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# Research Roadmaps - A Critical Part of your Plan for Research Success

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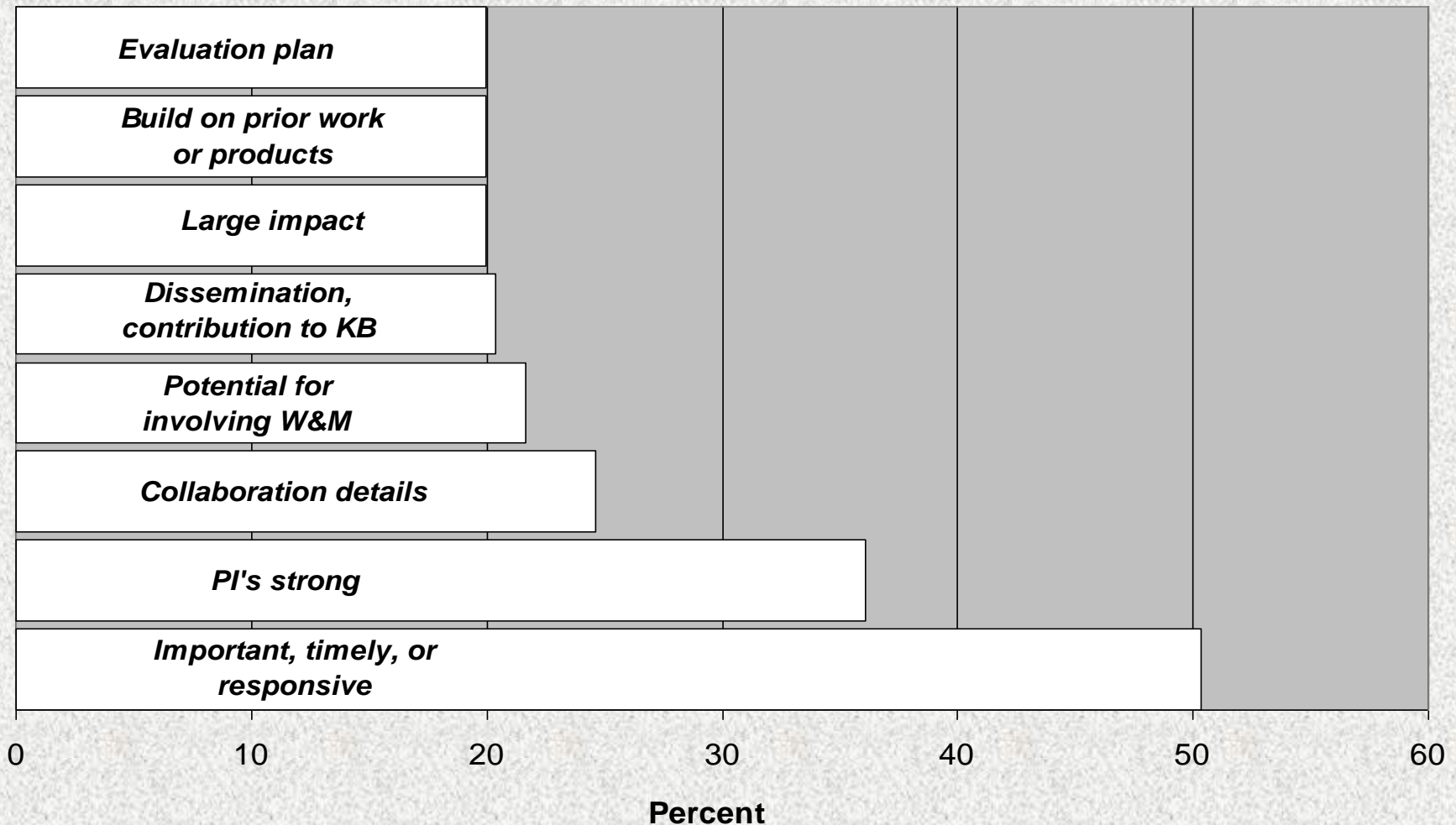
CEO, *PowerfulEducation* Technologies

US Presidential Award Recipient for Excellence in Mentoring Faculty & Students

# Most Common Strengths

*\*developed by NSF DUE Program Officers in 2008*

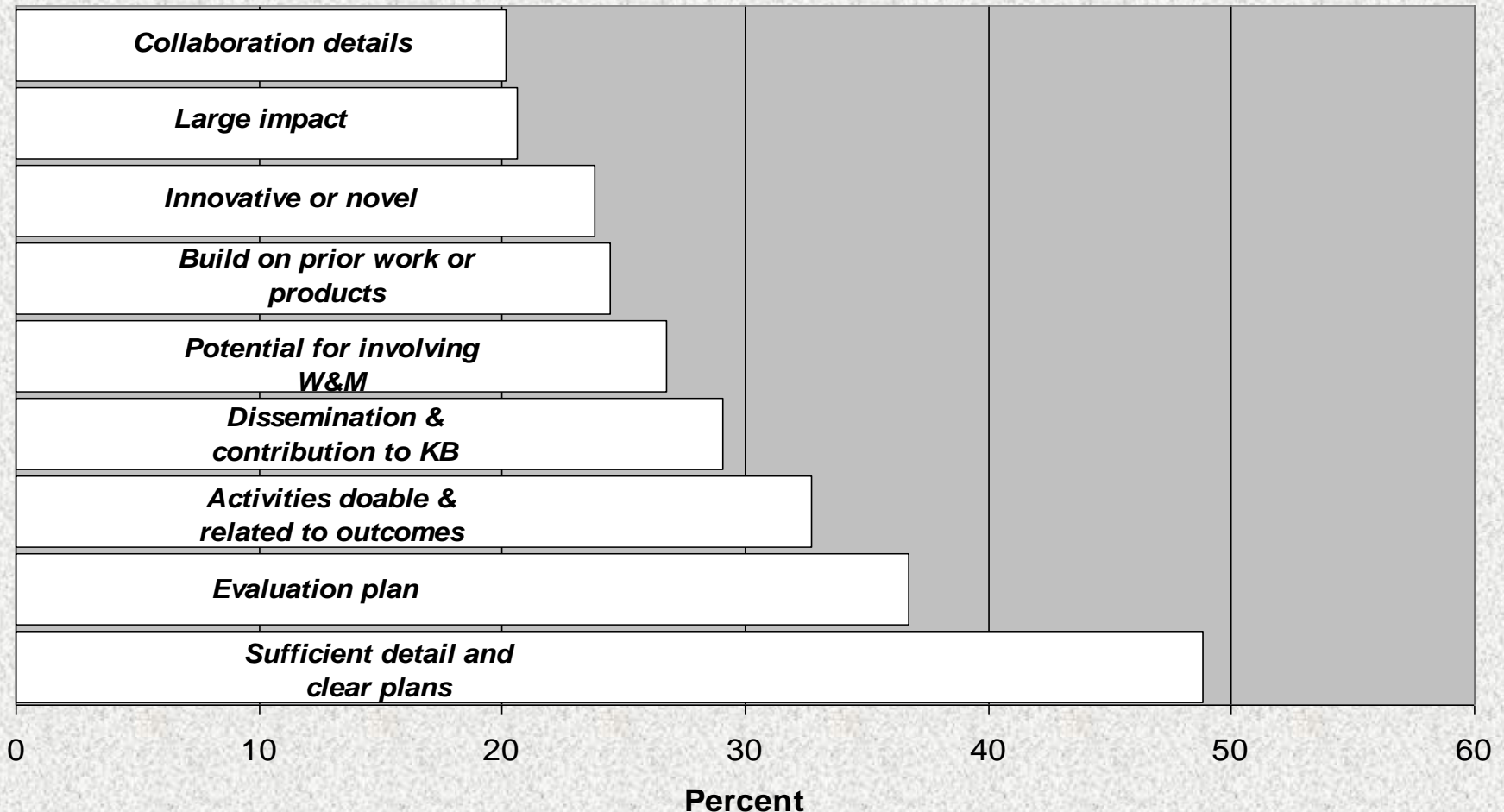
## Strengths Cited in More Than 20 % of the Panel Summaries



# Most Common Weaknesses

*\*developed by NSF DUE Program Officers in 2008*

## Weaknesses Cited in More Than 20 % of the Panel Summaries



# What makes a proposal Competitive?

- Likely high impact
- New and original ideas
- Succinct, focused project plan
- Knowledge of subject area of published, relevant work
- Experience in essential methodology
- Clarity concerning future direction
- Sound scientific rationale
- Realistic amount of work
- Sufficient Detail
- Critical Approach/sound plan of implementation

# The World of Research



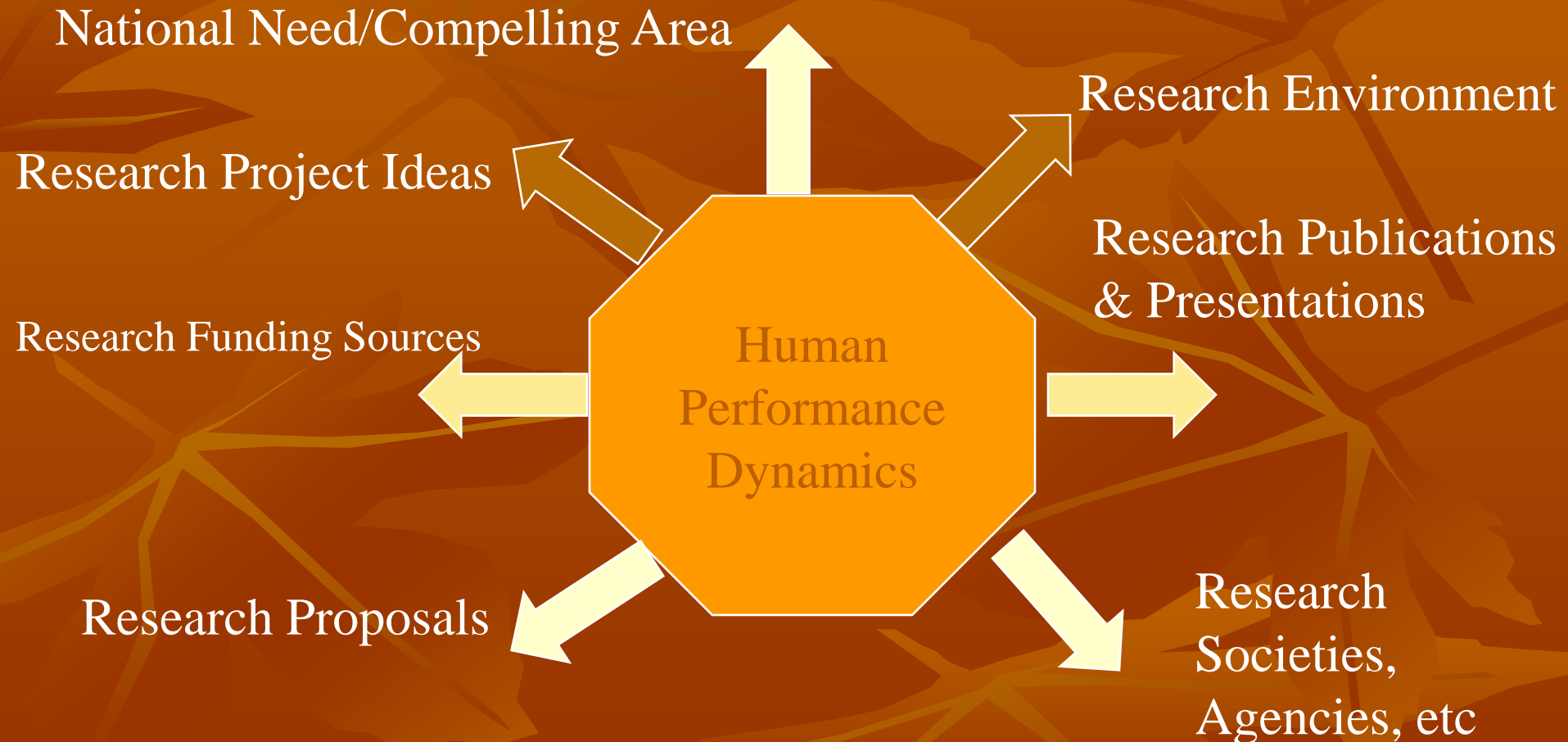
How do I get there from here ?



# Successful Research Efforts

- Develop Research Program Areas
- Develop A Research Roadmap
- Identify Funding Agencies
  - Plan for approaching Agencies
  - Identify Deadlines for submission
  - Determine Formats needed for submission
- Develop Research Infrastructure
  - Personnel, Students, Equipment, Surveys, Test Subjects, etc
- Develop Publication Plan
- Develop Presentation Plan

# Research Program





# The World of Research



The Strategic Journey

# What is a Research Roadmap ?

- Research Plan
- Critical Path
- Blueprint
- Timeline



# Why is a Research Roadmap Needed ?

- To Effectively Manage Resources
  - Talent, Time, Energy, etc.
- To Provide Daily Guidance
- To ensure that your long term goals are met
- To provide enhanced productivity
  - ( i.e. Efficiency)
- To provide “peace of mind”

# Primary Components of the Roadmap

- Compelling Problem/Area of National Need
- Research Vision
  - (SMART criteria)
- Research Areas of Priority
  - (SWOT analysis)
- Research Objectives to be pursued
  - (Important questions to be answered)
- Significance of Research Objectives
  - (What is the Value Added)

# Developing a Research Roadmap

N E E D	V I S I O n	A R E A	O B J E C T I V E	S I G N I F I C A N C E	M E T H O D	T I M E L I N E	F U N D I N G	P U B L I S H	P R I O R I T Y
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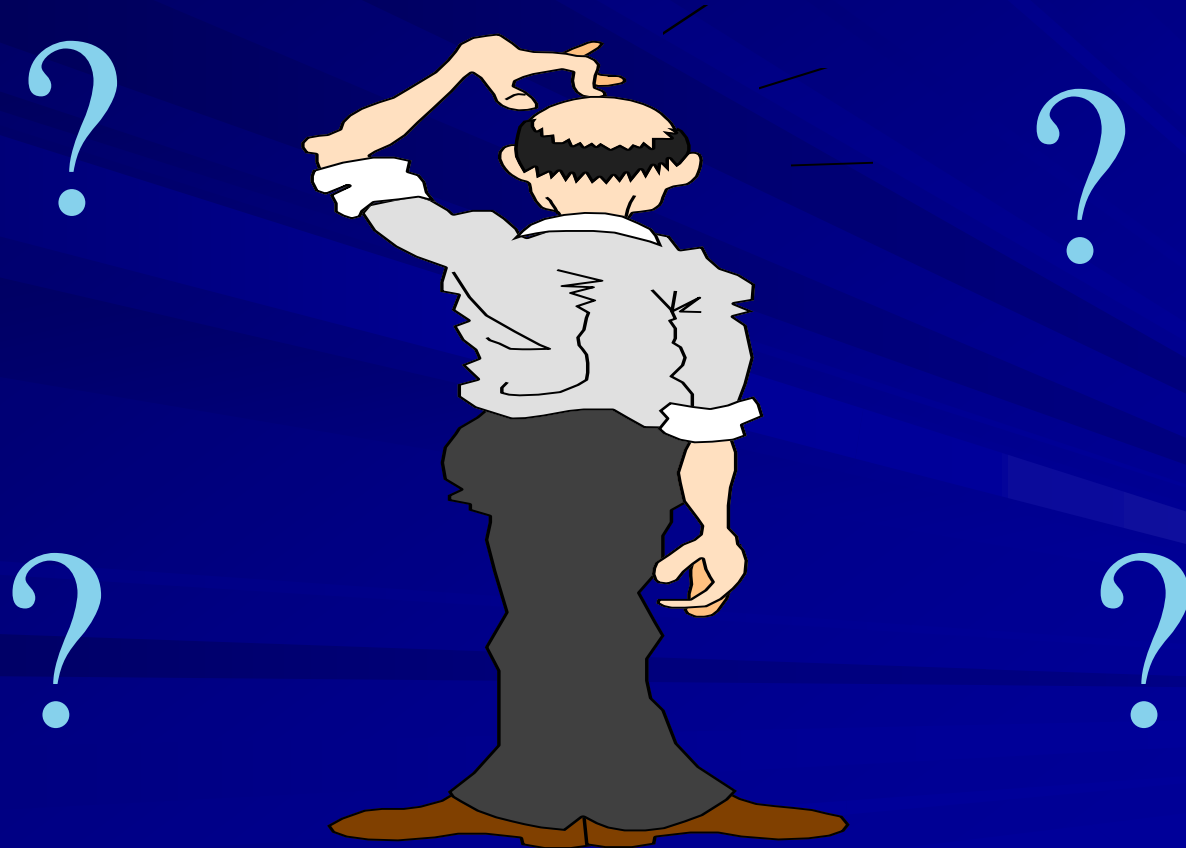
# Developing A Research Roadmap





# Step1: What National Area of Need/Compelling Area of Research Are You Interested in Working On???

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# Primary Components of the Roadmap

- **Compelling Problem/Area of National Need**
- Research Vision
  - (SMART criteria)
- Research Areas of Priority
  - (SWOT analysis)
- Research Objectives to be pursued
  - (Important questions to be answered)
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***Considerations for  
Compelling Research  
Ideas, Projects,  
Programs, Proposals***

**Benefit to  
Societal  
Advancement**

**Benefit to  
Human Health  
and Welfare**

**Benefit to US  
Competitiveness,  
Environment, Economy**

**Benefit to the Professional  
Discipline**

**Benefit to the Research Knowledge Base**

# Grand Challenges

Make solar  
energy  
economical



Manage the  
nitrogen  
cycle



Provide  
energy from  
fusion



# Grand Challenges

Provide access to clean water



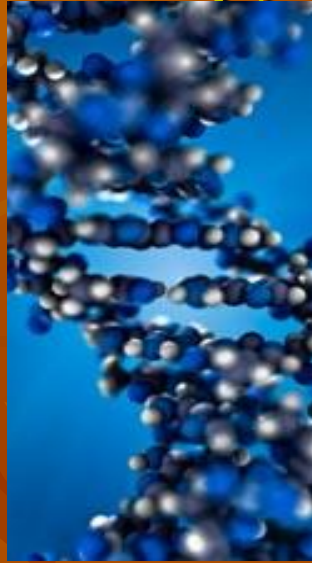
Advance health informatics



Restore and  
Improve  
Urban  
Infrastructure



# Grand Challenges



Engineer better  
medicines

Reverse-  
engineer  
the brain



Prevent  
nuclear  
terror



# Grand Challenges

Enhance  
virtual reality



Secure  
cyberspace

Engineer the  
tools  
of scientific  
discovery



Advance  
personalized  
learning



## Step 2: Identify your Research Vision



# Primary Components of the Roadmap

- Compelling Problem/Area of National Need
- **Research Vision**
  - (SMART criteria)
- Research Areas of Priority
  - (SWOT analysis)
- Research Objectives to be pursued
  - (Important questions to be answered)
- Significance of Research Objectives
  - (What is the Value Added)

# SMART Criteria

- S – Specific
- M- Measureable
- A- Ambitious/Achievable
- R- Relevant (Responds to a NEED)
- T- Time Defined

The background of the slide features a pattern of stylized, overlapping leaves in various shades of orange and brown, creating a textured, autumnal effect.

**The major societal problems that I am  
most interested in solving include:**

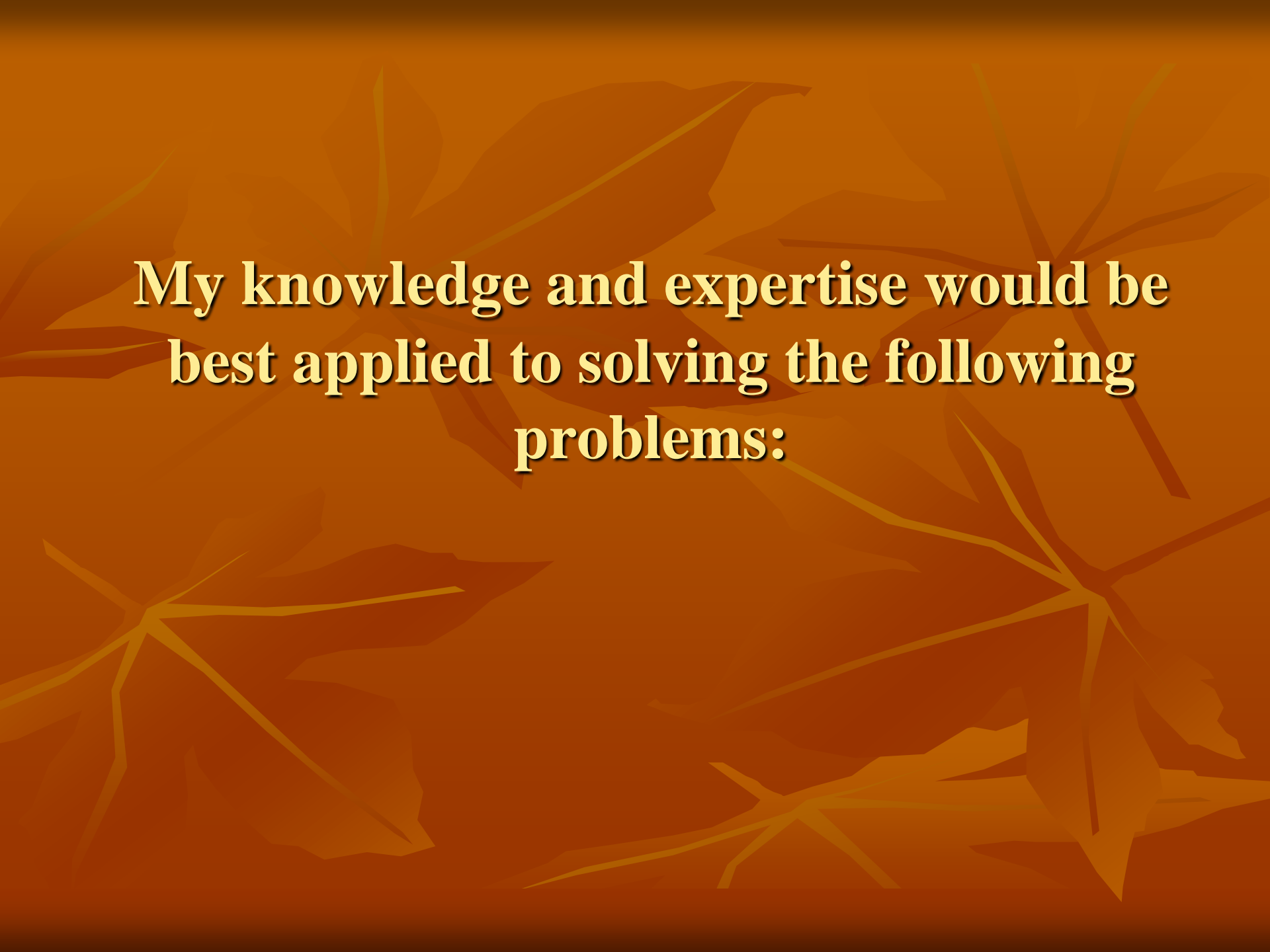


**Society would be a better place if the  
following were created:**





**My knowledge and expertise would be  
best  
applied to the following areas of study:**



**My knowledge and expertise would be  
best applied to solving the following  
problems:**



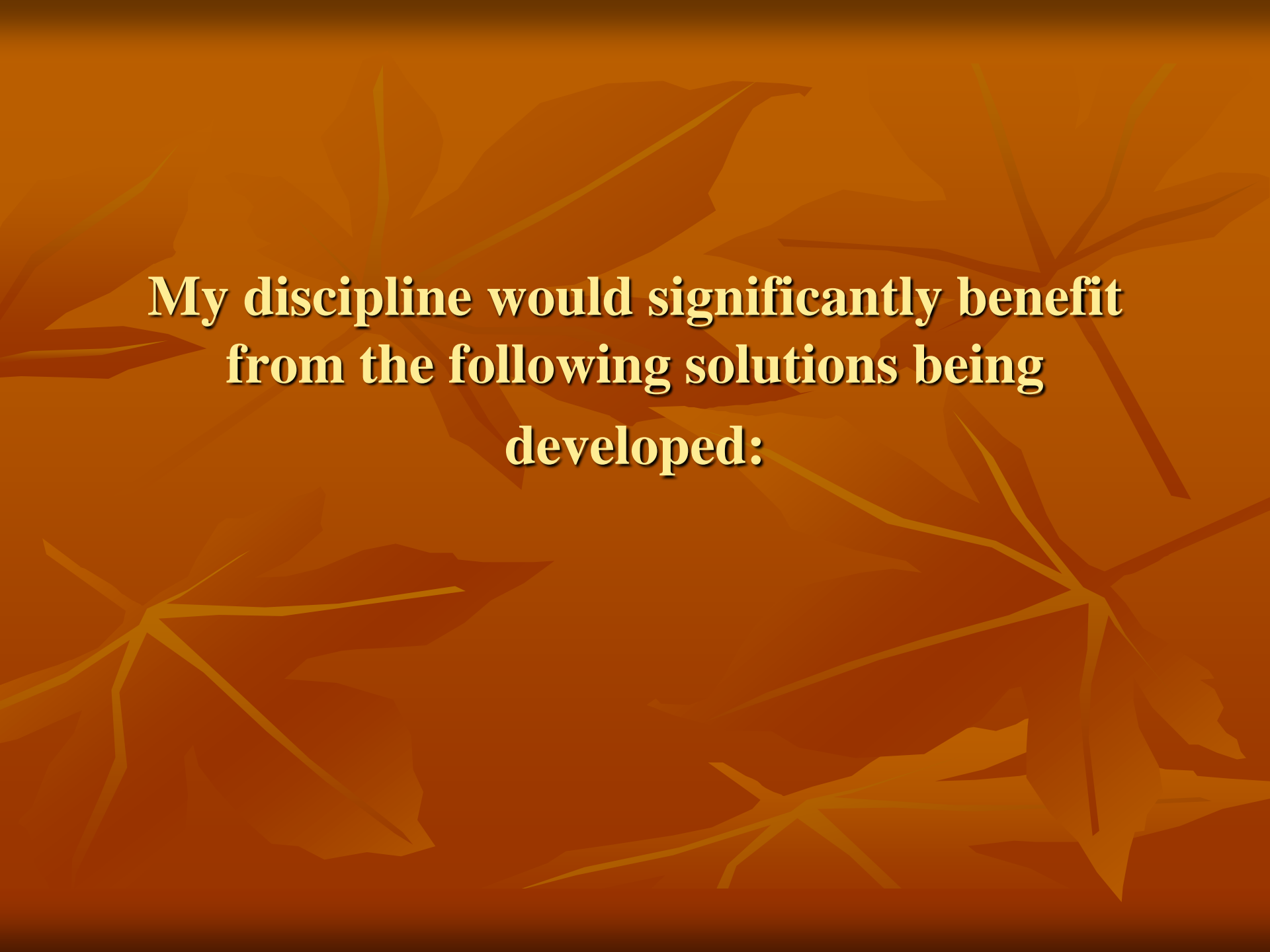
**Society would be a better place if the following solutions were implemented:**



**US Competitiveness Would Increase If  
the following were created or done:**



**My discipline would significantly  
benefit from the following creations:**



**My discipline would significantly benefit  
from the following solutions being  
developed:**





**The Grand Challenges that I am most  
interested in helping to address in our country  
are:**



**The ENVIRONMENT Would Increase  
BE BETTER If the following were  
created or done:**

## Step 3: Identify your Research Priority Areas to Pursue



# Primary Components of the Roadmap

- Compelling Problem/Area of National Need
- Research Vision
  - (SMART criteria)
- **Research Areas of Priority**
  - (SWOT analysis)
- Research Objectives to be pursued
  - (Important questions to be answered)
- Significance of Research Objectives
  - (What is the Value Added)

# SWOT Analysis-Research Domain

Goal Enhancers		Goal Inhibitors	
<b>S</b>	<ul style="list-style-type: none"><li>• _____</li><li>• _____</li><li>• _____</li><li>• _____</li></ul>	<b>W</b>	<ul style="list-style-type: none"><li>• _____</li><li>• _____</li><li>• _____</li><li>• _____</li></ul>
<b>O</b>	<ul style="list-style-type: none"><li>• _____</li><li>• _____</li><li>• _____</li><li>• _____</li></ul>	<b>T</b>	<ul style="list-style-type: none"><li>• _____</li><li>• _____</li><li>• _____</li><li>• _____</li></ul>

- **S**trengths: what are the advances/advantages of your current research or literature in the field.
- **W**eaknesses: what are the mistakes made or fruitless efforts of your current research or literature in the field.
- **O**pportunities: what are the new theories to be tried/what existing theories haven't been tried, etc
- **T**hreats: what circumstances/situations/hurdles exist that could inhibit the achievement of the research goals.

## Step 4: Identify the Research Objectives to Pursue



# Primary Components of the Roadmap

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- Research Objectives to be pursued
  - (Important questions to be answered)
  - What are you trying to accomplish
- Significance of Research Objectives
  - (What is the Value Added)
  - What will be the outcomes



# To formulate Objectives

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## ■ 3 Basic Types of Research

### – #1 Descriptive Research Study

- Typically provides general information about a certain factor
  - Ex. How many Americans buy Foreign vehicles?
  - Ex. Percentage of African-Americans young females that voted in the last presidential election

# To formulate Objectives

---

## ■ 3 Basic Types of Research

### – #2 Experimental Research Study

- Typically analyzes the effect of or the relationship of multiple variables
  - Ex. What is the impact of playing games on the fatigue level of humans
  - Ex. What is the affect of typing on the development of Carpal Tunnel Syndrome

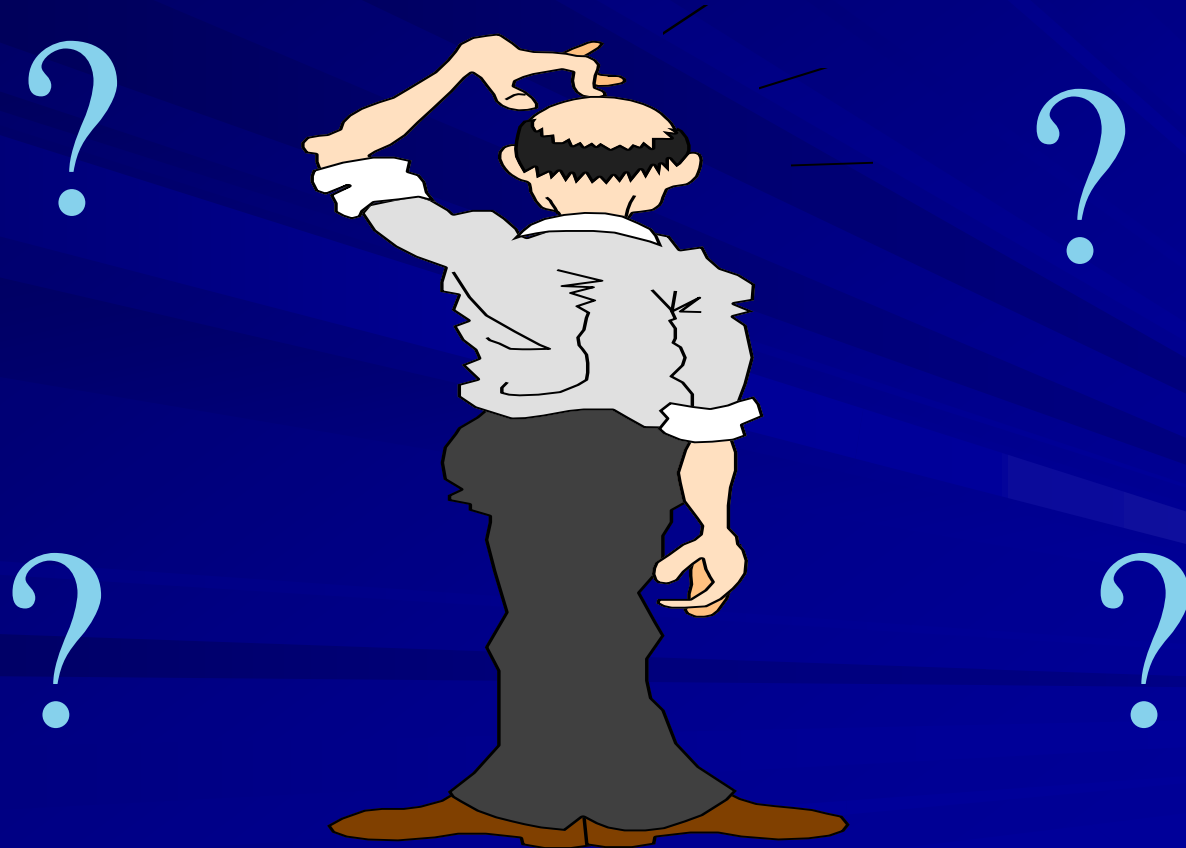
# To formulate Objectives

---

- 3 Basic Types of Research
  - #3 Evaluative Research Study
    - Typically provides an evaluation or assessment of a certain product, process, or phenomenon
      - Ex. How difficult is it to operate a cell phone?
      - Ex. What are the customer complaints associated with the Disney Fast Pass System?

# Step 5: Plan the Research Methodology to be used

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# *Primary Components of the Roadmap*

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- Research Methodology
  - (how will this be done?)
- Research Timeline
  - (how long will this take?)
- Research Funding Plan
  - (Do I need some money for this research?)
    - (Who will pay for this?)
    - (How much will it cost?)



# Write a Research Plan to Answer Key Questions

What has been done previously by others in this research area?

Why is your approach promising?

Why is the research goal and objectives to be pursued important?

What evidence supports that this is a good research idea to pursue?

} *Rationale*

How will the research study be conducted?

What research methods will be used?

What research variables will be tested?

What research equipment will be used?

What testing samples will be used?

} *Methodology*





# Write a Research Plan to Answer Key Questions

**What experimental design will be used?**

**What participant group will be used?**

**What control group or baseline testing measures will be used?**

**What data collection instruments will be used?**

**What data collection techniques will be used?**

**What data collection protocol will be used?**

**What data analysis techniques and approaches will be used?**

**What statistical analysis techniques will be used?**

**What timeline will be used for the research work?**

**What management strategy will be used oversee this research?**

**What major milestones will be met in the research and when will they be met?**



*Methodology***Y**



# Primary Components of A Research Roadmap

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- Publication Plan
  - (What aspect is publishable?)
  - (Where will I publish this work?)

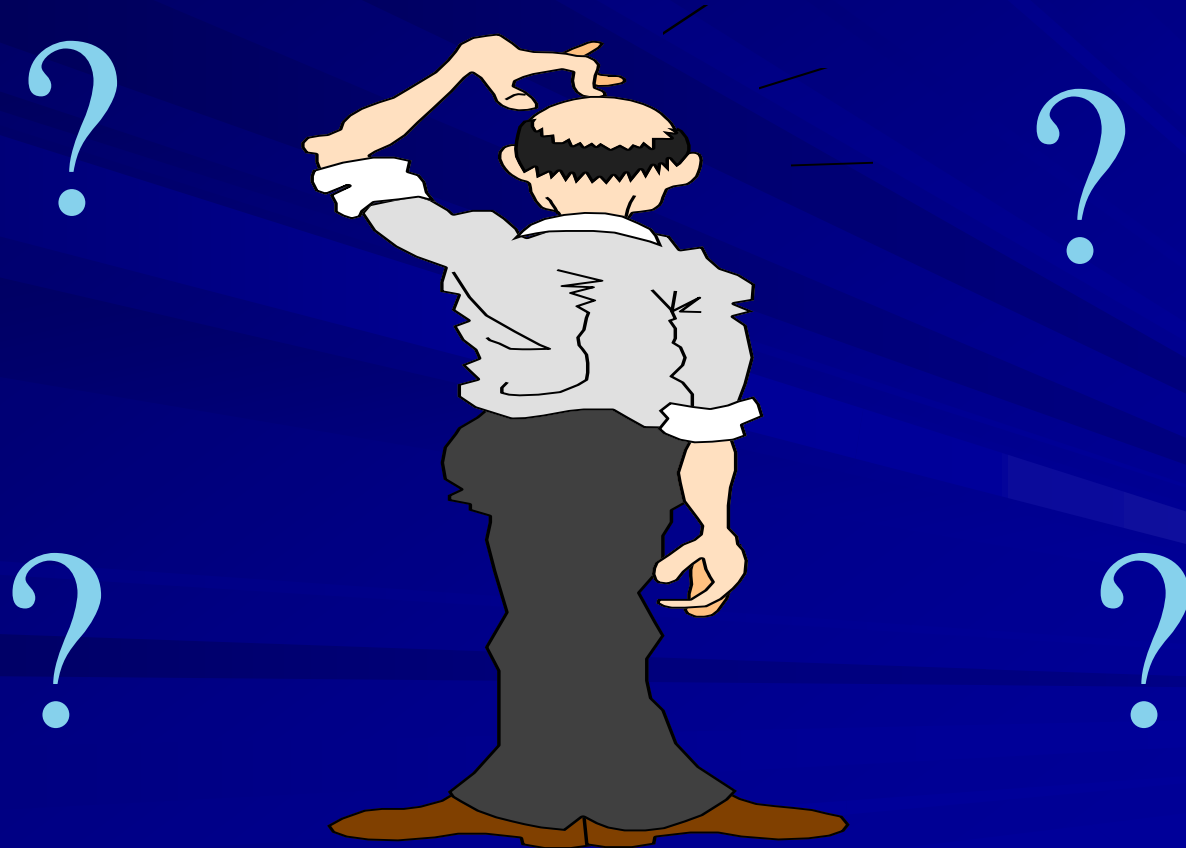
# Various Types of Publications

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- Conference Proceedings Publications
- Journal Publications
- (Content consideration –
  - literature reviews,
  - discussion of conceptual ideas,
  - description of designs, theories, policies, practices, etc
  - Project outcomes
  - Experimental results

# Additional Points to Ponder

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# *Strategy for Success*



Chase The Fat Rabbits

# *Strategy for Success*

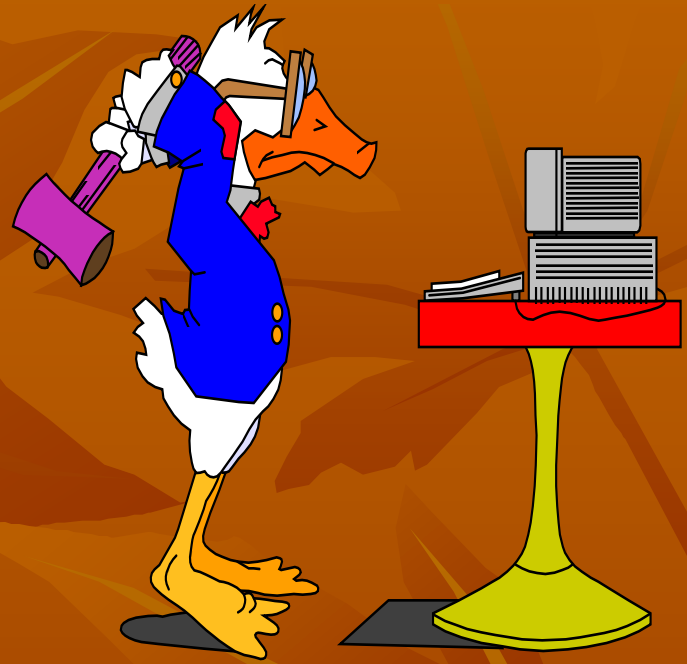


Decide if you Should RUSH-IT OR FLUSH-IT

# DEVELOP YOUR POWER PARTNERS



- **Collaborators**
- **Mentors**
- **Advocates for your Work**
- **Expert Reviewers**
- **Administrators**



**TURN the  
CRITIC OFF**



# INVEST IN LOW COST SUPPORT



# **Productive People Think and DO Things Differently**

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