



# Problem Solving Cases



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A Webinar for Faculty at University of Arkansas, Pine Bluff

April 16, 2020

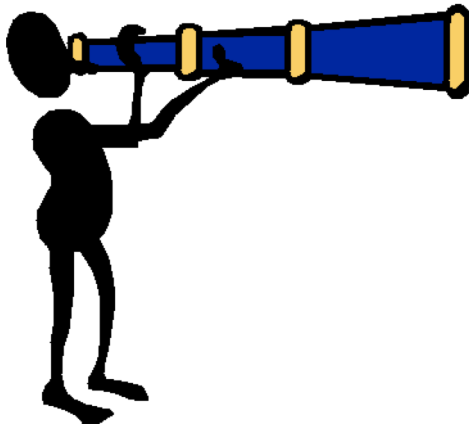
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"Assistance at A Distance"<sup>SM</sup>

# About Fred Nickols



  
**DISTANCE CONSULTING**  
*"Assistance at A Distance"<sup>SM</sup>*

# Overview



- A Little History (Dewey & Polya)
- Four Illustrative Cases
- Recap & Wrap Up
- My Contact Info
- Concluding Remarks

# Two Major Domains

## Mathematical Problem Solving

- George Polya (1945) *How to Solve It*

## Practical Problem Solving

- John Dewey (1910) *How We Think*

# John Dewey's Process (1910)



- The Occurrence of a Felt Difficulty
- Location & Definition of the Difficulty
- A Suggested Solution (An Idea)
- The Rational Elaboration of an Idea
- Corroboration of an Idea and a Concluding Belief (Acceptance or Rejection)

# The Flat Tire Problem

- Flat Tire on the Way to Work
  - It is 7:15 am
  - Important Meeting at 8:00 am



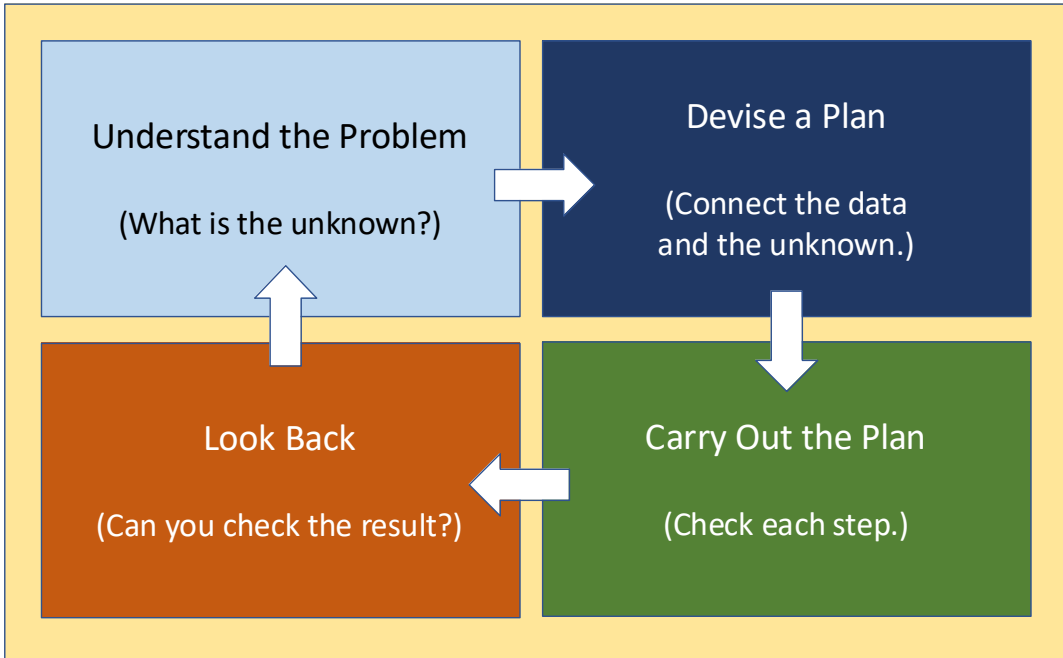
- Some Questions to Answer
  - What is the current state of affairs?
  - What is the desired state of affairs?
  - What are the limits on my actions?
  - What would produce the desired state of affairs?
  - What are my options?
  - Which option seems best?
  - How will I prove it worked?
  - How will I implement it?

# Flat Tire Information Matrix

What is the current state of affairs?	What is the desired state of affairs?	What are the limits on my actions?
My left rear tire went flat and I'll probably be late for work.	I arrive at work on time.	Time. I have 45 minutes before I'm supposed to be at work and 15 minutes of driving time left.
What is producing the current state of affairs?	What would produce the desired state of affairs?	What are my options?
The left rear tire is flat, making the car undrivable.	A way of getting to work on time.	Change the tire Hitch a ride Call a cab/Uber/Lyft Call AAA Call someone I know
Which option seems best?	How will I prove it worked?	How will I implement it?
Changing the tire.	I get to work on time.	Open the trunk Remove the spare tire Remove the lug wrench Remove the jack and handle Jack up the car Etc., etc., etc.

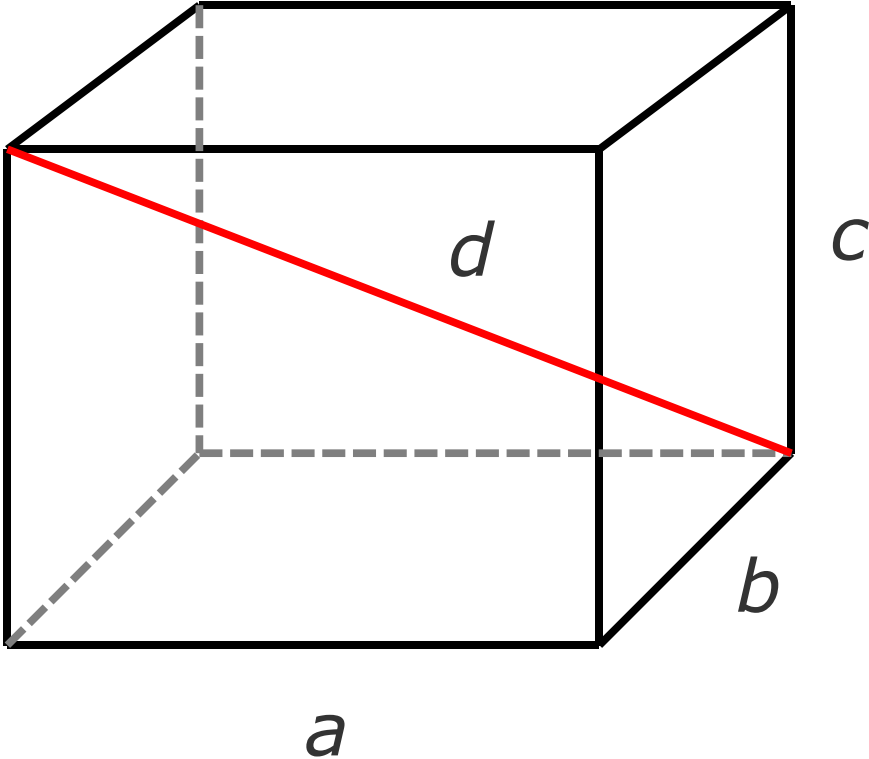


# George Polya's Process (1945)



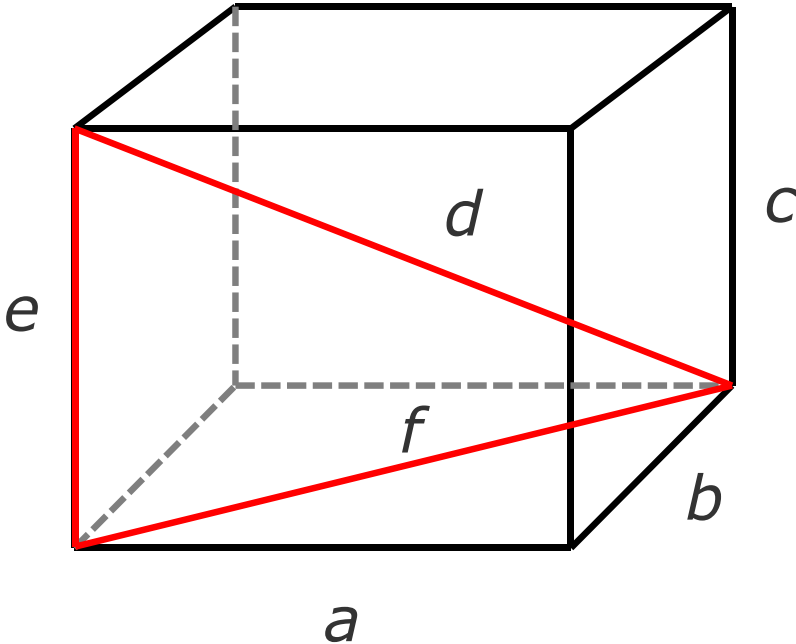


How do you find the Length of  $d$ ?

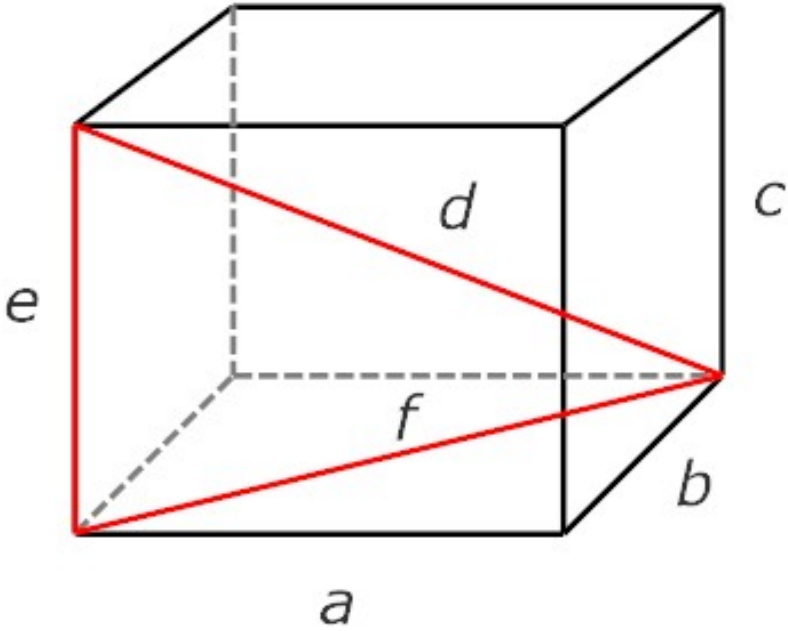


# To find the Length of $d$

- $d$  is the hypotenuse of a triangle with sides  $e$  and  $f$
- $f$  is also the hypotenuse of a triangle with sides  $a$  and  $b$
- Find  $f$  first and then use it to find  $d$



# The Length of $d$

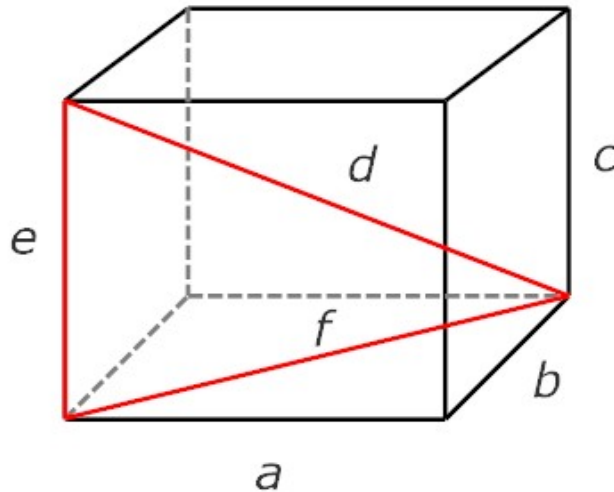


$$f = \sqrt{a^2 + b^2}$$

$$d = \sqrt{e^2 + f^2}$$



# Let's Do the Math



$$f = \sqrt{a^2 + b^2}$$

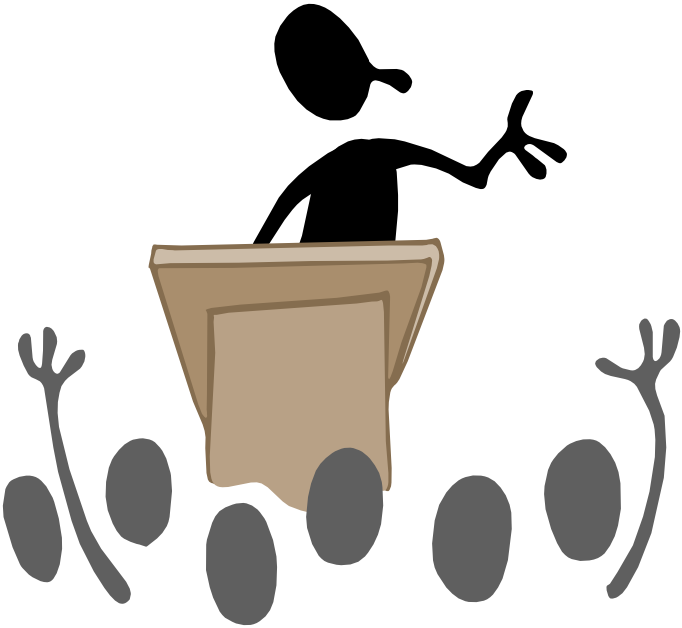
$$d = \sqrt{e^2 + f^2}$$

$$a = 4 \quad b = 3 \quad c = 3 \quad e = 3$$

$$f = 5 \quad d = 5.8309518948$$



# Questions?



# Case: The Reject Rate Problem



The Reject Rate is too high.

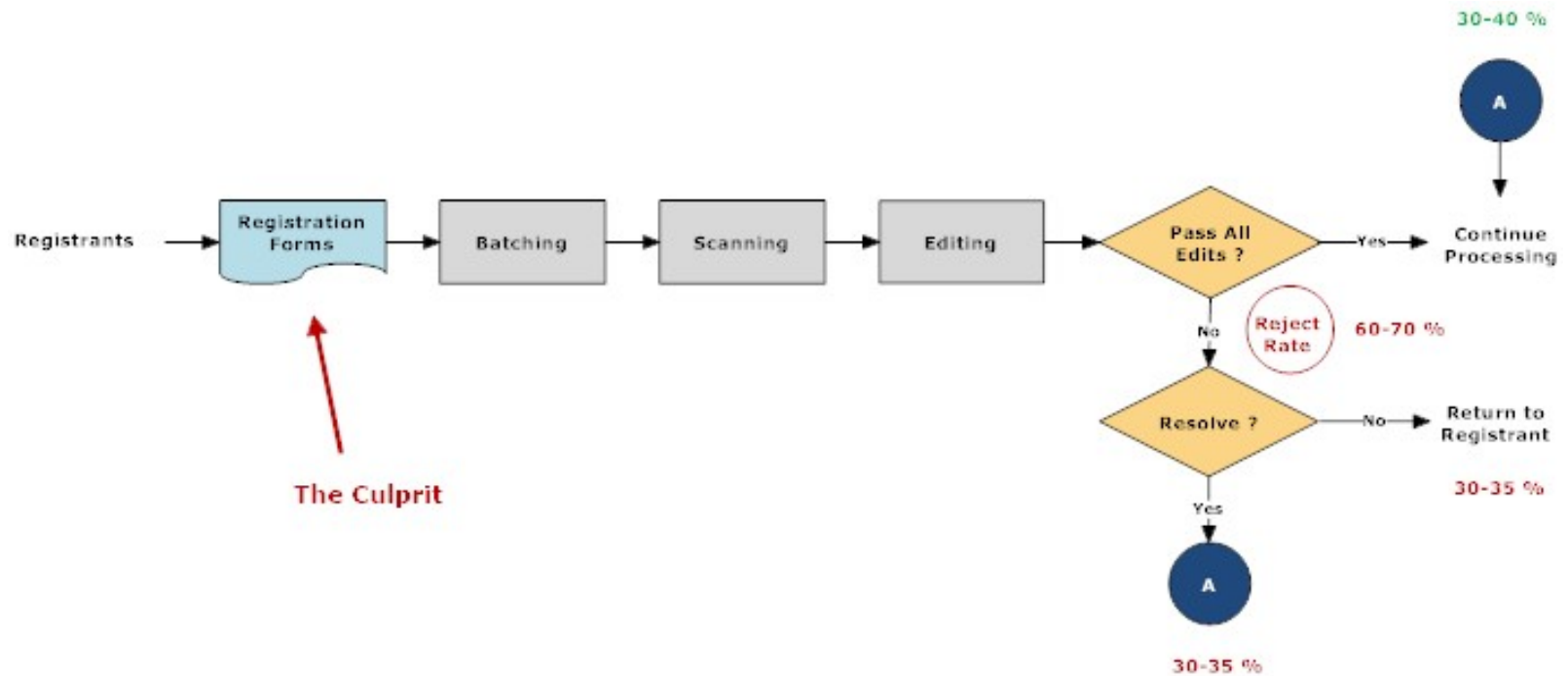


How low do you want it?



As low as you can get it.

# Registration Form Processing



# Two Questions



Why would they want to fill it out completely and correctly?



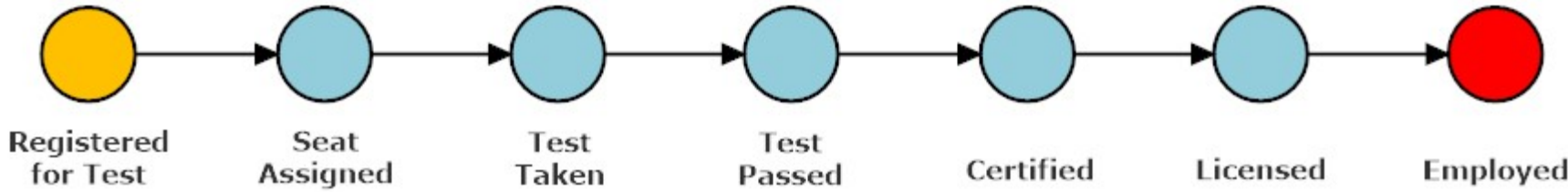
How would they know they did?



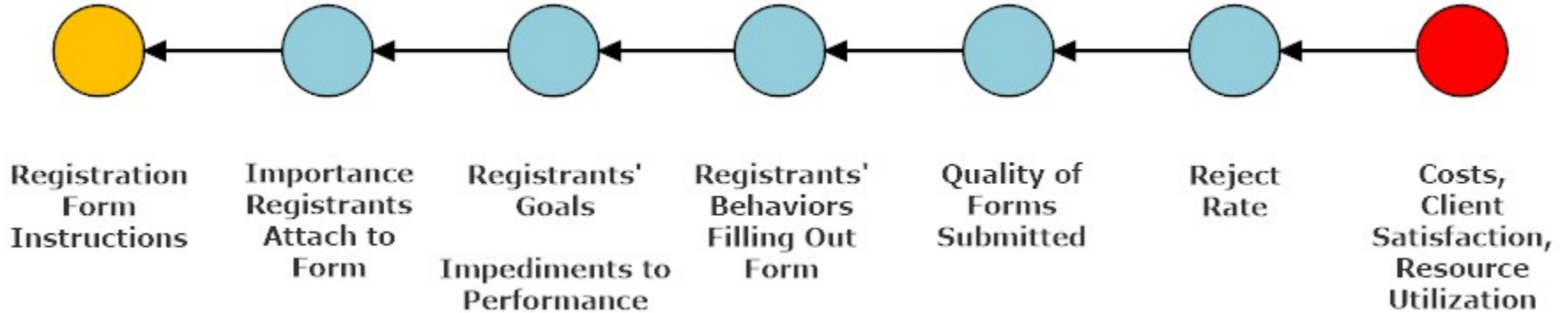
# Reject Rate Problem Structure



# Their Path to Employment



# My Path to the Solution

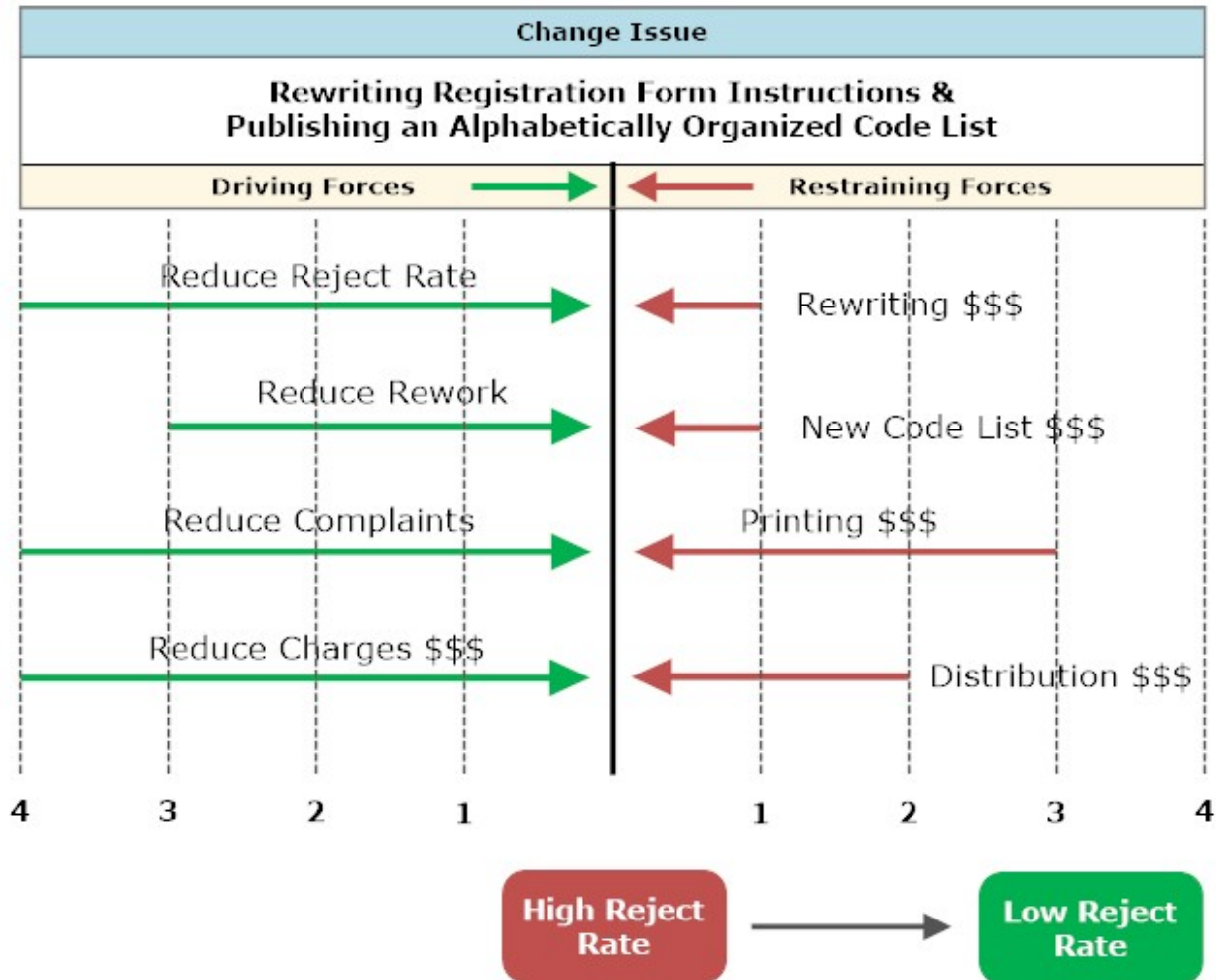


# Reject Rate Information Matrix

What is?	What should be?	What are my limits?
The registration form reject rate is unacceptably high. It runs from 65 to 70 percent.	The reject rate should be much, much lower.	I can only do what the program managers will approve.
What is producing the current state of affairs?	What will produce the desired results?	What are my options?
Uncaring sloppiness on the part of the registrants and an institutional code list that is numerically instead of alphabetically organized.	Rewritten instructions making clear the importance of properly filling out the registration form and a reorganized code list.	Do nothing. Modify the code list only Modify the instructions only Modify both the code list and the instructions
Which option seems best?	How will I prove it worked?	How will I implement it?
Modify both	Monitor the reject rate	Obtain program manager approval Rewrite and send out a new registration form Rewrite and send out a new code list

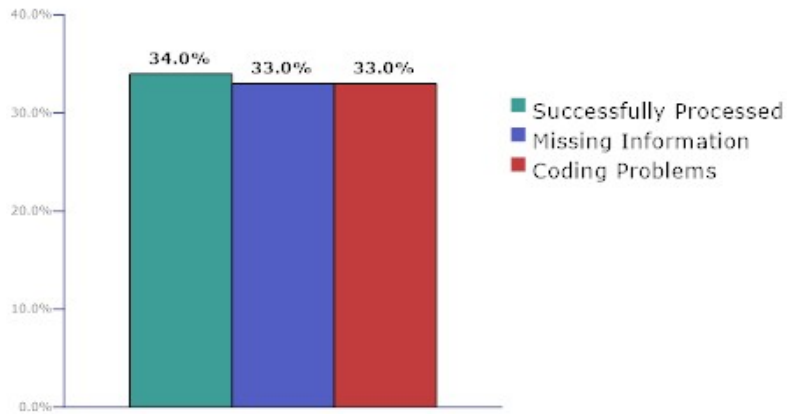


# Reject Rate Force-Field Analysis

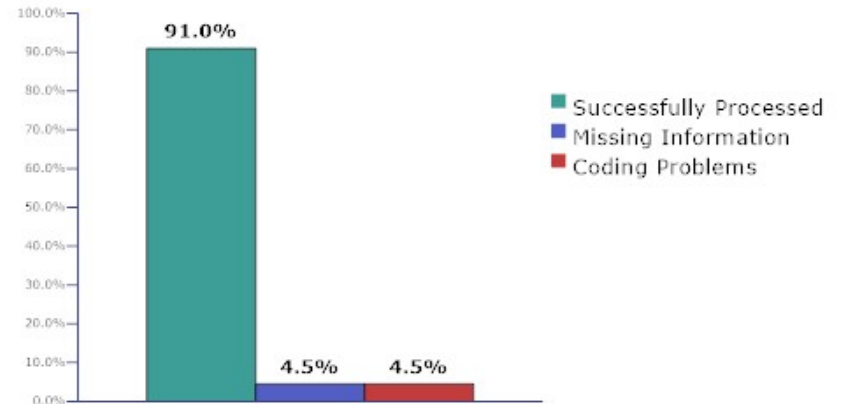


# Before and After

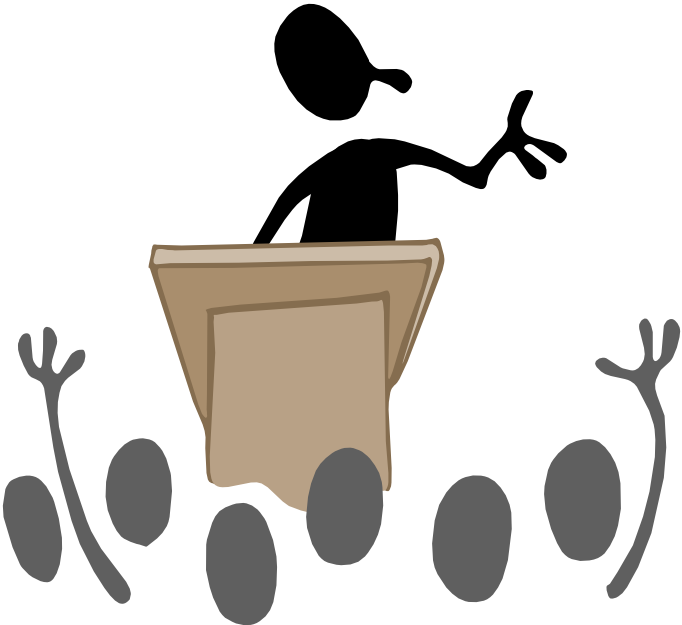
### Reject Rate (Before)



### Reject Rate (After)



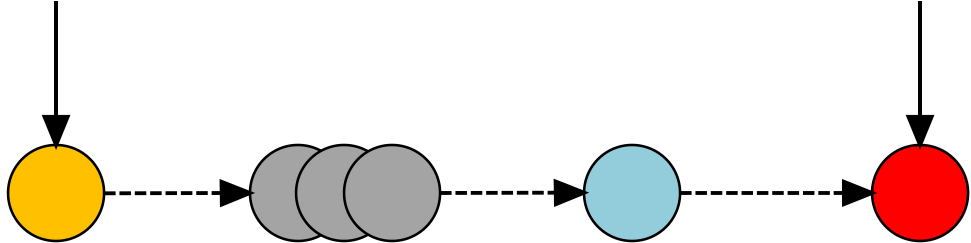
# Questions?



# Change is Indirect

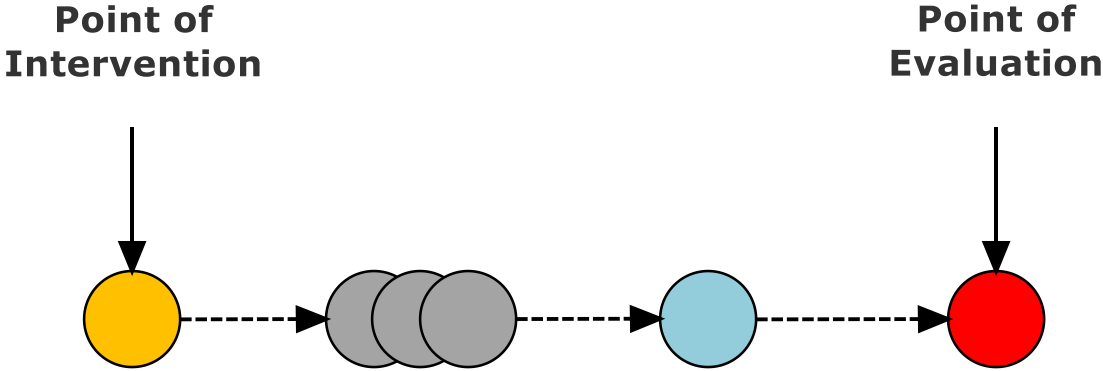
**You Change Things  
Over Here**

**To Get Results  
Over There**

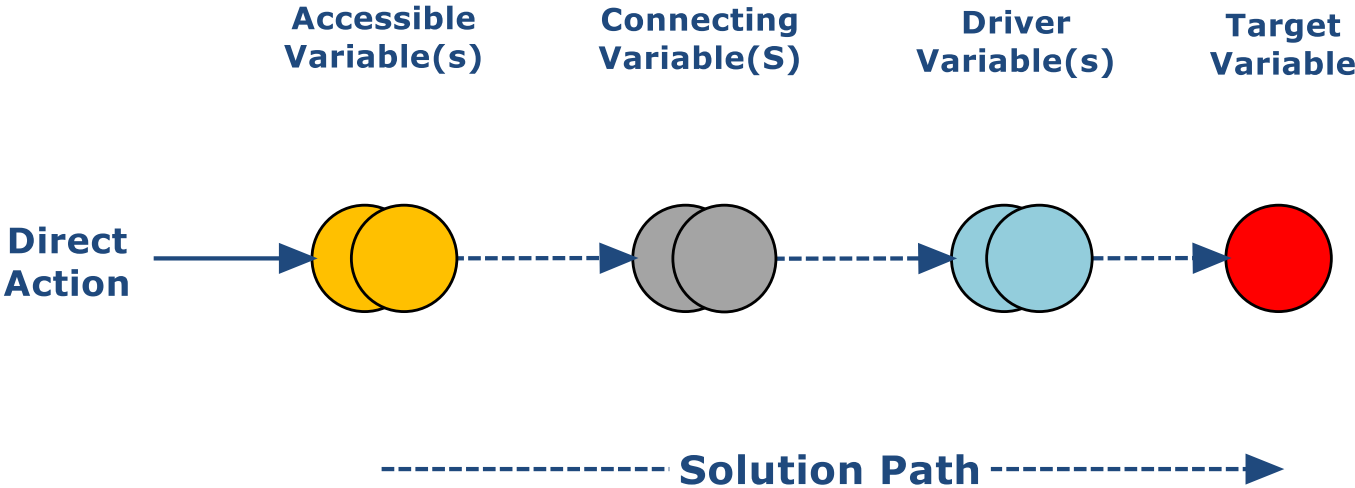




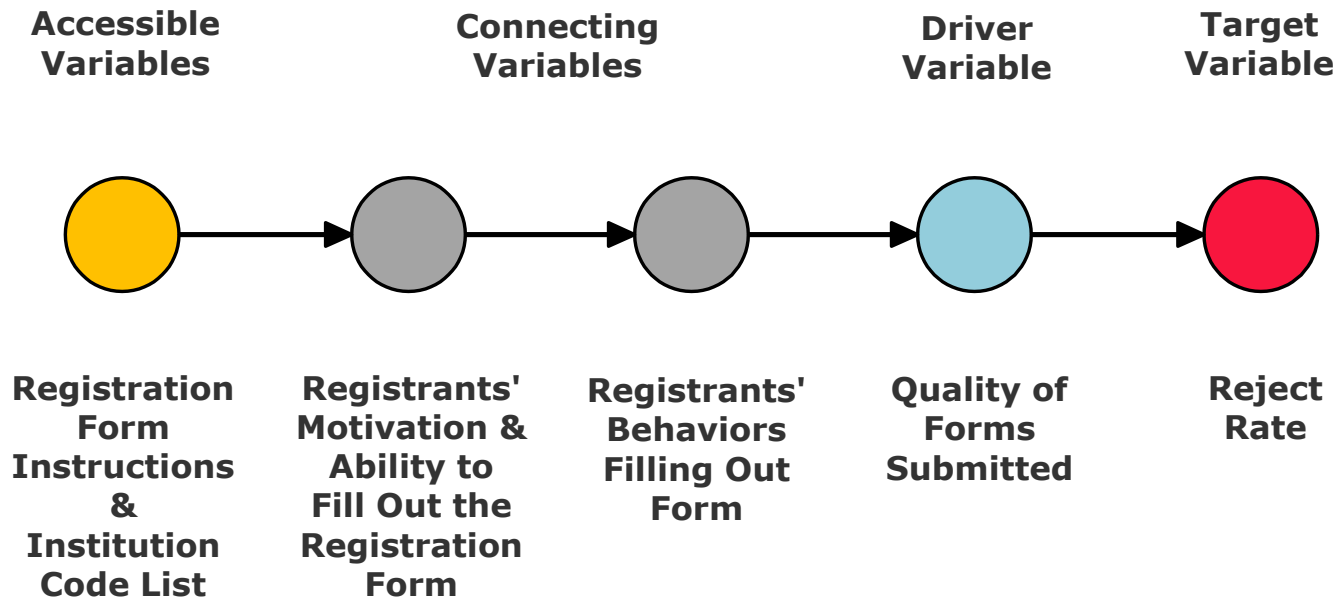
# Two Points



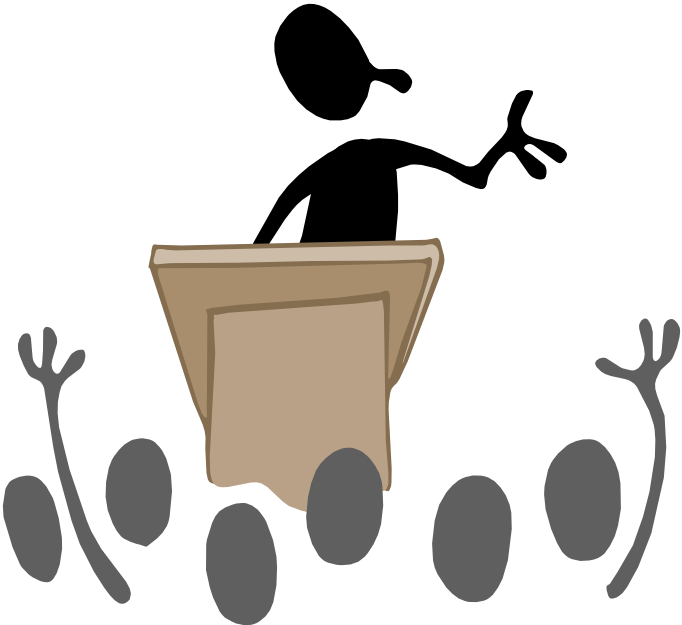
# Solution Path



# Reject Rate Solution Path



# Questions?



# The Load Rate Problem



NEWLY APPOINTED  
DIVISION DIRECTOR



MOVED INTO NEW  
BUILDING



A NEWLY ASSIGNED  
PROGRAM IN  
ADJACENT BUILDING

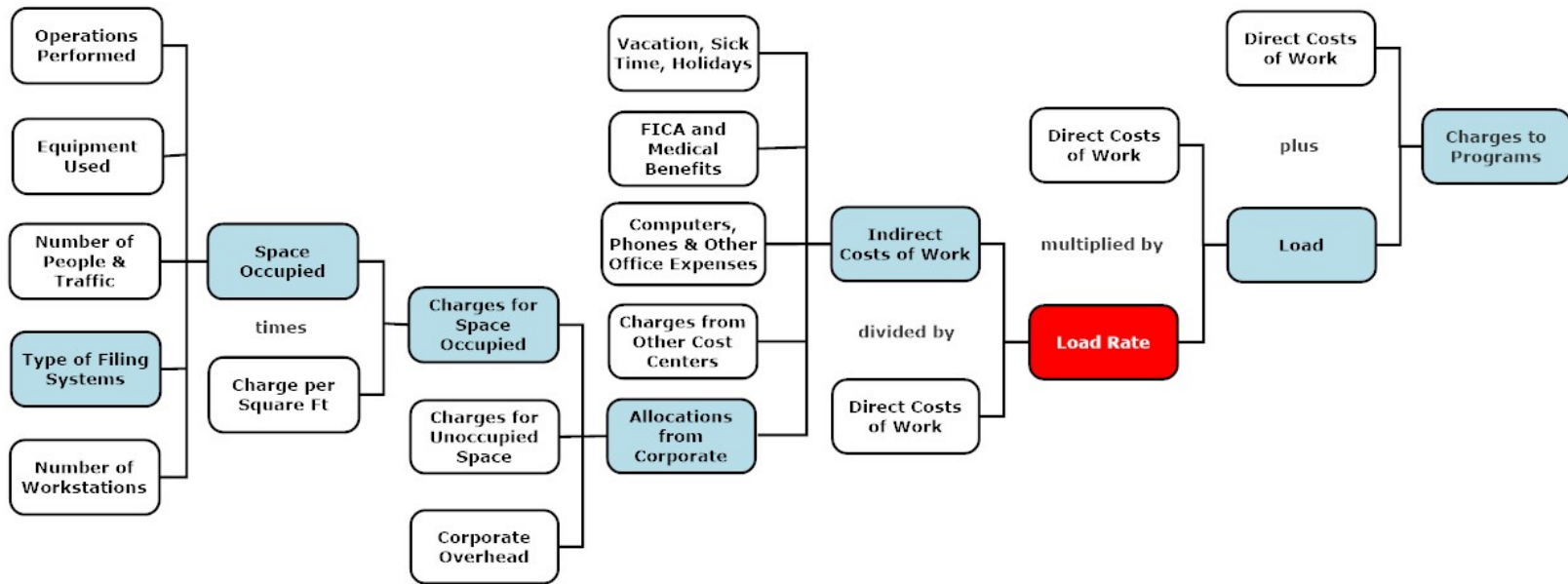


PROGRAM DIRECTORS  
BADGERING ME ABOUT  
"LOAD RATE"

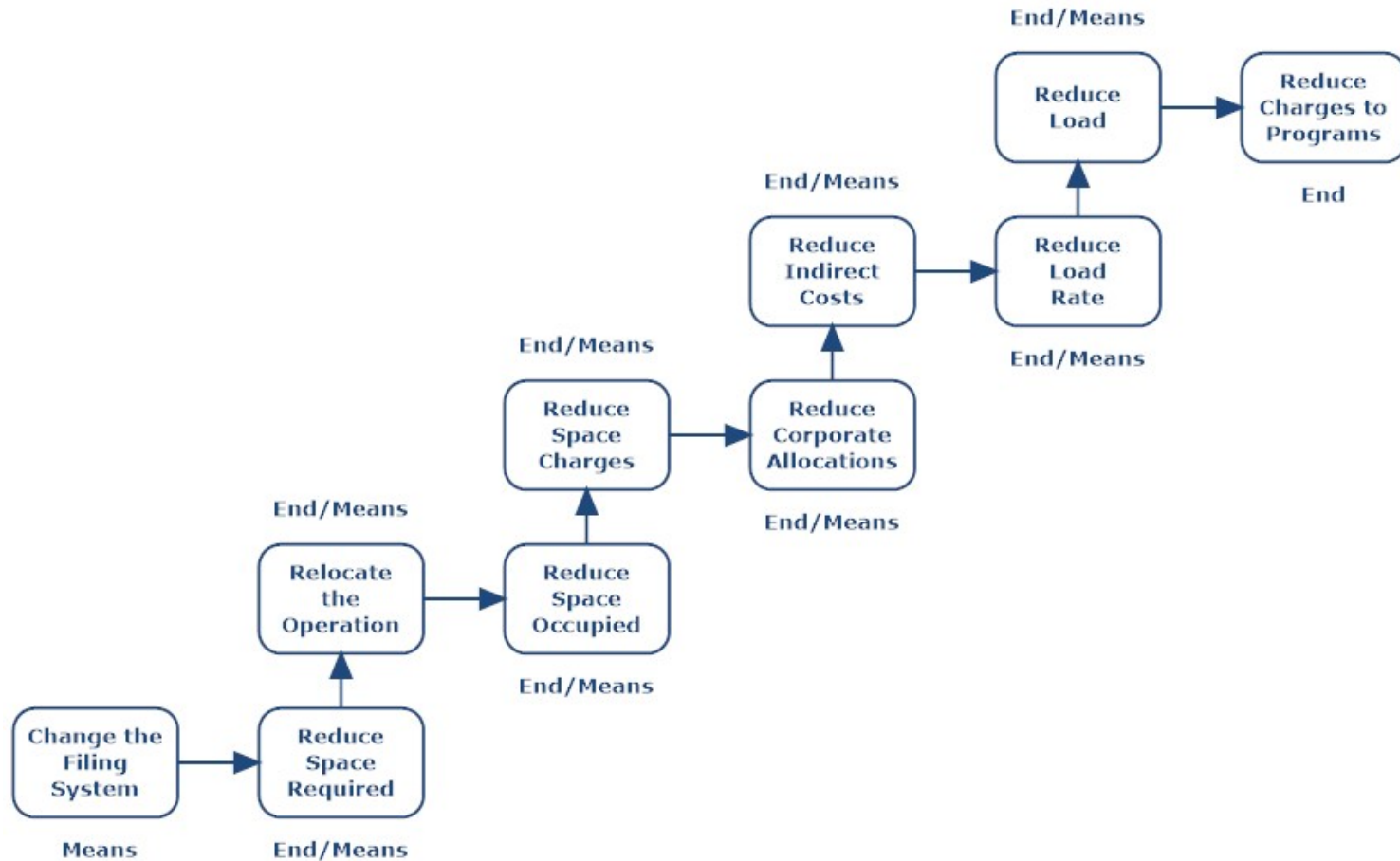


"DO SOMETHING!"

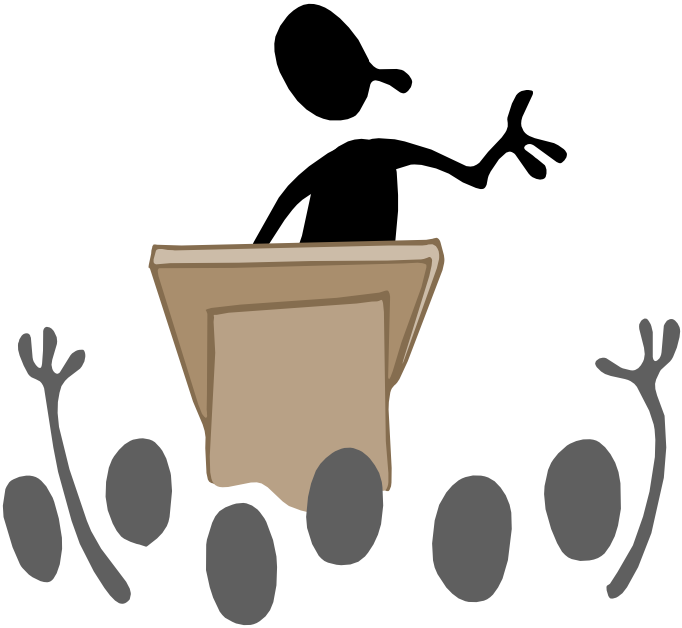
# Load Rate Solution Path



# Load Rate Means-Ends Hierarchy



# Questions?





# Test Center Staffing Problem

- My VP of Operations posed this problem to me:  
“Given a set of rooms of known or determinable capacity, some number of students to be tested, and guidelines for staffing the test center, is there an algorithm or systematic procedure that will allow you to determine the lowest staffing cost for any and all test administrations?”
- I replied, “Sure.”
- He asked, “What makes you so certain?”
- I replied, “There’s nothing ambiguous in what you just said.”
- He said, “Develop it.”



# A Moment of Insight



# Staffing Problem Structure

- Staffing Guidelines

- One Test Center Supervisor per Test Center
- One Room Supervisor per Room
- One Assistant Room Supervisor for every 35 students over 50 per room
- One Hall Proctor for every 4 rooms

- Illustrative Example

- 120 Test Takers
- Cafeteria (100 test takers)
- Several classrooms (50 per room)



# Two Staffing Solutions

- Minimum Number of Rooms

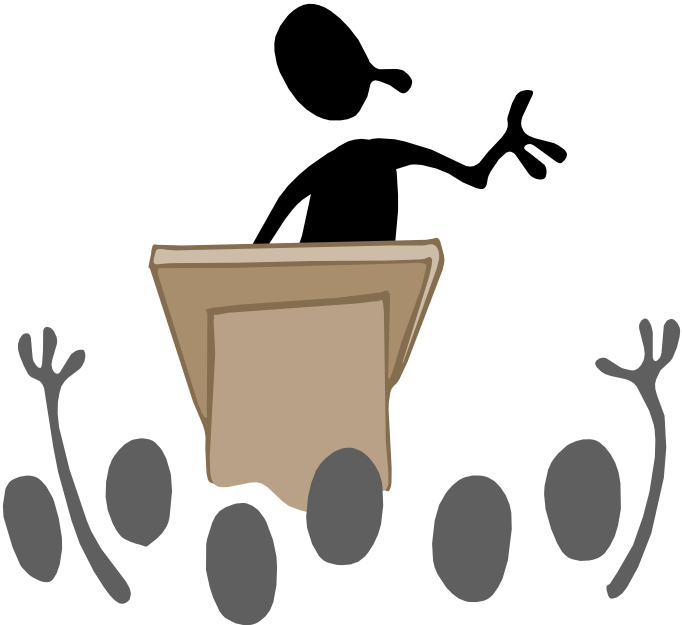
- 100 Students in Cafeteria
- 20 Students in a classroom
  
- 1 Test Center Supervisor
- 2 Room Supervisors
- 2 Assistant Room Supervisors
- 1 Hall Monitor

- Minimum Lines Crossed

- 85 Students in Cafeteria
- 35 Students in a classroom
  
- 1 Test Center Supervisor
- 2 Room Supervisors
- 1 Assistant Room Supervisor
- 1 Hall Monitor



# Questions?



# Closing Remarks



Covered several cases

Introduced "Solution Path"

Structure, Structure, Structure

Diagrams, Diagrams, Diagrams

Change, Change, Change

"AHA!"

Materials are already on the  
Assessment site

# Contact Information



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*"My Objective is to Help You Achieve Yours"*



# Concluding Remarks

Steve Lochmann

