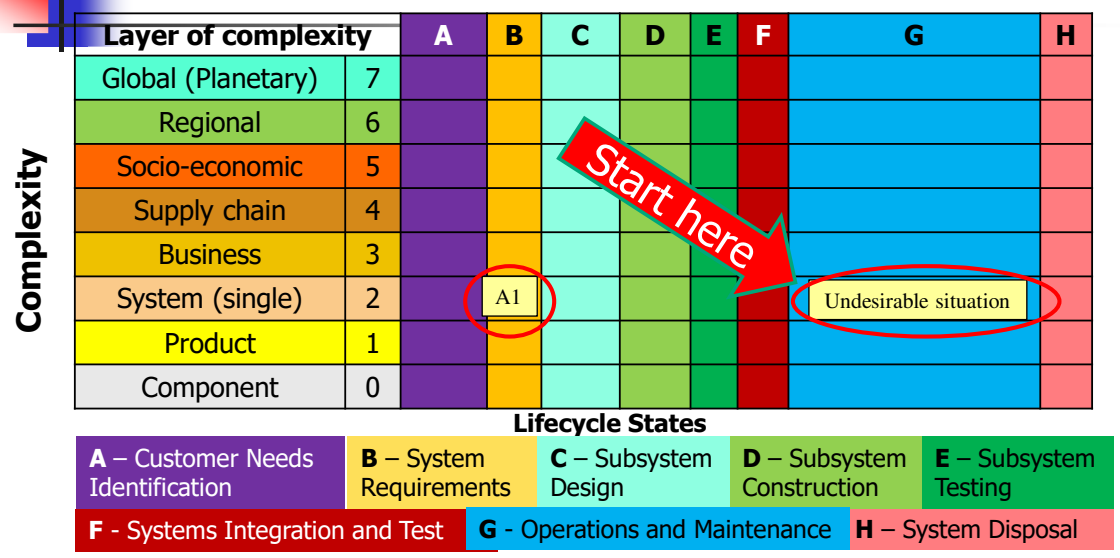
Module 13: Modelling, simulation and using models in building a simulation over the SDP Session 2 of 7

Rev 2.1.0

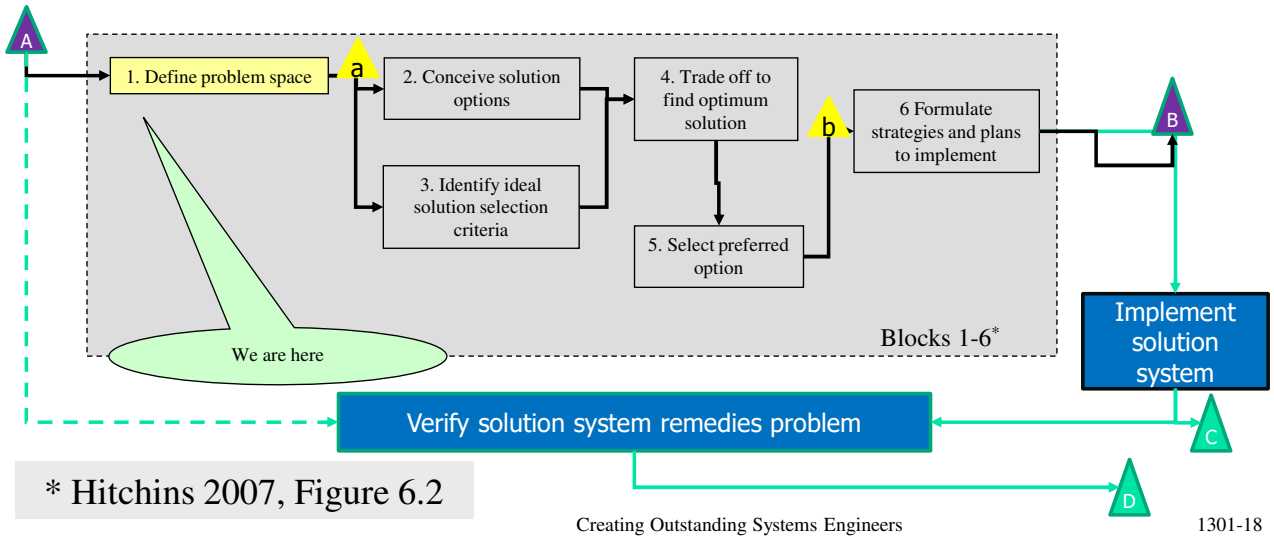
Needs Identification



Column A (reminder)

1. **This sub-state contains the set of activities that explore/scope the problem, leading directly to Phase A.2. The activities performed in this phase produce a definitive statement of the problem-in-context.**
2. This sub-state contains the set of activities that conceive the whole solution system (which 'emerges' from/"complements" the problem) and produces the concept of operations (CONOPS) that describes how the solution system will operate in its future environment.
3. This sub-state contains the set of activities that design the whole solution system, identify the environment, other interacting systems, the subsystems, parts, interactions, functional architecture, physical architecture, etc., etc., - but still all of the whole.

HKM²F Column A1 The Needs State (problem language)

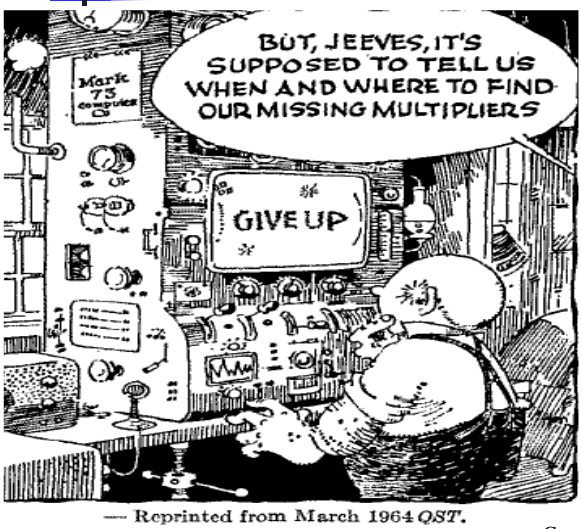


* Hitchins 2007, Figure 6.2

Undesirable situation

- 1978
- Located in Silver Spring, Maryland
- Want to contact all 75 Sections in the 1979 ARRL Sweepstakes contest
- Want to make as high as score as possible
- Will be using low radiated power (100 Watts)
- Have no way of knowing when a Section is active other than by hearing it on the air
- Operating at home
  - Family, pets and other interruptions possible

Focusing in on the problem



— Reprinted from March 1964 *QST*.

- Problem had been recognized at least 12 years earlier
- Understand the factors involved in the ARRL sweepstakes contest well enough to enable an operator in Silver Spring, MD to contact all the Sections **(multipliers)** given the constraints of low radiated power

Key words in red

Exploring to determine real need

1. Read about factors

- Identify the factors
- Identify relationships between factors
- Develop understanding of domain and undesirable situation

2. Create contest simulation

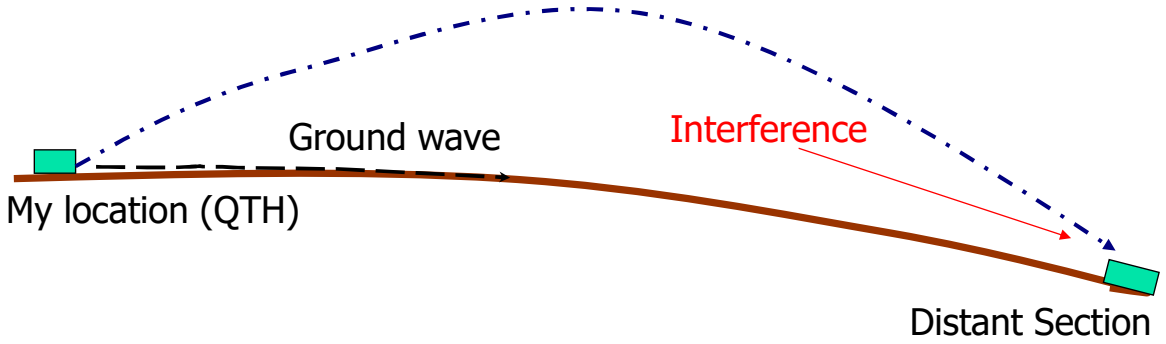
- Identify the factors
- Identify relationships between factors
- Develop understanding
- Create simulation
- Run simulation
  - Try approaches and see what happens
- Develop **better** understanding

Key for FCFDS

Radio Propagation

Sky wave (ionosphere)

(refraction altitude dependent on frequency, date and time (solar effect)



Evolving the FCFDS

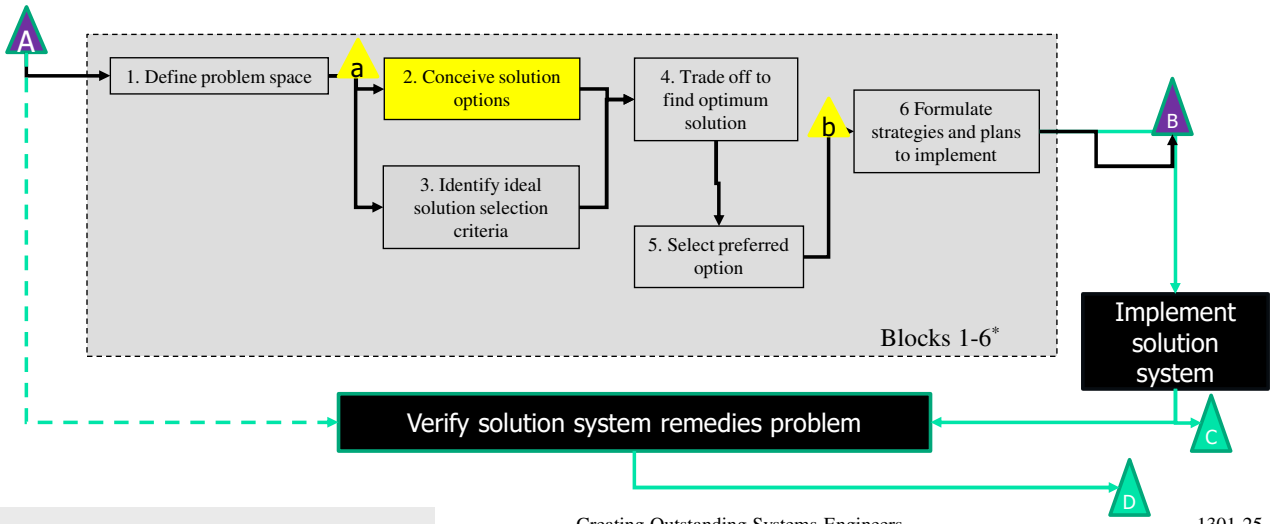
- Develop an understanding of the pertinent factors and their interrelationships that contribute to a **future winning entry** in the ARRL Sweepstakes contest to enable working as many stations in all the Sections within the limitations of the operator's equipment from a location in Silver Spring, Maryland (MD).
- Develop a simulation of the next iteration of contest in the form of a game to
  1. Verify the understanding and
  2. provide training.

What the customer needs [OARP]

- Develop a simulation that is:
  1. Realistic enough to enable an operator in Silver Spring, MD to contact all the Sections given the constraints of low radiated power if the operator has developed an understanding of the pertinent factors involved in contacting all the Sections.
  2. Fun to play.

Realistic enough to enable successful completion of mission at the appropriate time

HKM²F Column A The Needs State (problem language)

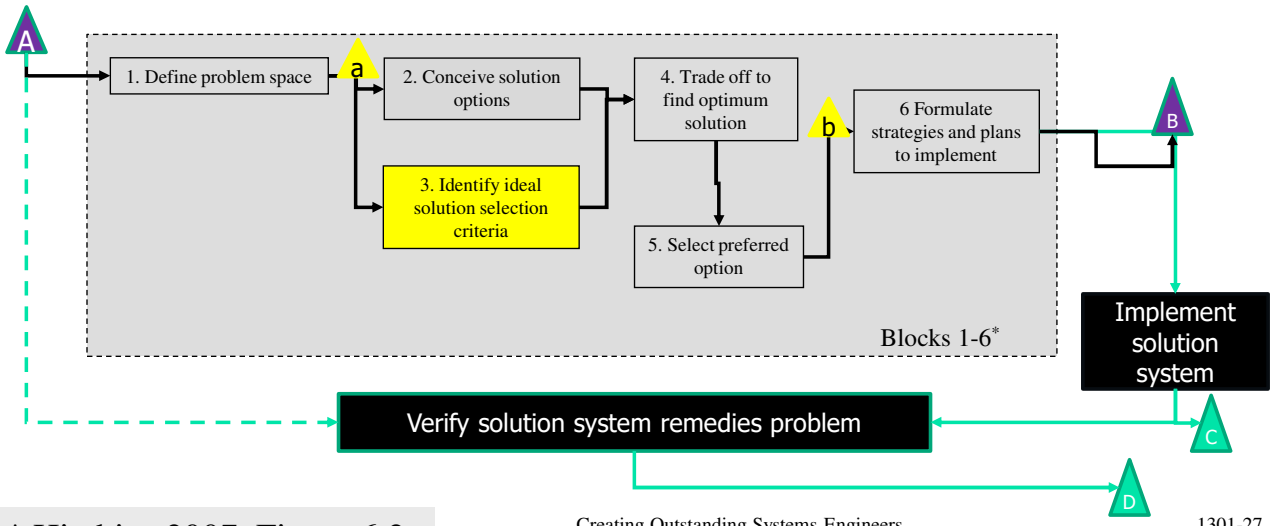


* Hitchins 2007, Figure 6.2

Options

1. Hardware
   1. Personal computer
   2. Dial-up line to IBM 360
   3. Other
2. Software
   1. BASIC
   2. FORTRAN
   3. Other

HKM²F Column A The Needs State (problem language)



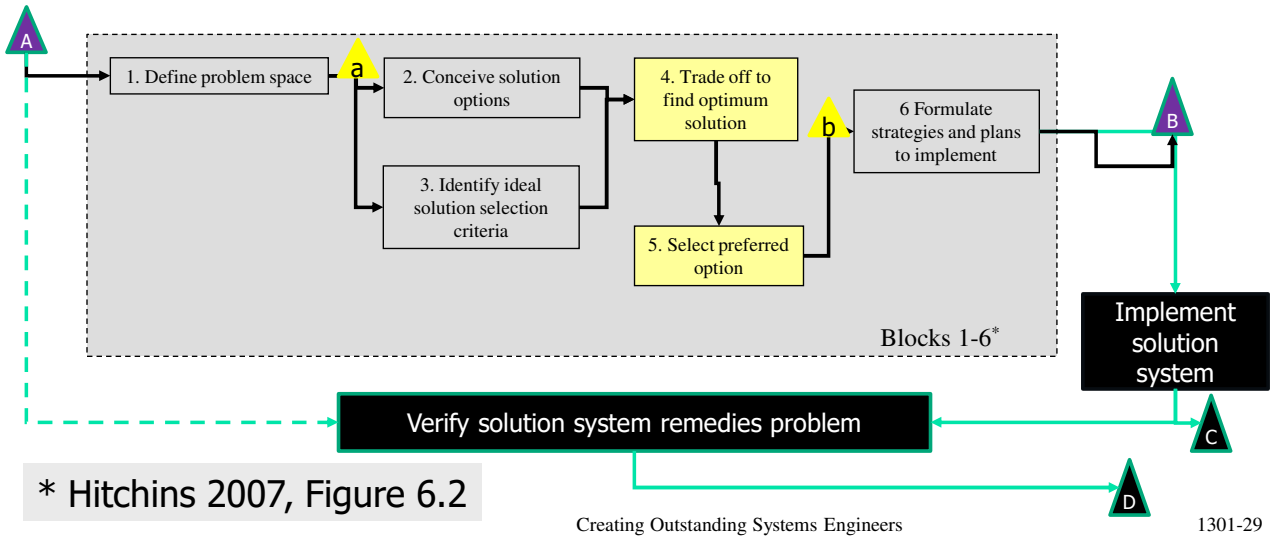
* Hitchins 2007, Figure 6.2

Solution selection criteria

1. Amateur effort, so it has to be fun
2. Serve as a learning exercise for programming in 'BASIC'
3. Can be developed in a reasonable time
4. Affordable

Requirements or selection criteria?

HKM²F Column A The Needs State (problem language)



* Hitchins 2007, Figure 6.2

Decision

- Develop simulation in BASIC
- Feasibility check
- Q-1: Is at least one computer accessible and available?
  - A-1: Yes
    - Q-2: Does it have BASIC language?
    - A-2: Yes
      - Result: Approach may be feasible
        - Domain knowledge
        - Memory requirements?

Feasibility study: Constraints (implementation domain knowledge)

- INTEL Hardware platform
  - Given constraint
  - 8080 microprocessor (8 bits)
- Assume software written in BASIC
- Enough memory?
  - 32K RAM
  - Interpreter occupies 16K Bytes
- Need some space for stack and run time variables
- Leaves about 12-14KBytes for program

Feasibility study: Risk management (implementation domain knowledge)

- Do some software code size estimation
  - Table of Stations callsign array is largest data element
    - (need to know there are 2707 maximum from published scores)
- Conclusion – feasible but with implementation risk
  - RAM Memory may be insufficient
- Risk mitigation possibilities
  - Use "spaghetti code" to cut down on memory use
    - Document source code accordingly, REM statements are discarded by interpreter
  - Use IBM 360 if code won't fit in Intelec MD8/80
- TPM: RAM usage – track during software development

Ideas from OARP and FRAT

Implementation domain knowledge is software programming and PC platform

Prior published scores*

Results, 44th ARRL November Sweepstakes

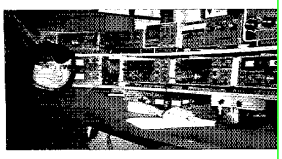
The 1977 SS was the year of the clean sweep!

By Tom Frenaye,* K1KI

The 1977 November Sweepstakes nearly matched the previous year's SS in number of entries and number of new records set. A total of 2698 logs was received, a decrease of about four percent from the all-time record of 1976 when a bicentennial year SS award was offered for those making more than 200 QSOs.

Competition was, as it always is, very fierce. Last year's number-three operator on cw, KP4EAJ, bettered his effort by more than 40 QSOs to put KP4RF (ex-KP4AST) on top. The record cw score made by K7VPF at KV4FZ in 1976 (193,500) was topped by just 232 points! The super station on top of the mountain in Puerto Rico also produced a new effort. The 1975 record on phone held by WA5VDH was almost topped by N4MM's 175,500 points, but John will have to try again next year to uncover the 27 extra QSOs he needed to break the record. The number-10 spot in the top-ten low-power scores required an increase of 12,000 points (or 10 percent!) in 1977 over 1976. It gets tougher every year.

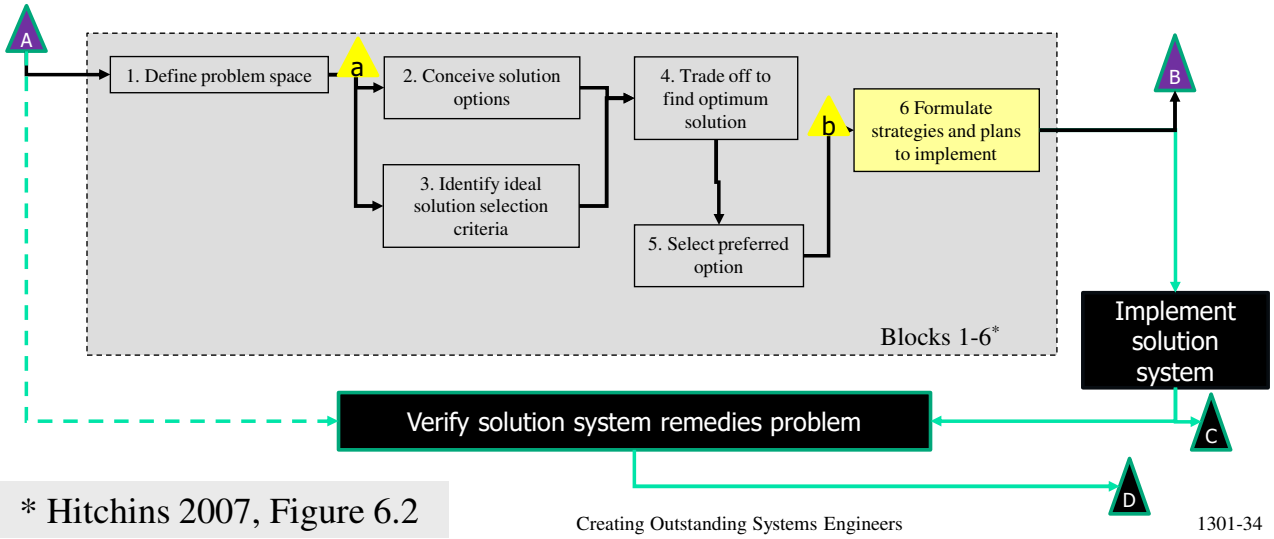
A couple of scores really do merit special recognition. The effort from VE5DX on phone (number 10 in the top ten) was outstanding, though being about the only station on from Saskatchewan undoubtedly made a difference. George, WØUA, operating from home on cw and at WØTR on phone, turned in the order were WB3DCT/N (33,158 points)



The big signal up north comes from VE5DX. Jim turned in the top high-power score on both modes in the Canadian Division.

* QST, May 1978, page 68-

HKM²F Column A The Needs State (problem language)



* Hitchins 2007, Figure 6.2

Strategy and plan to implement

- Develop understanding in time for next year's contest (1979)
- Use published 1977 result data as basis for distribution of stations in Sections
- Simulation game hardware platforms – choice of spare time use of: (decision to be made later)
  1. Intelec 8/80 platform available in lab
     - Feasibility study
  2. IBM 360 via telephone dial-up modem
     - Serial I/O devices
- Use incremental or cataract (mini-waterfalls) development lifecycle

Exercise 13-11 identifying the factors

1. Identify at least 5 of the factors in the scenarios developed in Exercise 13-11
   1. Use HTPs and Active Brainstorming
2. Identify the relationships between the factors
3. Prepare a <5 minute presentation containing
   1. This slide and the version number of the Module
   2. The scenarios at top level
   3. The factors you identified and the relationships between them.
   4. The exercise problem formulated per COPS problem formulation template
   5. A compliance matrix for the exercise
   6. Lessons learned from exercise
4. Save as a PowerPoint file in format Exercise13.21-abcd.pptx
5. Post/email presentation as and where instructed

Any questions ?

1. Best
2. Worst
3. Missing

Email: beyondsystemsthinking@yahoo.com
Subject: <class title> BWM Session #