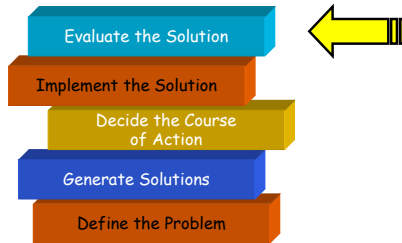




Evaluation

- After implementation, a final evaluation of the solution is needed



Evaluation

Guidelines for evaluating your solutions

- Does it completely solve the problem?
- Is the solution ethical?
- Does the solution endanger people or the environment?



Evaluation

General Guidelines

- Evaluation should be a *ongoing* process
- Examine your solutions at each phase of the project
- Have an **independent review** of your work
- Do a **KT Potential Problem Analysis**
- Ask questions!!



Evaluation

The McMaster Five-Point Strategy

- Check that the solution is blunder-free
- Check the reasonableness of results
- Check that criteria and constraints are satisfied
- Check the procedure and logic of your arguments
- Confirm **ALL** findings!



Evaluation

The Snow Cruiser

- The original conception of the Snow Cruiser is most often credited to Dr. Thomas C. Poulter who served as second in command of Admiral Byrd's Antarctic Expedition II.
- During this expedition, Admiral Byrd nearly lost his life when he was isolated by the weather at the Advanced Base.
- It took three attempts for Dr. Poulter to rescue the Admiral due to the difficulty of traveling a mere 123 miles in the inhospitable conditions.
- This incident is believed to have been the spark that inspired Dr. Poulter to first visualize the Snow Cruiser.



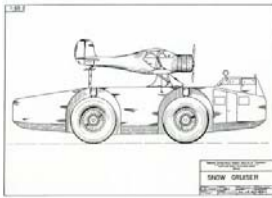
Evaluation

The Snow Cruiser

Some Design Features:

1. A range of 5,000 miles
2. Room for a crew of five
3. Supplies for a year
4. An airplane on the roof
5. Outstanding terrain capabilities





The Snow Cruiser

- Work on the Snow Cruiser was begun on August 8, 1939 at the Pullman shops in Chicago Illinois. The Foundation had just eleven weeks to build, test and deliver the completed Snow Cruiser to Boston, Massachusetts where it would be loaded aboard ship for transport to Antarctica.



The Snow Cruiser

- On October 24, 1939 the nearly completed Snow Cruise began a 1021 mile trek to Boston.
- This trip would be the shakedown cruise as well as a race the reach Boston before the North Star sailed for the Antarctic.
- On November 12, the Snow Cruiser pulled alongside the North Star at Boston Army Wharf. To fit on the deck of the North Star, the Cruiser's tail section had to be temporarily removed.



The Snow Cruiser

- On January 12 the North Star anchored at the Bay of Whales.
- To unload the Snow Cruiser from the deck of the North Star, a large ramp was constructed of heavy timber.
- Unloading of the Snow Cruiser took place on January 15, with Dr. Poulter at the helm.
- Half way down the ramp the timbers began to break. Dr. Poulter quickly gave the Cruiser full throttle and she lurched from the ramp to the safety of the ice.



The Snow Cruiser

- The Snow Cruiser failed to perform up to expectations.
- The tires sank deeply into the snow (3 feet) and spun too easily.
- In an attempt to improve the cruiser's performance, the crew attached the two spare wheels and tires to the front wheels, increasing the surface area of the tires by 50 percent.
- To improve traction, they installed chains on the smooth rear tires.



Evaluation

The Snow Cruiser Failed

- What went wrong?
- Were the assumptions valid?
 - What information is available about the Antarctic environment?
 - How difficult is the terrain?
 - If the vehicle will move on dry roads in good weather, what makes us think it will function on snow and ice?
 - Most polar vehicles up to this time used caterpillar treads rather than tires.
 - Why would our new tire design work?
 - Why do other vehicles use treads?
 - The answers to some of these obvious questions may help avoid a failed design.





Evaluation

The Snow Cruiser Failed

Does the solution solve the Real Problem?



- | Clearly the problem is at least twofold.
- | One problem is to protect the workers and explorers from the harsh polar environment.
- | The other, and just as important an aspect, is that the vehicle should have good mobility on the expected terrain so that exploration (the main goal of the expedition) is possible.
- | The design was quite successful from the protection/living accommodations standpoint.
- | The Snow Cruiser was nicer inside than many pre-World War II bungalows.



Evaluation

The Snow Cruiser Failed

Does the solution solve the Real Problem?



- | The design only partially addressed the mobility problem.
- | Elaborate design features were included to enable the Snow Cruiser to cross crevasses in the snow that it would certainly encounter, but it appears that insufficient consideration was given to ensuring "normal" mobility in polar ice and snow.
- | Surely some incorrect assumptions were made regarding the traction of the tires and the power necessary to move such a mammoth vehicle in these severe conditions.
- | Challenging all the assumptions of the design and making sure that the real problem (and all facets of it) are solved are keys to determining a functional solution.



Evaluation

The Snow Cruiser Failed

Is the problem permanently solve?



- | If indeed the Snow Cruiser functions as designed, it would be a permanent solution to polar expedition problems.
- | Does the solution have impact?
- | In this case, yes. The Snow Cruiser could have revolutionized the way polar explorations were conducted.



Evaluation

The Snow Cruiser Failed

Have all consequences of the solution been examined?



- | This question is difficult to answer, not knowing what went on at the time, but providing the vehicle operates as designed, it appears that many adverse consequences were anticipated and designed for.
- | Provisions and fuel were available for long periods of time.
- | It had a travel range of 5000 miles.
- | Seemingly every contingency had been prepared for...except the fatal mobility flaw.



Evaluation

The Last Penny

- | Two friends; a business major and an engineering major
- | The business major has an accounting project
- | The accounting sheets for the project of several hundred thousand dollars will not balance by two or three dollars




Evaluation

The Last Penny

- | The business student says: *"Don't worry it only a small percentage of the total."*
- | The engineering student says: *"It could be the result of two major errors that may compensated one another."*









Evaluation

Ethical Considerations



- "Solutions are not always black and white with regard to ethics, but shades of gray"
- Ethics Checklist
 - Is it legal?
 - Is it balanced?
 - How will it make me feel about myself?
 - Will it make me proud?


Evaluation

The Five P's

- Purpose
- Pride
- Patience
- Persistence
- Perspective







Evaluation




Purpose

- What is the objective for which you striving?
- Are you comfortable with that as your purpose?
- Does your purpose hold up when you look at yourself in the mirror?







Evaluation




Pride

- Can you take pride in the solution you have developed?
- Is there any false pride or self-doubt involved?

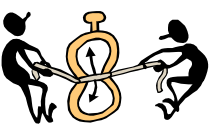





Evaluation




Patience

- Have you taken the time to think through all the ramifications of your solution?

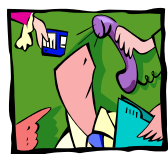





Evaluation



Persistence

- Are you sticking to your guns and not being dissuaded by other demands?
- Have you given up too soon on finding a solution that is fair and balanced?



Evaluation



Perspective

- Have you taken the time to focus inside yourself to be sure everything fits with your ideals and beliefs?
- How does the solution fit into the "Big Picture"?



End of Chapter 7

