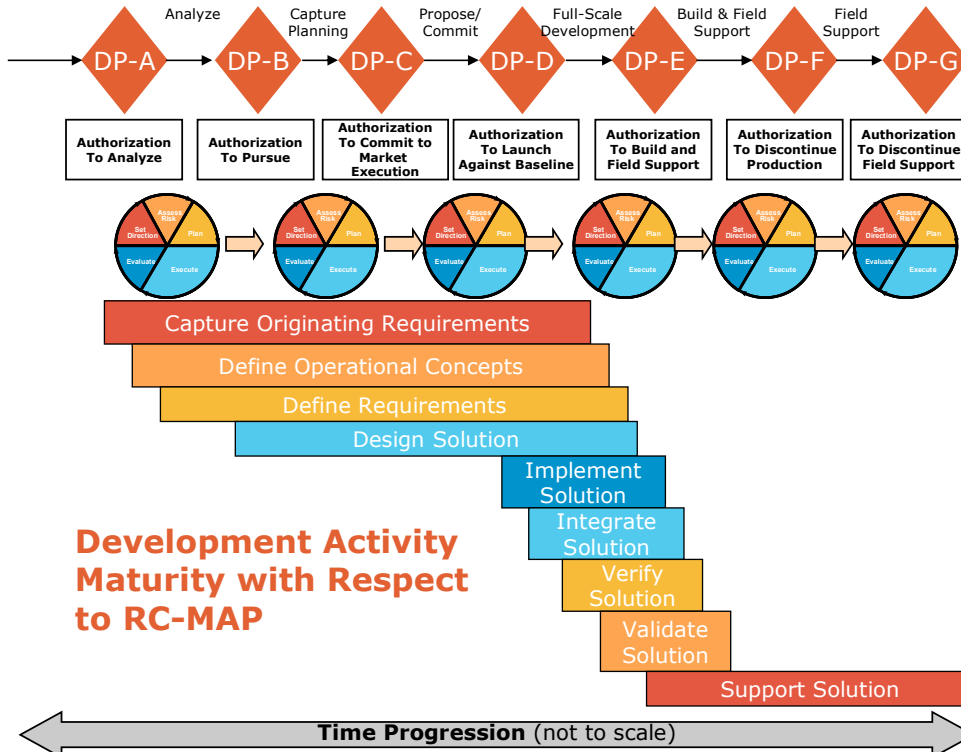
Operational concepts:

- Make it easier for users to understand the use of the system – they are intuitive, easy to generate, and understandable
- Reduce the debate by refocusing from requirements to scenarios
- Facilitate complete and consistent requirements – provide focus at the right requirements
- Identify user interface issues – provide early insight on usability
- Provide inexpensive opportunities for early validation
- Provide a foundation for testing during product validation
- Expose potential risks early
- Capture customer expectations & assumptions

Notes:



Context – Define Operational Concepts and MAP



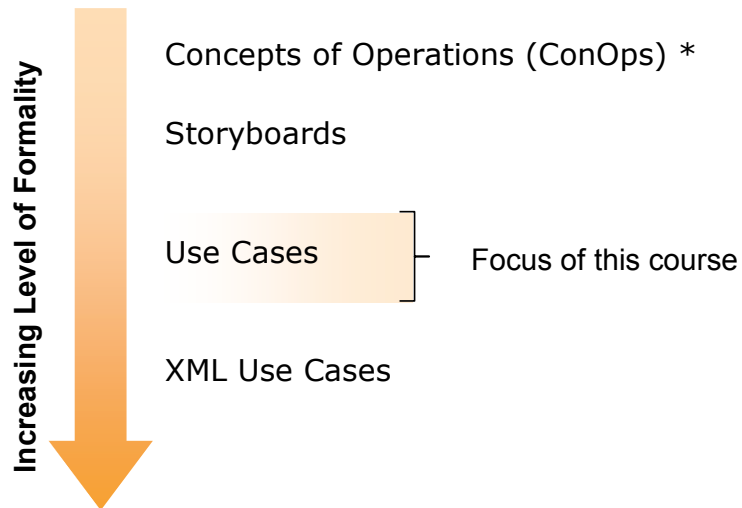
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Types of Operational Concepts

Notes:



Types of Operational Concepts



Notes:



Concepts of Operations (ConOps)

- Informal *Textual* Operational Description
 - Can incorporate all types of operational concepts
 - Storyboards
 - Prototypes
 - Use Cases
- Commonly Found In Operational Research Literature
- Sometimes Provided By Customer

Notes:



ConOps vs. OpCons (GS def'n)

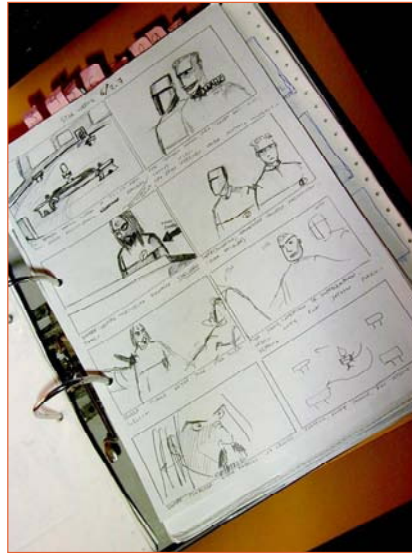
- Concept of Operations
 - Strategic document - multiple participants
 - High-level operations
 - Unique term in use by military customers – focus is on Sr. Officer view of employment of military force
- Operational Concepts
 - Tactical document – individual users
 - Low-level “hands-on” use of systems
 - Focus on Jr. Officer or Enlisted hands on use of a system
- Difference only in Stakeholder vantage point
- Strategic Concept of Operations evolution to a tactical Operational Concept could be a seamless thought process
 - Consider the Ops Concept as an extension of low-level Use Cases from higher level ConOps Use Cases

Notes:

Storyboards

Informal Operational Description

- Examples
 - Sketches
 - Static formats
 - Step Diagrams
 - Scripts



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Notes:



XML Use Cases

- Formal Methodology *and Notation* For Use Cases
 - Facilitates autocode generation
 - Not covered in this course (but may be in the future...)

```
1 <?xml version="1.0" encoding="utf-8"?>
2 <tracking-metadata generator="Presenter ver 5.0" version="1.0">
3   <objective id="Quiz20407" max-score="30" passing-score="24" min-score="0">
4     <name>Quiz</name>
5     <interactions>
6       <interaction id="Interaction20412" type="matching" score="10" correct-response="[0.D,1.A,2.C,3.B]">
7         <name>Knowledge Check - 1</name>
8         <title>Knowledge Check - 1 </title>
9         <responses>
10          <matching-set type="source">
11            <response id="0">D Capture Originating Requirements </response>
12            <response id="1">A Define Operational Concepts </response>
13            <response id="2">C Define Requirements </response>
14            <response id="3">B Design Solution </response>
15          </matching-set>
16          <matching-set type="target">
17            <response id="A">A. Identify Use Cases </response>
18            <response id="B">B. Exploration of the Solution Space </response>
19            <response id="C">C. Identify Product Requirements </response>
20            <response id="D">D. Identify Most Important Requirements </response>
21          </matching-set>
22        </responses>
23      </interaction>
24      <interaction id="Interaction20425" type="true-false" score="10" correct-response="F">
```

Notes:





Use Cases & Scenarios

- Defines intended purpose of system usage
- Captures user interaction with the system
- Consider all actors who interact with the system
- Explores user expectations of operability
- Provides a description of a "day in the life" of your product

What Are Use Cases Used For?

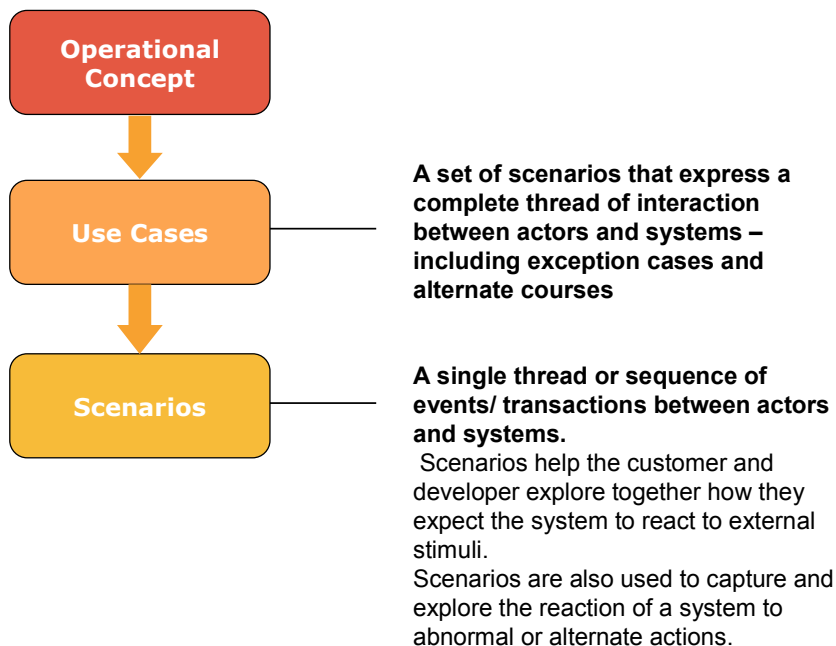
Use cases help expose:

- Functions
- Functional requirements
- Boundary interfaces
- User Interfaces
- Functional Interfaces

Notes:



Use Cases and Scenarios



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Notes:





What will defining operational concepts do for me?

Operational concepts:

- Enable the discovery of requirements that may otherwise be missed by a traditional requirements-only approach.
- Can significantly enhance communication of customer expectations & needs.
- Demonstrate our commitment and sensitivity to customer needs.
- Aid in early development of users manuals, training materials, user interface design, and validation exercises.
- Provide a context for requirements analysis, system design, and implementation.

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Notes:



Lesson Summary

- Operational concepts bridge the communications gap between end users and the system designers
- Operational concepts are used early in the product development life cycle
- There are multiple types of operational concepts techniques
- Operational concepts are essential for new and novel systems, especially those with complex interactions between the system and the user
- Use cases are not requirements....but form one source for exposing formal requirements



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Notes:

Define Operational Concepts

Lesson 3: Operational Concept Methodology

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Operational Concept Methodology

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Operational Concept Methodology



Lesson Objectives

- Describe operational concept content
- Explain who prepares an operational concept definition.
- Identify the stakeholders and their roles in the ops concept process.
- Describe different contexts of system operation.
- Explain the roles of the actors in the ops concept process.
- Given a scenario, identify the actors and their roles in use cases and scenarios.
- Identify the key components of a use case.
- Describe main course steps.
- Describe a sequence diagram.
- Describe a use case diagram.
- Given a scenario, develop a use case diagram, main course steps and sequence diagram.



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Notes:



Ops Concept Content Use

Operational concepts:

- Contains no "shall" statements
- Must not refer to specific design components
- Ask questions regarding how the operator/ maintainer/ user intends to use **capability**

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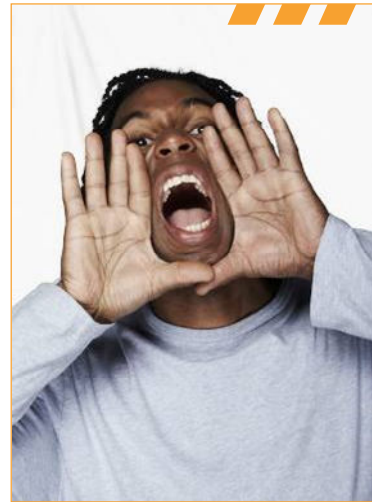
Notes:



Shout Out!

Who "owns" the operational concept definition?

Who are the stakeholders of the operational concept definition?



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Notes:



Who is the Owner of Operational Concepts?

- The entire project team 'owns' the ops concept
- Typically, a Systems Engineer is assigned the role of 'keeper'



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Notes:



Stakeholders of Ops Concept

For whom are you writing the Ops Concept document?

Stakeholders:

- End Users
- Customers
- Development Team Members
- Operation Manual authors
- Trainers
- New Project Team Members
- Life-cycle support team members



Notes:

Stakeholders of Ops Concept

Typical stakeholders:

- Ops concept 'keeper' or 'author'
- End-user
- Customer
- Engineering development team
- Project sponsor
- Trainers
- Life-cycle support teams



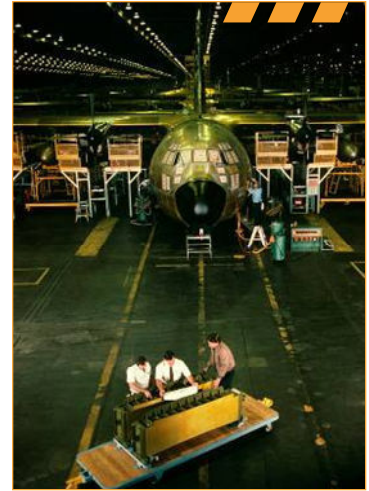
Notes:



Operational Context

Consider system context for life-cycle phases:

- Development
- Verification
- Manufacturing and Production
- Storage and Transportation
- Operation
- Maintenance and Support
- Installation and Deployment
- Simulation and Training
- Upgrade
- Disposal



Notes:



Actors

- **Actors**
 - Participants in the Use Cases & Scenarios
 - Individuals or systems that interact with the primary system of interest

- Identify the actors - know your audience!
 - Roles
 - Skills
 - Authority
 - Knowledge
 - Language
 - Culture
 - Experience
 - Education
 - Reading level
 - Technical prerequisites
 - Occupational specialties

- **Participants on Stage**
 - Primary Actors
 - Secondary Actors

Notes:



Actors

- Context understanding may expose different actors – who or what will interact with the system under each context
- A system comprised of all biological actors may reveal that the system is a human system, like an organization or agency
- A system comprised of all physical actors may be an indication that your “system” is a subcomponent of a much larger system



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Notes:



Use Case Method

- Define system or architectural context(s)
- Identify and characterize actors
 - Address actors for each life-cycle phase
- Assess system operation
 - Discovered through assessment of user community expected usage
 - Open dialog, interviews with actors
 - Derived from source requirements and stakeholder needs
- Define Use Cases & Scenarios
 - Capture a list of potential Use Cases
 - At least one main Use Case should be developed for each life-cycle phase of the system

Notes:



Use Cases & Scenarios

- Use Cases are typically separated into individual scenarios that represent a cohesive flow of events
 - Main Scenario
 - Extended Scenarios
 - Alternate Courses - options open to the user
 - Exception Cases - when something goes wrong

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Notes:



Use Cases & Scenario Content

- Capture the following information to fully define a use case scenario:
 - **Use Case/Scenario Name:** Typically <verb-noun> style
 - **Purpose/ Overview Description**
 - **Actors**
 - **Trigger Stimulus:** Identify the initiating event that would cause this scenario to occur.
 - **Preconditions:** Scenarios that lead into this use case or assumptions/ conditions that exist prior to this use case
 - **Postconditions:** Identify the state that exists after completing the scenario.

Notes:



Scenario Description

Each scenario includes the following types of information:

- Step Description
 - A step by step sequence of events.
- Actors
 - Who initiates that step
- Data
 - Identify the information and control data transactions that occur in the associated step
- Branches
 - Identify any extension, exception, or alternate scenarios that may branch from the associated scenario step

Notes:



Example: Main Course Steps (excerpt)

| # | Step Description | Data | Branch | User I/F |
|---|--|--|---|------------|
| 1 | Airplane is on ground at the departure airport | • Air/ground status | | Data I/O |
| 2 | Controller issues departure clearance to flight crew | • Departure runway | | Voice Comm |
| 3 | Pilot enters departure data into FMS flight plan Note: This data is normally entered as part of the pre-flight FMS data entry. The SMS does not require any additional pilot entered data. | <ul style="list-style-type: none"> • Departure airport • Departure runway • Runway condition • Wind direction and speed • OAT • Anti-ice • Anti-skid • Flap setting • Barometric pressure | Alternate Course AC 1.1.1 is taken if pilot does not enter all required data | FMS HMI |
| 4 | Pilot selects departure airport chart for display. | • Airport ID | | FIS HMI |
| 5 | Departure runway is highlighted on the airport chart display. | N/A | Exception | IFIS HMI |

Add Actor Column

Consider adding a column/ links to Storyboard illustration for each step. Build a comic strip!

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Notes:



Iterative Scenario Evolution

Evolving a set of sequenced scenarios is a multi-pass approach:

- **First pass:** Capture the sequence of steps – from the perspective of a primary actor
- **Second pass:** Add steps conducted by “the system” and other actors – fill in the gaps.
- **Third pass:** Consider extensions, alternate courses, or exceptions to each step.
- **Fourth pass:** Capture the data item names.

- **Subsequent iterations**
 - Define functions/ activities and functional requirements.
 - Define interface definition – human machine interface design

Notes:



Use Case & Scenario Outline

- **Use Case/Scenario Name**
- **Purpose/ Overview Description**
- **Actors**
- **Trigger Stimulus**
- **Preconditions**

| Step # | Actor | Step Description | Data Item | Branch |
|--------|--------|--------------------|-------------|--------|
| 1 | <role> | <task or activity> | <data name> | <ref> |
| 2 | | | | |
| 3 | | | | |

- **Postconditions**

Notes:

Activity: Defining operational concepts for Kitchen Assistant

- **First Pass:** Capture the sequence of steps for the **Main Course scenario (happy day!)** from the perspective of a primary actor for the Kitchen Assistant.
- Only one actor at this time!

You have **10 minutes** to complete this activity.

Notes:

Instructions:

One or two teams will select a spokesperson and debrief their exercise results to the rest of the class.

Notes:

Activity: Defining operational concepts for Kitchen Assistant

- **Second Pass:** Add steps conducted by “the system” and any other actors – fill in the gaps
- Consider for each step “when this happens, then what?”

You have **10 minutes** to complete this activity.

Notes:

Instructions:

One or two teams will select a spokesperson and debrief their exercise results to the rest of the class.

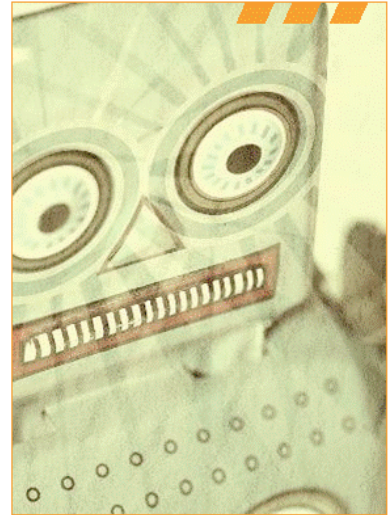
Notes:

Kitchen Assistant Review

Review the Kitchen Assistant main course steps.



Kitchen Assistant



Notes:



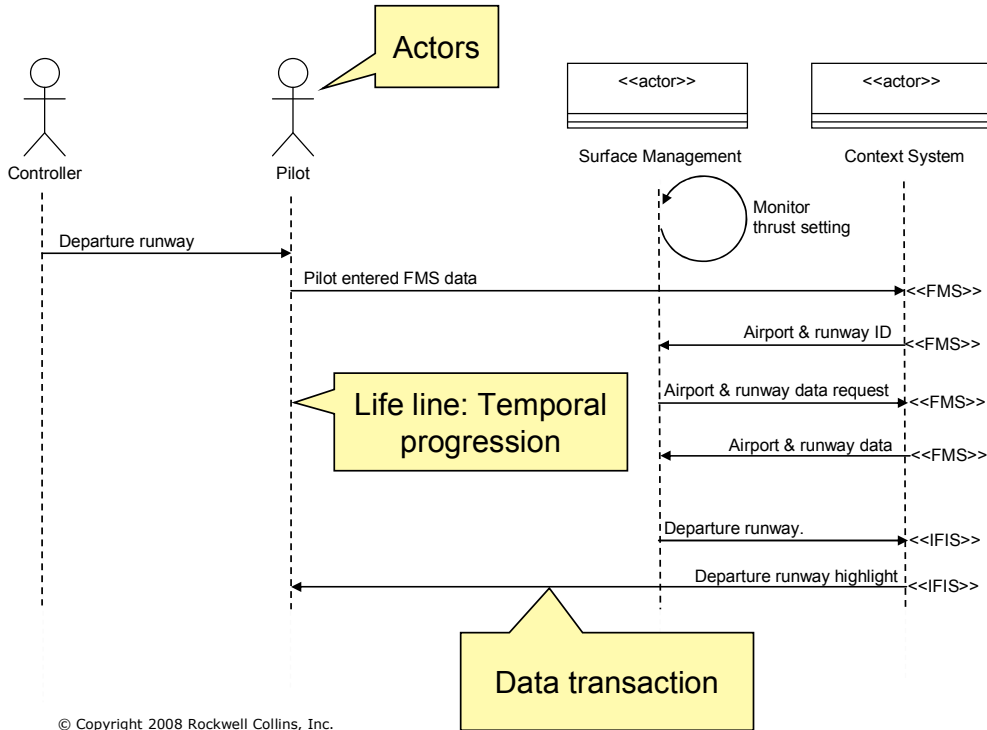
Scenario Variants

- **Main Scenario:** Describe the happy day scenario – when all goes according to plan
- **Extension:** Describe a particular step of a scenario in more detail
- **Alternate Course:** Describe alternate scenarios that result from operational alternatives & decisions.
- **Exception:** Describe additional scenarios that address exception conditions or failures (abnormal events or off-nominal conditions). Address such issues as:
 - Safety
 - Security (penetration, spoofing)
 - Misuse and Abuse
 - Abnormal Operation (failure conditions)
 - Environmental Conditions (weather, temperature, etc)

Notes:



Sequence Diagram



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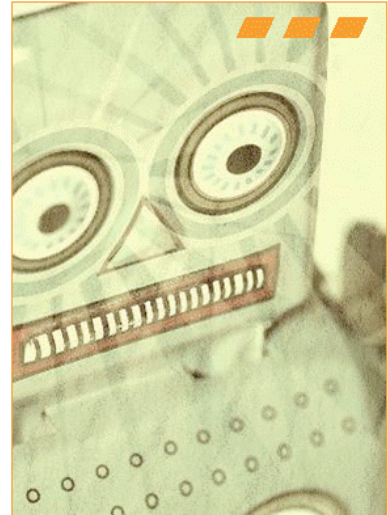
Notes:

Kitchen Assistant Review

Review the Kitchen Assistant sequence diagram.



Kitchen Assistant

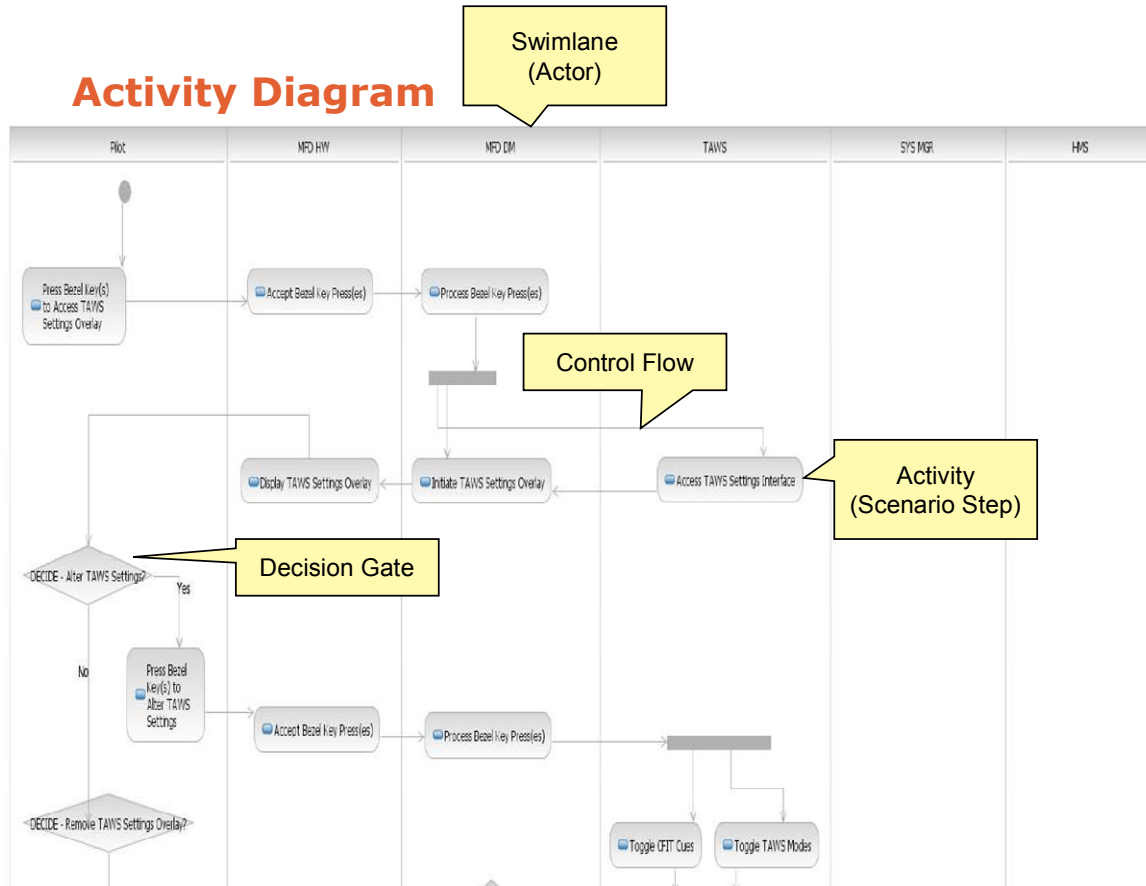


Notes:

Notes:



Activity Diagram



Activity: Defining operational concepts for Kitchen Assistant

- Create an activity diagram presentation of your use case
- Combine the main scenario and one exception case/alternate course into one diagram..

You have **10 minutes** to complete this activity.

Notes:

Instructions:

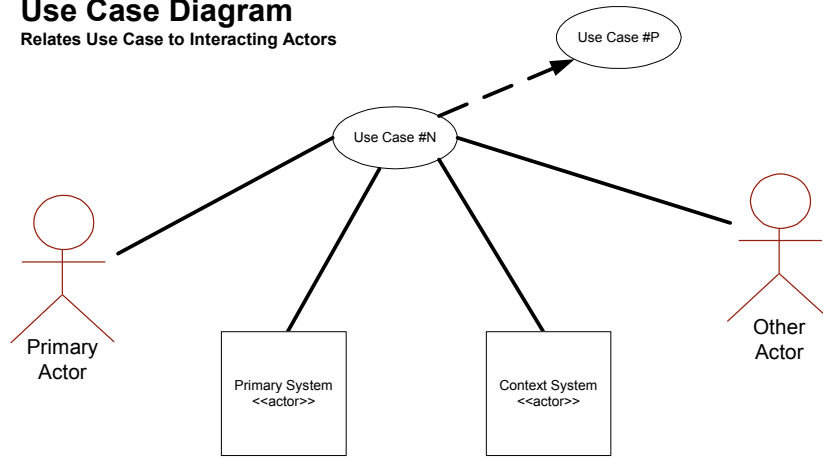
One or two teams will select a spokesperson and debrief their exercise results to the rest of the class.

Notes:

Use Case Diagrams

Use Case Diagram

Relates Use Case to Interacting Actors



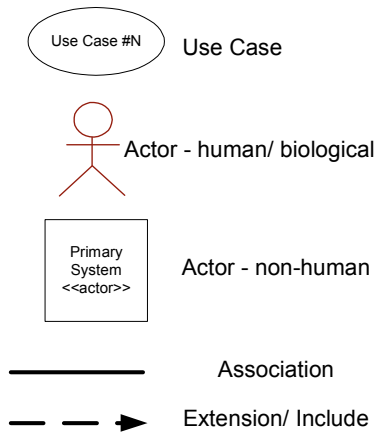
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Notes:

Use Case Diagram Semantics

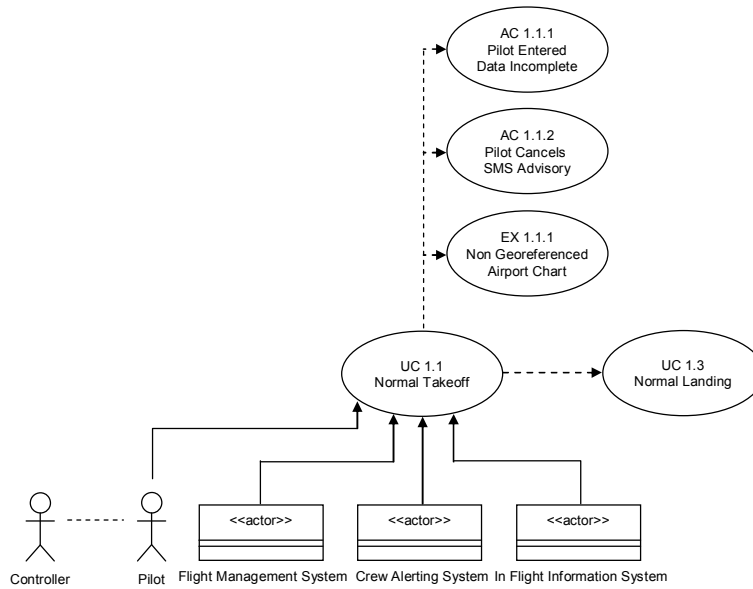
Use Case Diagram Notation



Notes:



Example: Use Case Diagram



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Notes:

Activity: Defining operational concepts for Kitchen Assistant

- Develop a **Use Case Diagram** for the Kitchen Assistant.
 - Put all scenarios and actors from prior work into a Use Case Diagram

You have **10 minutes** to complete this activity.

Notes:



Kitchen Assistant Review

Review the Kitchen Assistant use case diagram.

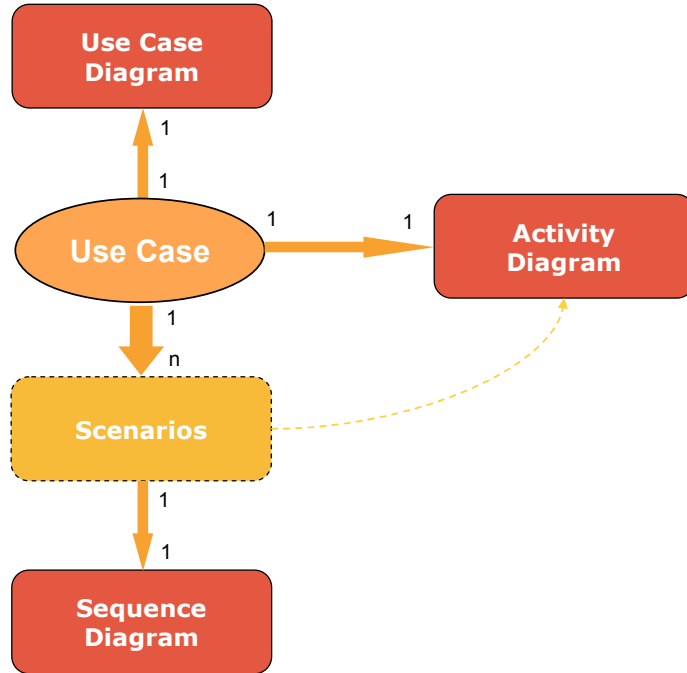


Kitchen Assistant



Notes:

Use Cases & Scenarios with Diagrams



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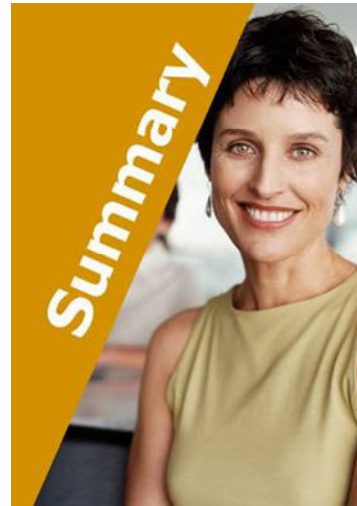
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Notes:



Lesson Summary

- Identify stakeholders, actors, & operational contexts
- Define use cases and corresponding scenarios
- Define a main course, alternate course, and exception scenario
- Capture sequence diagram for each scenario
- Capture activity diagram representation of the use case
- Structure the use cases & scenarios in a use case diagram structure



Notes:

Define Operational Concepts

Lesson 4: Operational Concepts Style Guide

Notice

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Operational Concepts Style Guide

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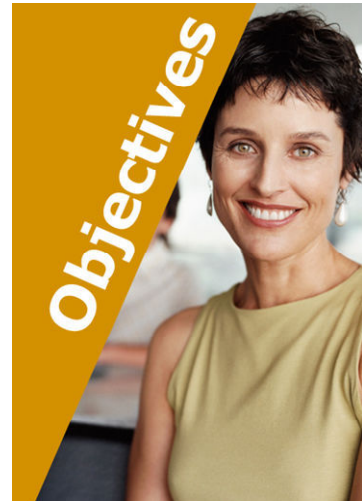
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Operational Concepts Style Guide



Lesson Objectives

- Capture an Ops Concept document in a disciplined structure
- Explain when it is time to stop an operational concept.
- Describe how to conduct an operational concept review.
- State the conditions under which an operational concept may be essential, recommended, suggested, or not advisable.



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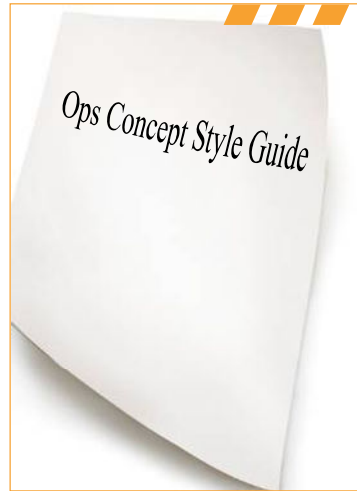
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Ops Concept Style Guide

Start the Ops Concept document by inputting information gathered while capturing originating requirements:

1. Introduction
2. References
3. Statement of Need
4. Most Important Requirements
5. Life-Cycle Phases
6. Architectural Context
7. Actors



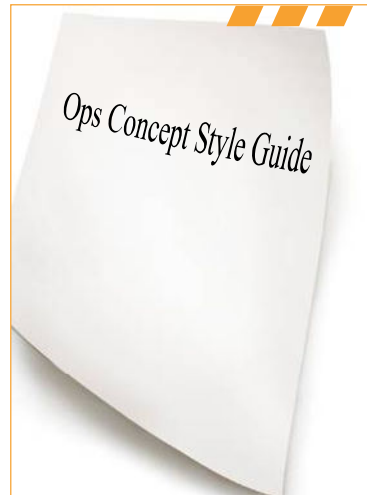
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Documenting the Use Case

Capture the following information to fully define each use case & corresponding scenarios:

- Use Case Name
- Purpose
- Actors
- Trigger Stimulus
- Preconditions
- Use Case Diagram
- Scenario(s)
- Post conditions



Notes:



When is Enough Enough?

When do you start/ stop the ops Concept process?

Questions to ask yourself:

- Does the scenario add to your understanding of the system?
- Does it expose any additional functions, functional requirements, or interfaces?
- Are scenarios covering the same ground that has already been covered?
- Have you considered all necessary exceptions, alternate course, or needed extensions of each step of each scenario?



Notes:

Validating Use Cases & Scenarios



Validating the Use Cases & Scenarios

- **Operational Concept Review**
 - Cockpit Working Group or other User Working Group
 - Project specific forum
 - Users Conferences or Meetings
 - Where do your users gather together for meetings?
 - Site Survey and Operational Visits
 - Explore the current operational environment
 - Development Team Review
 - Involve software, electrical, and mechanical leadership
 - Engage to gain an understanding of the product's anticipated usage
 - Revisit at all review opportunities
 - Have team members revisit the Ops Concept definition for each review – requirements review, design review, etc.

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Notes:



When is it appropriate to use ops concept in engineering development?

System Precedence

- Unprecedented systems
- Significant functional modification
- New application of existing functionality
- Minor functional modification or reuse of current capability

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Notes:

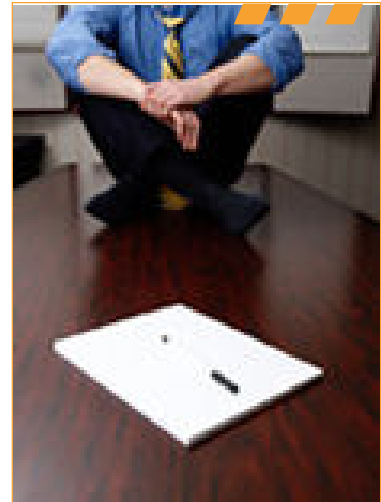


Unprecedented Systems

- Little or no basis for a similar capability
- Lots of user interfaces or actors



Essential



Notes:



Significant Functional Modification

- Known function, but maybe new extensions or modifications that are uncertain
- High functional complexity



Recommended



Notes:

New Application of Existing Functionality

Known function, but maybe new context that is uncertain



Suggested



Notes:



Minor Functional Modification or Reuse of Current Capability

Known function with only minor changes



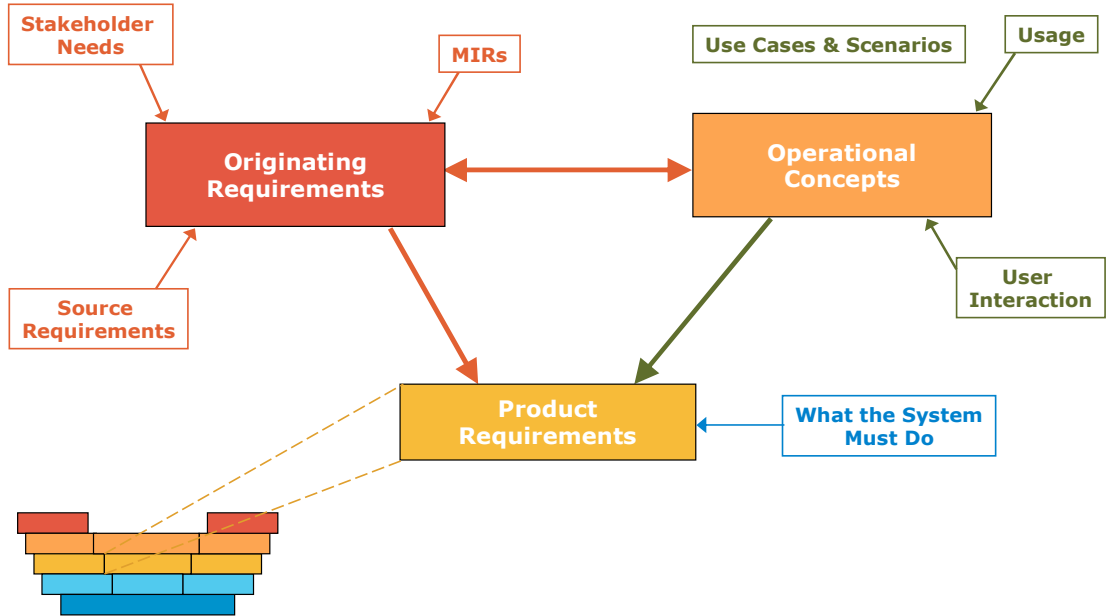
Not Recommended



Notes:



The Next Step: Requirements Analysis



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Notes:

Next Steps: Requirements Analysis & Design



Next Step: Requirements Analysis & Design

- Scenario Steps ≈ Activity of an Activity Diagram
- Translate Scenarios into Activity Diagram Presentation
- Translate Activity Diagram into Data Flow Diagram
- Define Functional Requirements for each Activity
- Define Interface Requirements for each Data Item
- Design:
 - Logical & Physical Architecture
 - Interface Design Definition
 - Human Machine Interface
 - Physical Interfaces

Notes:



Conclusion

- Use Cases and Scenarios are an excellent foundation for an Operational Concept!
 - Understandability - Customers readily identify with scenarios better than functional requirements
 - Systematic - disciplined approach to understand the operational concept - less verbose, more structured

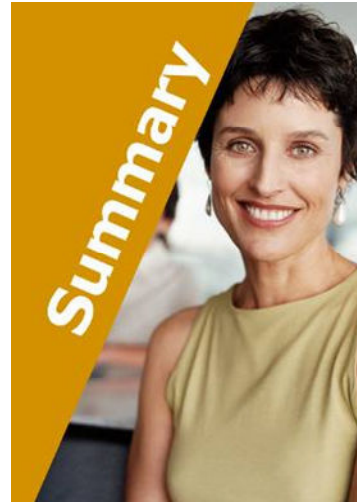
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Lesson Summary

- Reference Define Operational Concept Guideline and Style Guide for more information
- Explore when an operational concept is “complete” enough
- Review the use cases & scenarios with customers & other stakeholders
- When is it appropriate to use ops concept in engineering development?



Notes:

References

- **Course Materials**
 - ETIpedia
 - System Engineering Training
 - Define Operational Concept – TCP Activity & Task articles
- **Books**
 - Customer Centered Products: Creating Successful Products Through Smart Requirements Management, Ivy Hooks, 2001
 - The Engineering Design of Systems, Dennis Buede, 2001
 - OMG Unified Modeling Language Specification v1.3, 2000
 - Use Case Based Requirements Development, Thomas Vayda, 2000
- **Standards**
 - ANSI AIAA G-043-1992: Guideline for Preparation of Operational Concept Documents (new version to be published 2006/2007)
 - ISO/IEC 15288: Systems Engineering — System Life Cycle Processes, para 5.5.2.3
 - MIL-STD-498: Software Development & Documentation, para 5.3.2
 - DI-IPSC-81430: Operational Concept Description DID
 - DI-MCCR-80023: Operational Concept Document (old DOD-STD-2167 DID)
 - IEEE Std 1362-1998: Concept of Operations Document
- **Papers**
 - The Concept of Operations: The Bridge from Operational Requirements to Technical Specifications, Richard Fairley, SEMA Inc. and Drexel University, 1994. IEEE 0-8186-5480-5/94
 - Front-End Operational Concepts - Starting from the Top, Andrew Gabb, 2001. INCOSE Symposium Proceedings
 - Operational Concepts and the Case for Use Cases: Unifying UML with Systems Engineering, Raymond Jorgensen, Rockwell Collins, 2002. INCOSE Symposium Proceedings
 - The Usage Model: A Structure for Richly Describing Product Usage During Design & Development, Erik Simmons, Intel, 2005. IEEE RE '05 0-7695-2425-7/05
 - Tools to Support Human Factors and System Engineering Interactions During Early Analysis, Thronesbery/Malin/Holden, NASA, 2006. IEEE 0-7803-9546-8/06

Engineering of Systems – Evolving Class Exercise

1. System Objectives

1.1. Introduction

The Kitchen Assistant system is an exercise in the application of the Technical Consistent Process (TCP) for a complex system. Principles demonstrated through this class may be applied for any product development effort. This in-class exercise has been conducted on several occasions and has proven to be an interesting, interactive activity that any participant can relate to. The scope of the activity is only bounded by the imagination of the participants – let nothing dissuade your innovative thinking. Each area of the TCP is explored to demonstrate how it all fits together.

1.2. Statement of Need

The whole idea behind the Kitchen Assistant is to elaborate on the problem of a kitchen appliance or system that is perceived as a critical need in your household. What new idea could make life easier in your kitchen? What ideas are practical? If you could change how you work in your kitchen, how would you change it?

1.3. Stakeholders

The following are examples of Stakeholders that have been identified in the Capture Originating Requirements course.

- End-Users of the Appliance
 - Homeowner
 - Caterer
 - Restaurant Owner
- Supplier – grocery stores, food vendors
- Retailers – appliance sales (Sears, Best Buy, etc)
- Advertisers – those who might be interested in advertising opportunities through the appliance
- Manufacturer – typically, the company creating the appliance (participants in this class!)
 - Program Management
 - Marketing & Sales
 - Engineering Management
 - Engineering
- Recipe Owners (like Taste of Home magazine, etc)

1.4. Stakeholder Needs

The following are examples of Stakeholder Needs that have been captured in the Capture Originating Requirements course.

| Stakeholder Role | Expressed Need |
|------------------|---|
| Homeowner | I want something that will automatically put the dirty dishes into the dishwasher and then put them back in the cabinets. |
| Homeowner | I want something that composts my garbage - take it away without me handling it. |
| Homeowner | I want to be able to find recipes that I like to use (favorites) |
| Homeowner | Something to help me find out what food or wine goes with my meal. |
| Homeowner | I want something to help me plan for a special occasion party. |
| Homeowner | I'd like to track my caloric intake and know how many calories on in the meals that I prepare. |
| Homeowner | I can't find a recipe that will use up all my excess produce - give me options! |
| Homeowner | I'd like to plan out my week of meals and order groceries for the week. |
| Caterer | I'd like to keep track of my inventory and know when to order new supplies |
| Caterer | I'd like to organize the entire meal preparation to maximize time and minimize time that food might spoil or go cold. |
| Caterer | Give me something that keeps track of upcoming orders. |
| Restaurant | Want an ability to maintain inventory of ingredients. |
| Restaurant | I'd like to set-up a meal plan for the day - and the ability to customize the meal plan and menus for any given day. |
| Restaurant | I want someplace to store our new recipes and keep track of the success/ failure of those recipes on our clientele. |

1.5. Source Requirements

The following are examples of Source Requirements that have been captured in the Capture Originating Requirements course.

- Bob's Banquets Catering Service
 - Provide the ability to plan several different meal configurations.
 - Provide one convenient storage location for all Bob's recipe ideas

- Provide checklist and due dates for banquet preparation.
- Provide storage for individual banquet planning
- Provide inventory management of current stocks and supplies used in banquets.

1.6. Most Important Requirements

The following are examples of Most Important Requirements that have been captured in the Capture Originating Requirements course.

Most Important Requirements

Provide the ability to categorize, sort, filter, and display recipes for use in meal preparation.

Provide the ability to prepare a meal plan, check available inventory, prepare a grocery list, and execute on that plan.

Provide the ability to define my own recipes or capture my favorite recipes.

Provide the ability to track available inventory and restock when supplies are low.

Provide the ability to suggest complimentary foods or food substitutes.

1.7. Technical Performance Measures

The following are examples of Technical Performance Measures that have been captured in the Capture Originating Requirements course.

| Measure | Performance | Reason |
|------------------------|--|---------------------------------------|
| Weight | Less than 3 pounds | Handheld; clutch or purse size |
| Size | No larger than 4x6x1 in | Fit into handbag, purse, coat pocket |
| Power | No more than 150 Watts | Handheld - not too hot to hold |
| Battery Life | No less than 10 hours | Out shopping all day! |
| Legibility | Font size no less than 10 pt and selectable to larger font | Accommodate normal and poor eyesight. |
| Self-Contained Recipes | No less than 500 recipes on hand | Accommodate last minute changes |

2. Architectural Context

2.1. Actors

The following are examples of Actors that have been captured in the Capture Originating Requirements course.

- Cook

- Meal Planner
- Purchasing
- Children
- Host/Hostess
- Chef

2.2. System Context

The following are example context diagrams that have been expressed during the Capture Originating Requirements course.

2.2.1. Development Context

2.2.2. Verification Context

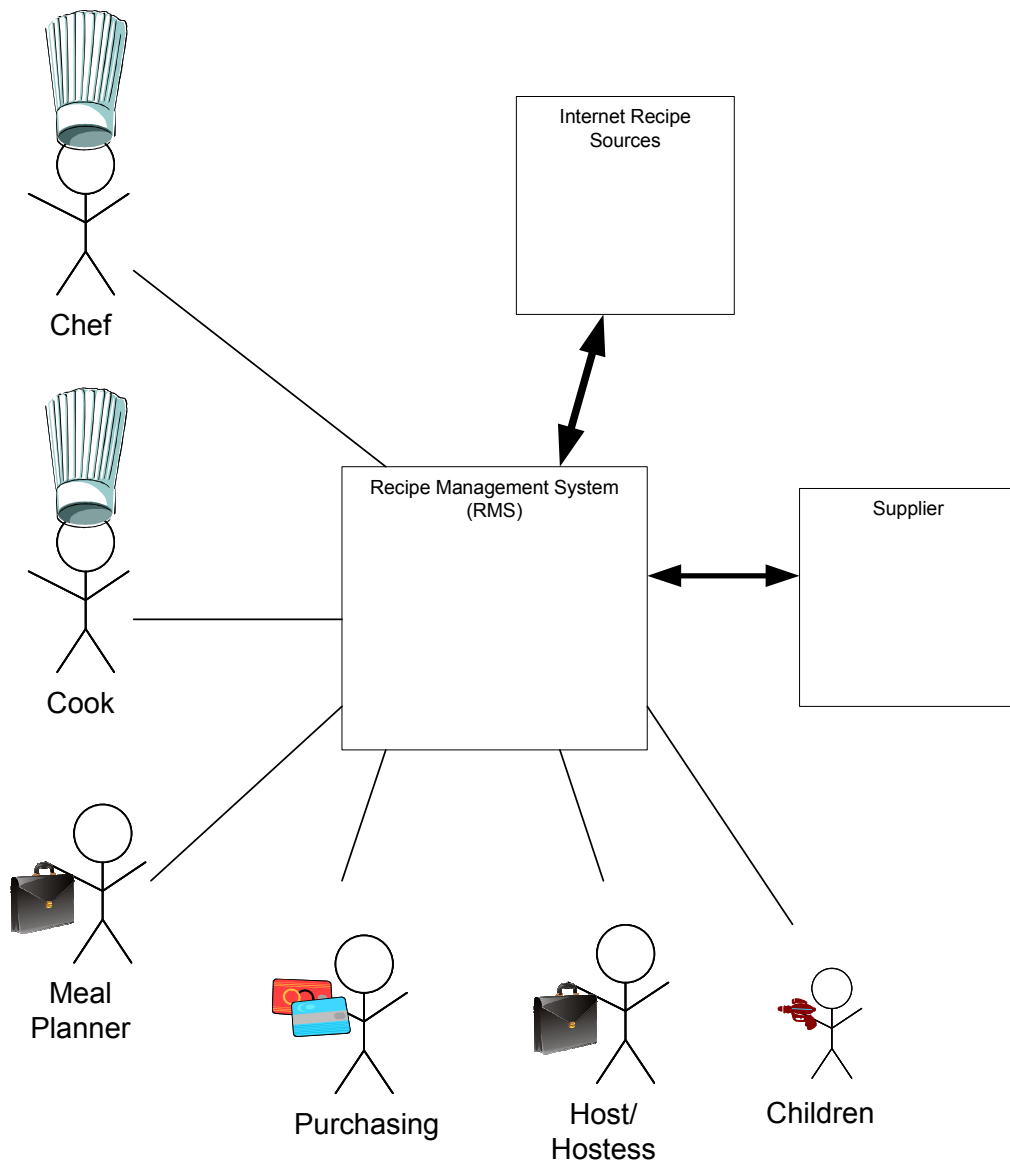
2.2.3. Manufacturing & Production Context

2.2.4. Storage & Transportation Context

2.2.5. Installation & Deployment Context

2.2.6. Simulation & Training Context

2.2.7. Operational Context



2.2.8. Maintenance & Support Context

2.2.9. Upgrade Context

2.2.10. Disposal Context