



# A WORKSHOP ON

# K-CHART™:

# AN EFFECTIVE TOOL FOR

# RESEARCH PLANNING AND

# MANAGEMENT

**K&Q ANALYTICS SDN. BHD.**

Marketed & Managed by :

**EduXplore**

A TOTAL ACADEMIC AND RESEARCH  
SOLUTIONS PROVIDER

Name : \_\_\_\_\_  
Institution : \_\_\_\_\_

## ABOUT YOUR PRINCIPLE TRAINER (THE INNOVATOR OF K-CHART & SPAM)

Mohamad Khazani Abdullah obtained his B.Sc. and M.Sc. in Electr. Eng in USA, '90 and '93 respectively, and a Ph.D. in Physics from U.Malaya,'99. He was awarded the National Young Scientist award in 2001 for contributions in the field of optical fiber communications. His other recognitions include Best



Design-Asia Pacific, Pittsburgh, '04; Special Award, Brussels, '05 and several gold medals. He has published more than 270 articles, produced 13 PhD and 30 Masters graduates. His finding on Optical Amplifiers was reported in Photonics Spectra, a leading scientific magazine in the field of photonics. He has successfully filed 15 patents and commercialized various products and services including in international markets. Currently, he is the CEO at SIGTech, specializing in fiber optic and electronic products and services. He has established several spin-off companies focusing on different aspects of Innovation, Education and Technology. He also currently serves as an Adjunct Professor at the Faculty of Engineering, UNITEN and as an Industrial Advisor for several other universities. His current research interest is in Management of Technology focusing on Innovations. His latest works include RDCB Innovation Value Chains, PCMC Model, Spiral of Knowledge, K Chart and SPAM.

# MAIN OBJECTIVES

TO REVIEW THE FUNDAMENTAL ISSUES IN  
RESEARCH (THE INNOVATION VALUE CHAINS)

TO APPRECIATE THE BENEFITS OF KCHART  
FOR RESEARCH PLANNING AND  
MANAGEMENT

TO FAMILIARIZE WITH THE CONSTRUCTION  
OF KCHART

# SLOT 1:

## BACKGROUND: SOME FUNDAMENTAL ISSUES IN RESEARCH

1. What is research
2. Distinguishing Research from Development
3. Objective of Research (Spiral of Knowledge)
4. Types of research
5. Quality of research

# DEFINING RDCB

R

- Processes in Establishing Knowledge through the understanding of the behavior or properties of Systems/Phenomena/Techniques under Study

D

- Processes in constructing the research findings into usable solutions

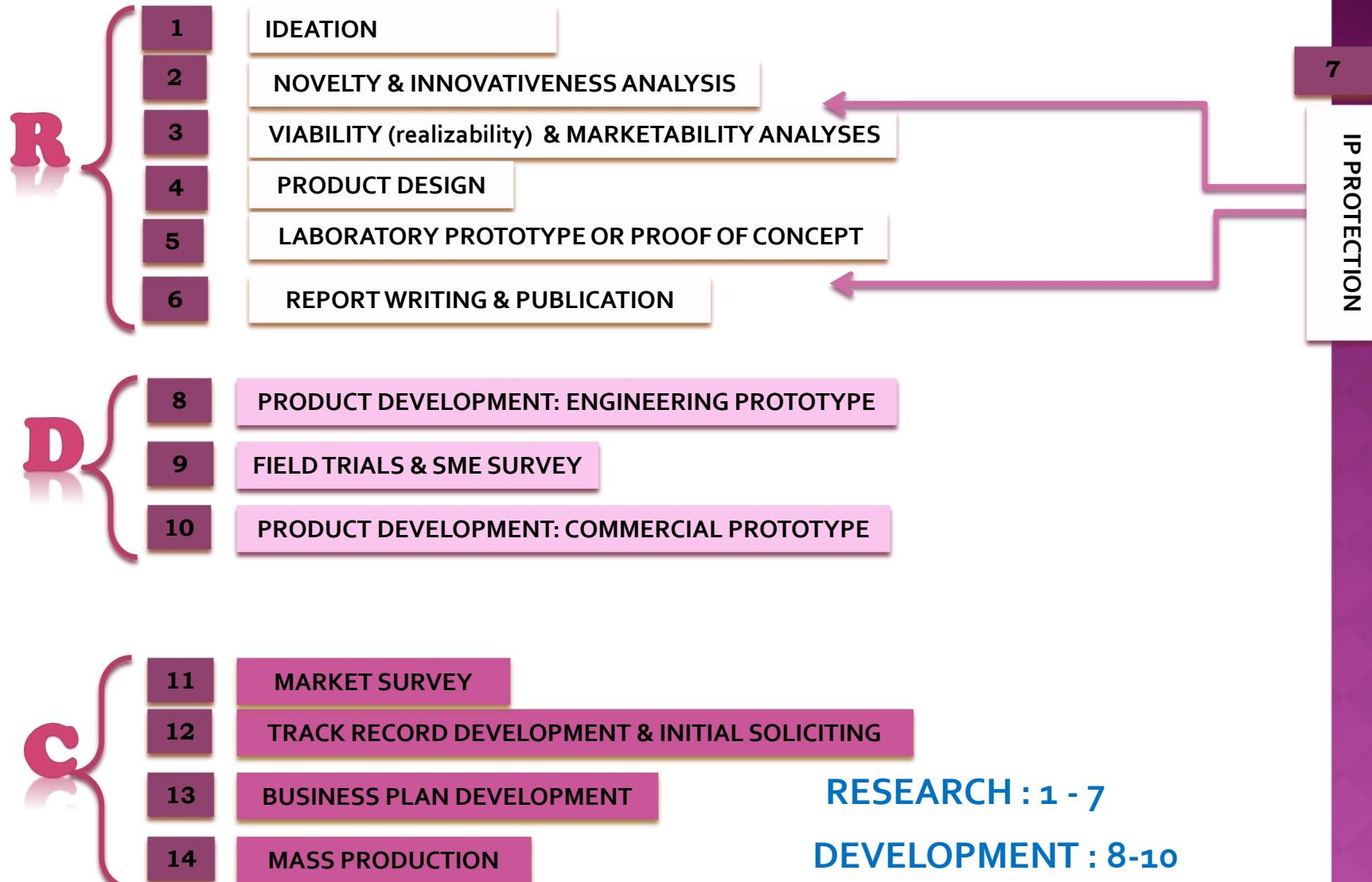
C

- Processes in taking a solution into the market

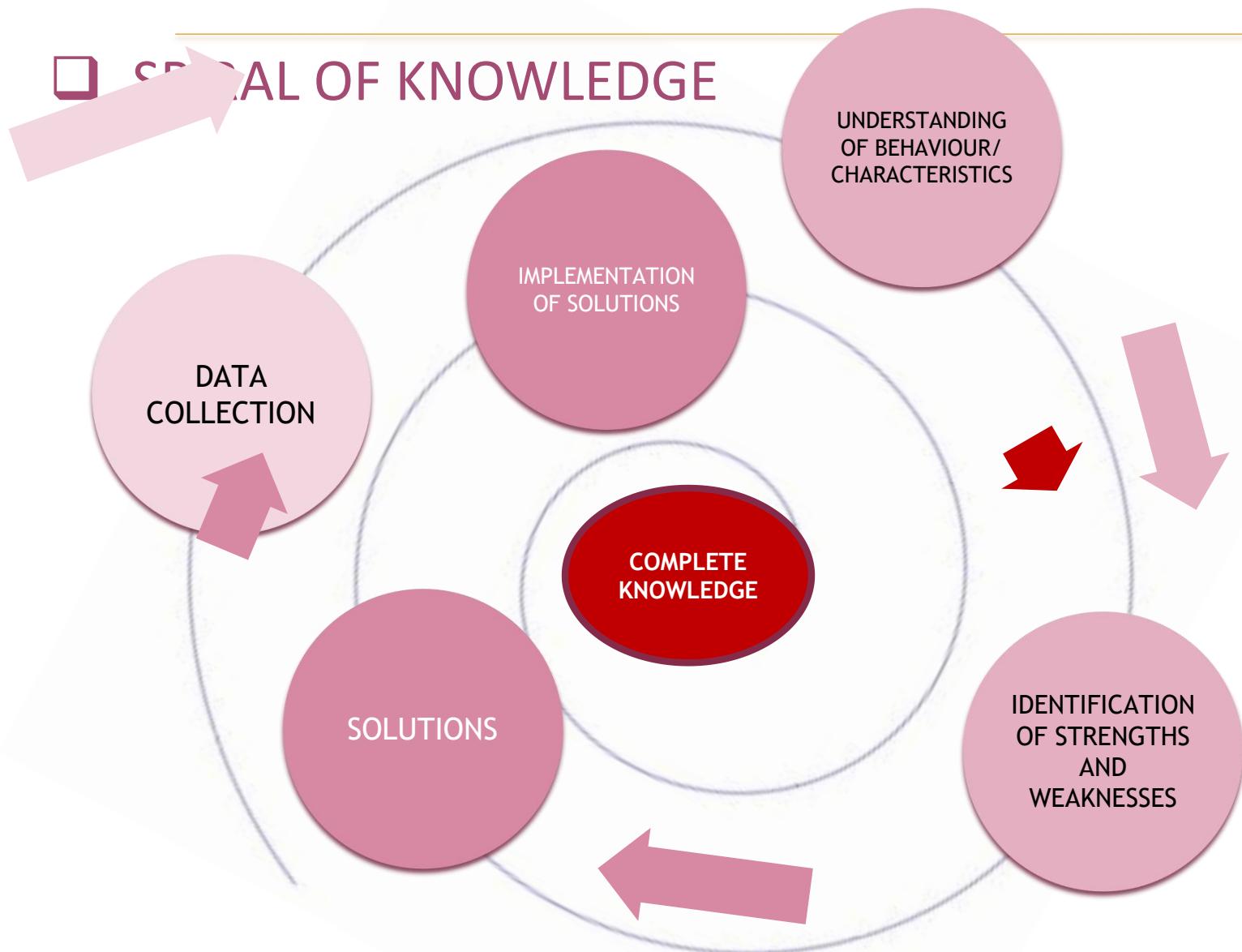
B

- Processes in sustaining the sales of the **solution profitably**

# THE RDC STAGES AND PROCESSES VERSION 1.1 (2012)



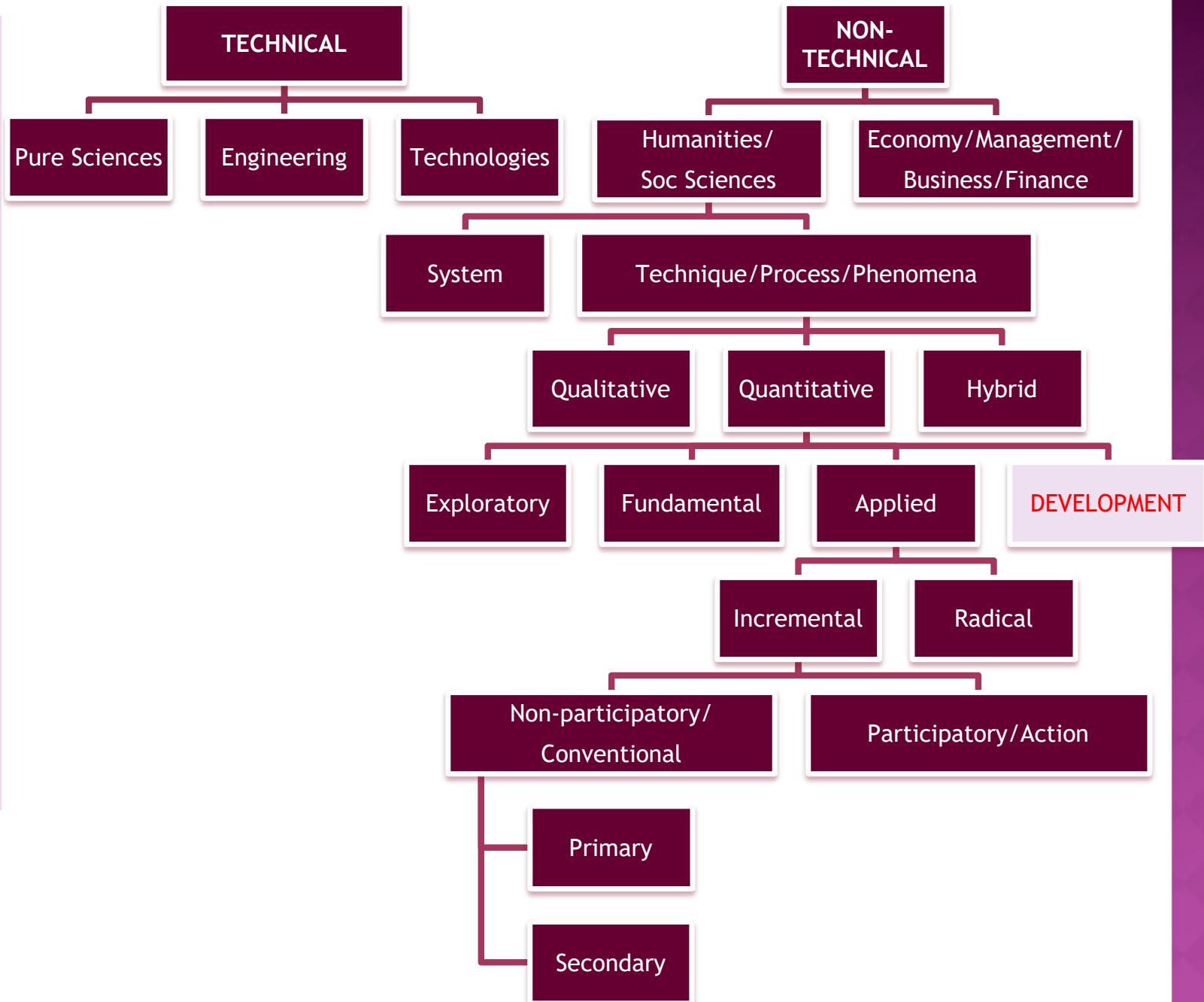
# LEVELS OF RESEARCH (OBJECTIVES)



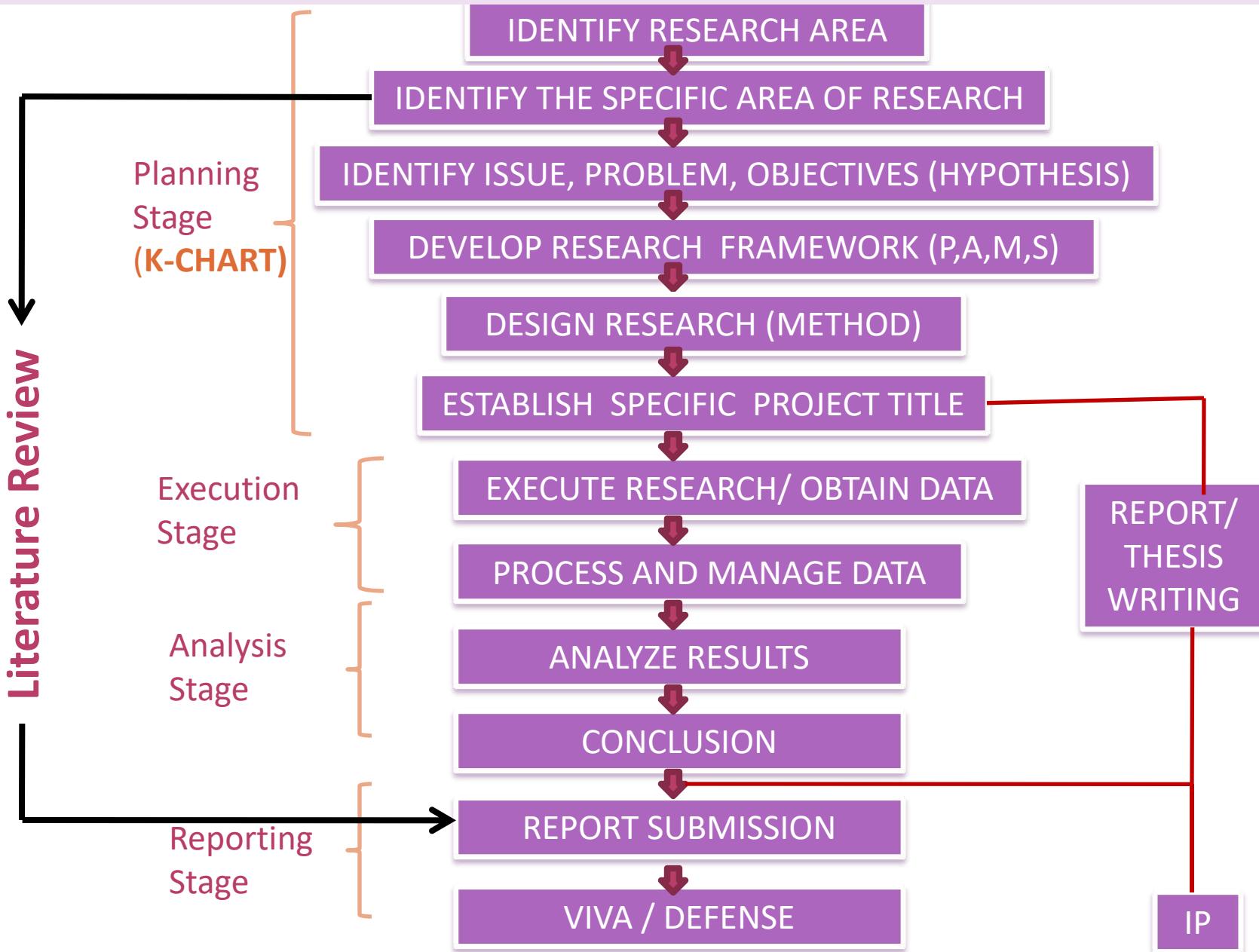
# EXAMPLES OF RESEARCH OBJECTIVES

OBJECTIVE	EXAMPLE	ANALYSIS
Collecting Data	Population/prevalence/frequency (of people, animals, plants, astronomical bodies, companies, diseases etc.)	DV is Population (number) IV is the type of subject Descriptive Analysis
	Trend/Pattern (geographical/spatial, temporal)	DV: Population (number) IV: Subject, Time, Place Descriptive, Relationship Anal.
Understanding/ Identification of Strengths & Weaknesses	Scoring/Indexing/ranking/rating (Innovation Capabilities, Economics-GDP, CPI, GPI, Productivity; Quality Index-Air, Water, etc.)	DV: Aggregated Parameter IV: Indicators, Parameters Descriptive, Relationship Anal., Factor Anal.
	Customer Satisfaction/ Loyalty	As above
Solution	to increase efficiency •Increase Productivity/Cost •Cost- materials, resources, time etc •Relates to quantity	DV: Performance Parameters IV: Design Parameters Causal Relationship Analysis, Comparative Analysis
	to increase effectiveness •Performance •Relates to quality	As above
Implementation	•To get real feedbacks and responses •To improve for the next	DV: Performance Parameters IV- Not important

# TYPES OF RESEARCH



# TYPICAL RESEARCH FLOW



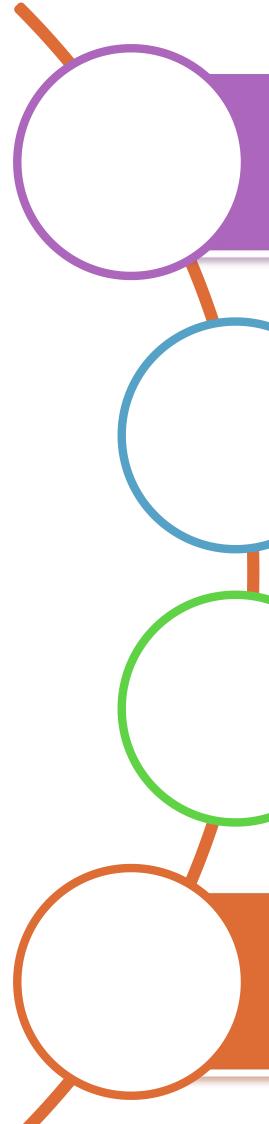
# SLOT 2:

## WHY K-CHART™?

### GRADUATE STUDY SCENARIO RESEARCH PROJECT SCENARIO

1. SCENARIO 1: GRADUATE STUDIES
2. SCENARIO 2: EMBARKING ON A RESEARCH PROJECT
3. QUESTIONS IN RESEARCH PLANNING
4. **STRUCTURE OF A K-CHART™**
5. BENEFITS OF K CHART IN RESEARCH PLANNING & MANAGEMENT
6. EXAMPLES FROM THE K CHART FOR VEHICLE

# SCENARIO 1: GRADUATE STUDIES



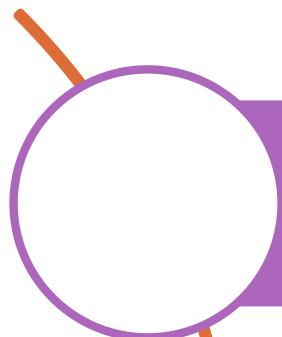
You just started your graduate study. You are looking for a title.  
Your supervisor is always busy.

You pick up and photocopy every single article you come across, only to sleep on it than to read it through.

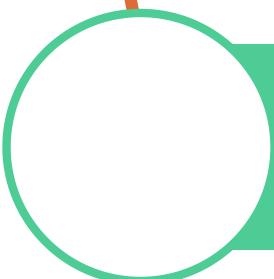
Even when you do finish an article, it's like reading Gibberish.  
You don't know what to get from the paper.

You keep asking yourself; What exactly am I working on? How much should I read? What should be my methodology? How many results should I have? How do I get a novelty?

# SCENARIO 2: EMBARKING ON A RESEARCH PROJECT



You are about to embark on a research project. You face a hard time identifying the **scope** of research and **specific problems** to solve.



You are planning to have co-researchers/ students, but **organizing and coordinating** them are not a piece of cake. You want them to work together, not to scream at each other.



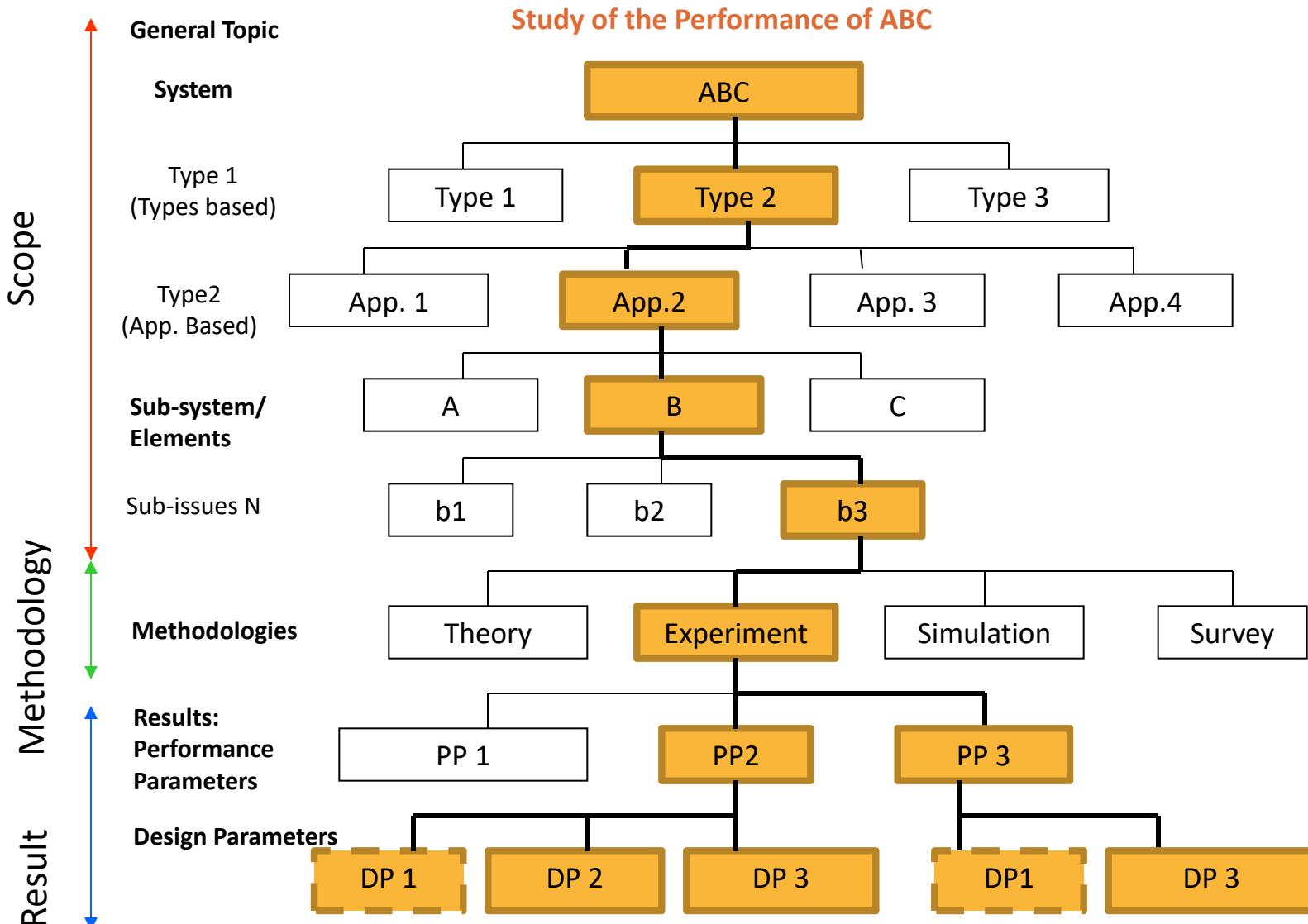
You ask yourself; who will do what, and how much? How many sub-projects can be created? How to maximize the outputs? How to produce more papers?

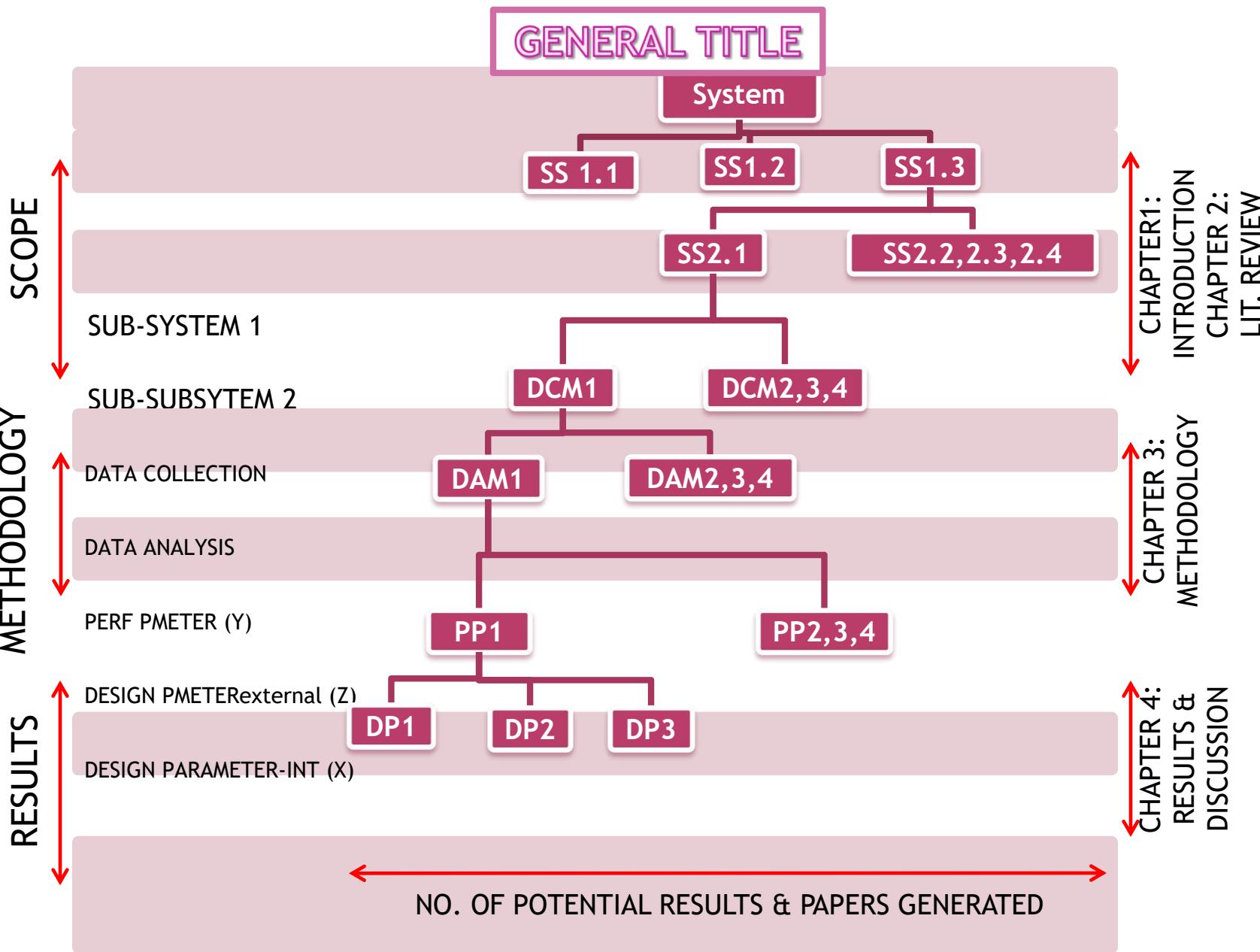
# QUESTIONS IN RESEARCH PLANNING

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1. What is the specific title of study
2. How to identify the problems to study?
3. How wide深深 is the study?
4. How much is the literature review?
5. What do I look for in reading reference papers ?
6. How do I choose between two (or more) design options?
7. How do I organize my study?
8. Should I focus on theory or simulation or what?
9. How many results should I get?
10. How do I know whether my results are correct and sufficient?
11. What if I can not get the target results?
12. How to arrange the results?
13. How to cluster for sub-projects?

# STRUCTURE OF A K-CHART™





# BENEFITS OF K CHART IN RESEARCH PLANNING & MANAGEMENT

Identify the scope of study

Guide for Literature Review (directed reading by knowing what you do not know)

Guide in choosing the main issues under study. Distinguish the focused issues from complementary ones

Gauge the level of quality of the research project, thus the potential for novelties and publications

Identify the level of assumptions

Establish the problems and objectives of research

Identify the methodology

Identify the results

# MORE BENEFITS

Guide to attain quality research through the selection criteria (zoom & expand)

Distinguish Research projects (PP and DP, more analyses) from Development projects (only PP, no DP, specifications rather than analyses). The less the Results layer (the PP and DP), the smaller the R, the larger the D

Distinguish Pure Fundamental research from Pure Applied research. The more fundamental the research, the more general (the wider) the Scope layer

# with a K-CHART™, let's try to answer these questions again

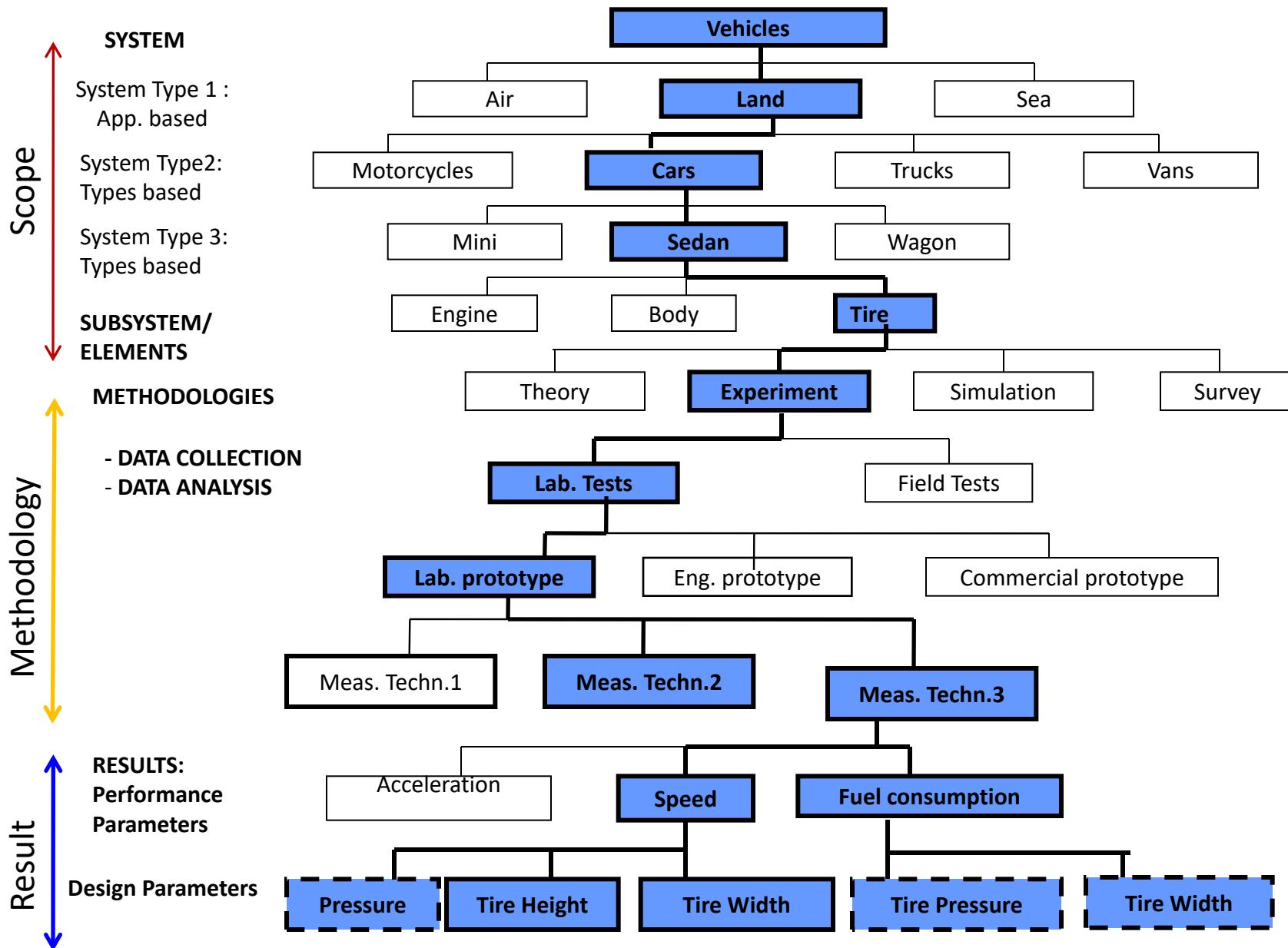
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# **and even more questions...**

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15. How to plan for publication ?
16. How to construct articles' titles ?
17. How to organize the report structure ?
18. How to plan for a graduate thesis writing?
19. How to integrate with new ideas ?
20. How to re-align the area of research when the original plan does not work ?



## EXAMPLES FROM THE K CHART FOR VEHICLE

- Project Title:
- Chapter Title:
- Paper Titles:
- Literature Reviews:
- Assumptions:
- Number of Results:

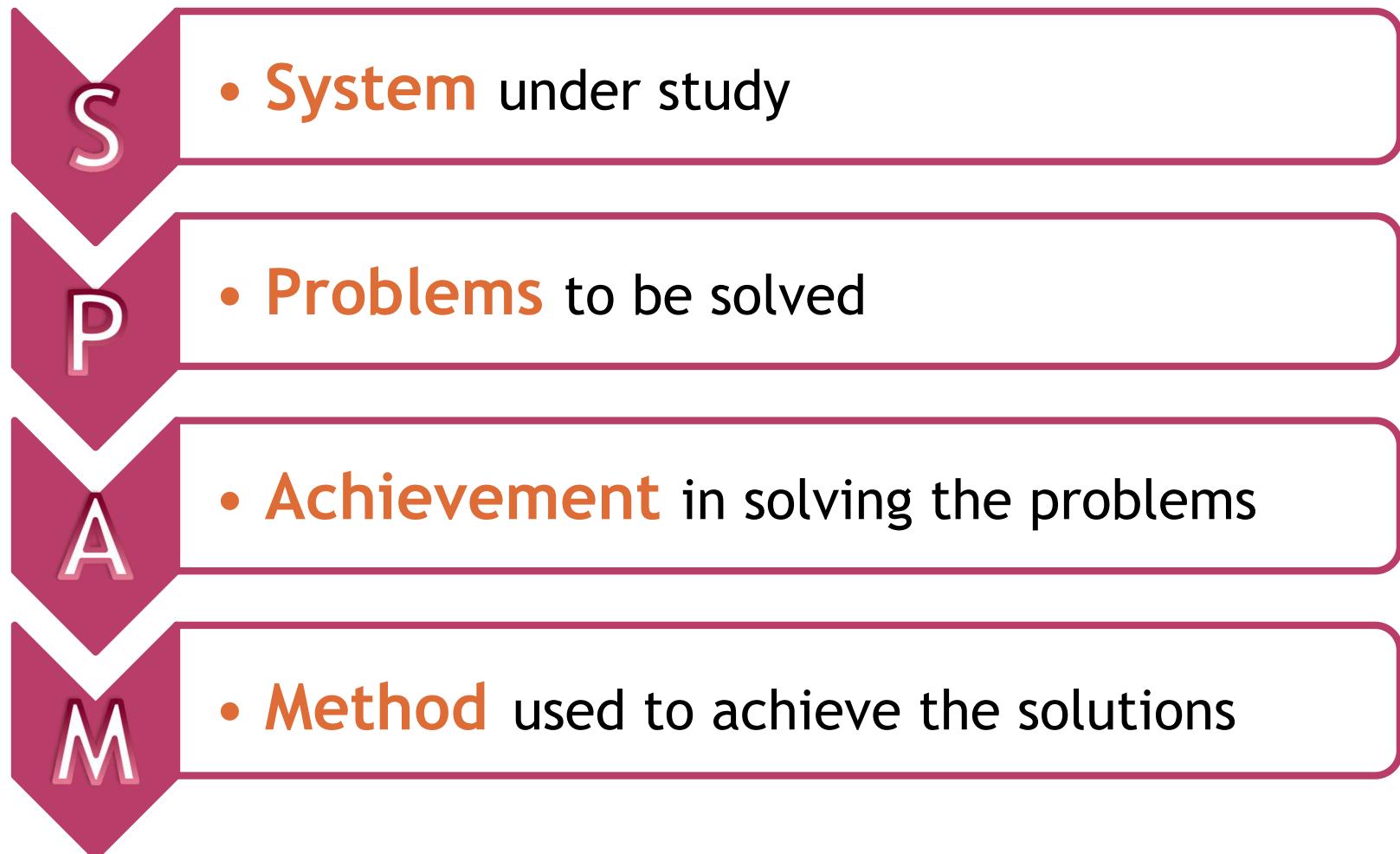
# SLOT 3:

## WHAT IS K-CHART™?

1. MAIN ISSUES IN RESEARCH: S.P.A,M
2. FRAMEWORK OF A RESEARCH PROJECT: IDENTIFY SPAM - ORGANIZE YOUR THOUGHTS
3. WHAT IS A K-CHART™?
4. THE K-CHART™ LAYERS

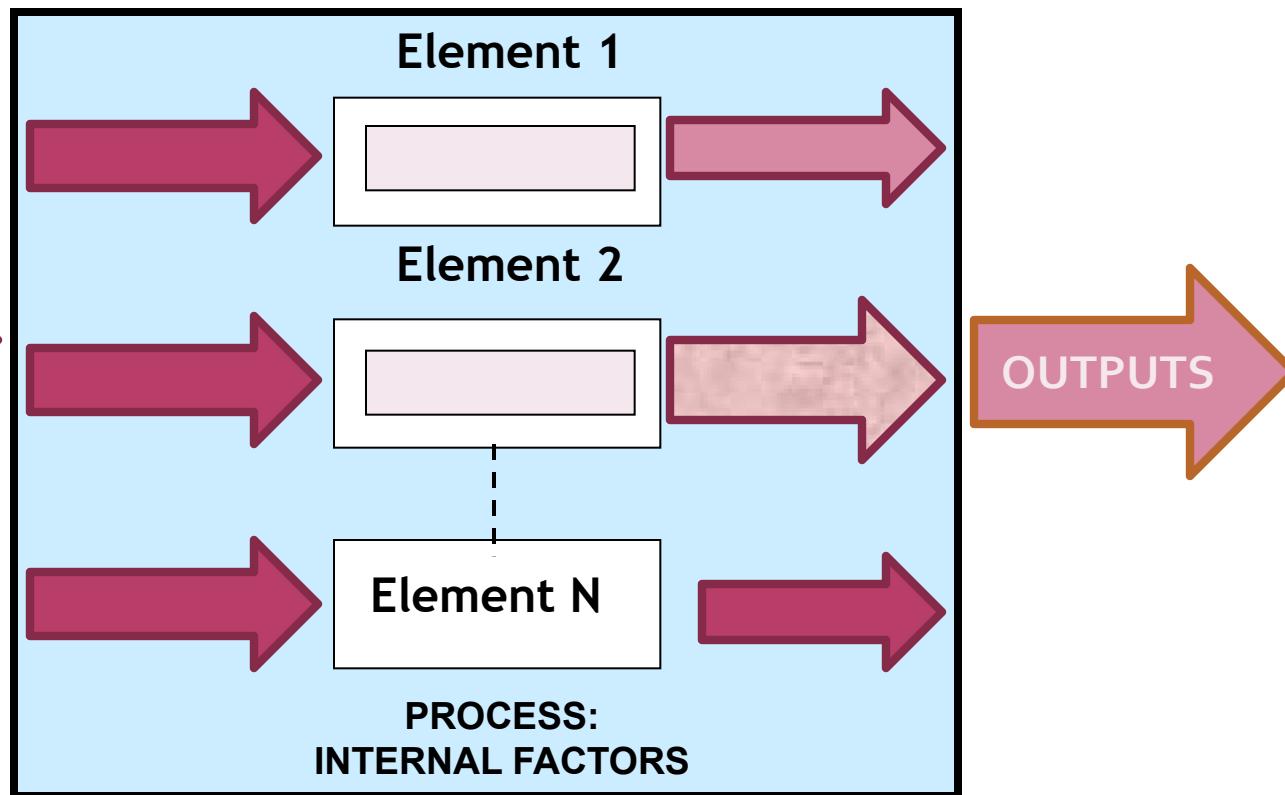
# S.P.A.M

## Main Issues in Research:



# FRAMEWORK OF A RESEARCH PROJECT: IDENTIFY SPAM

## System under Study (SuS)



# WHAT IS A K-CHART™?

A tool to help establish SPAM

By systematically organizing;

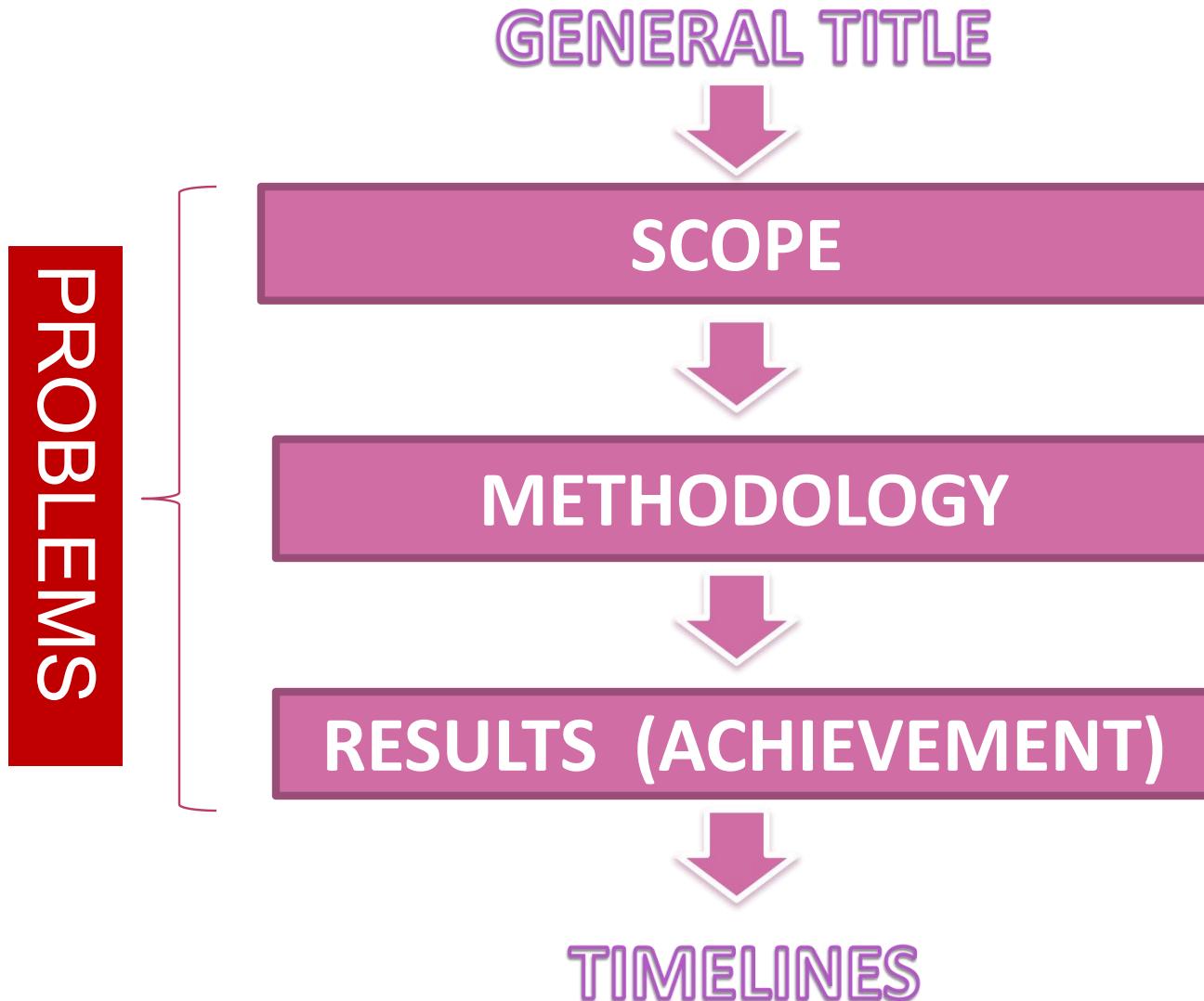
- Scope of Study
- Problems under research
- Methodology
- Results
- Timelines

In the form of a Tree Diagram

Through the process of “Zoom and Expand”

With specific rules

# THE K-CHART™ LAYERS



# SLOT 4:

## CONSTRUCTION OF K-CHART™?

# STEPS IN CONSTRUCTING A K-CHART

STEPS	ACTIVITY
1	Constructing the general title
2	Constructing the Scope of System under study layers
3	Constructing the Methodology layers
4	Constructing the Result layers
5	Constructing the Timelines

Note: The layers can be initially constructed independently

# **STEP 1: CONSTRUCTING THE TITLE**

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- A title should indicate:
  - The **S**ystem you are working on
  - The **P**roblems you are solving
  - Your **A**chievements
  - Your **M**ethodology
  
- General title: SPAM in general (no achievements)
- Program/Project Title: Specific SPAM
- Paper Title: Very Specific SPAM

# CONSTRUCTING THE GENERAL TITLE

One normally begins a research project with a general idea of what he/she wants to do

The general idea normally appears in the forms of the issues or the problems he/she wants to study in a certain area of research

So a research idea normally begins with issues/problems (P), while the System (S), the Method (M) and the Achievements (A) are not well formed yet.

However, quite often that Achievements (A) are directly identifiable through Problems (P)

# EXAMPLES OF TITLES

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- **GENERAL TITLE:**

- Factors affecting the performance of motor vehicles
- Customer Satisfaction in Tourism Industry
- Development of an Index for Human Innovativeness
- Dynamics of Firefly Population at Pjaya Wetlands
- Pattern of spread of Contagious Diseases in Malaysia
- Patients' Satisfaction towards Services in General Hospitals

- **PROJECT TITLE:** Patients' Satisfaction towards Out-patient Services in General Hospitals

- **PAPER TITLE:** Elderly Patients' Satisfaction towards Out-patient Pharmacy Services in General Hospitals

# **EXERCISE 1**

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## **1. Simulation : TITLE layers**

- 1. Effects of House Architectural Design on Inhabitants' Comfort Level**
- 2. Why Terengganu Maintains Top State in SPM Results for 5 years consecutively**
- 3. Factors that make Malaysian pupils not interested in Science and Mathematics**
- 4. Determining the TV viewing patterns that encourage the development of children**
- 5. How Does A language Influence Human Creativity?**

## **2. Hands on : TITLE layers**

**(Participants are requested to construct their own title) – individual or in groups**

# STEP 2: CONSTRUCTING THE SCOPE LAYER

Scope Layers consist of two categories:

1. System layer
2. Sub-system or Element layers

Each category is defined by its various types

## SYSTEM Layer

1. Begin the 1<sup>st</sup> layer with the **SYSTEM**
2. For the next layers, identify the **types** of the SYSTEM
3. Continue Step 2 until you exhaust the types of the SYSTEM

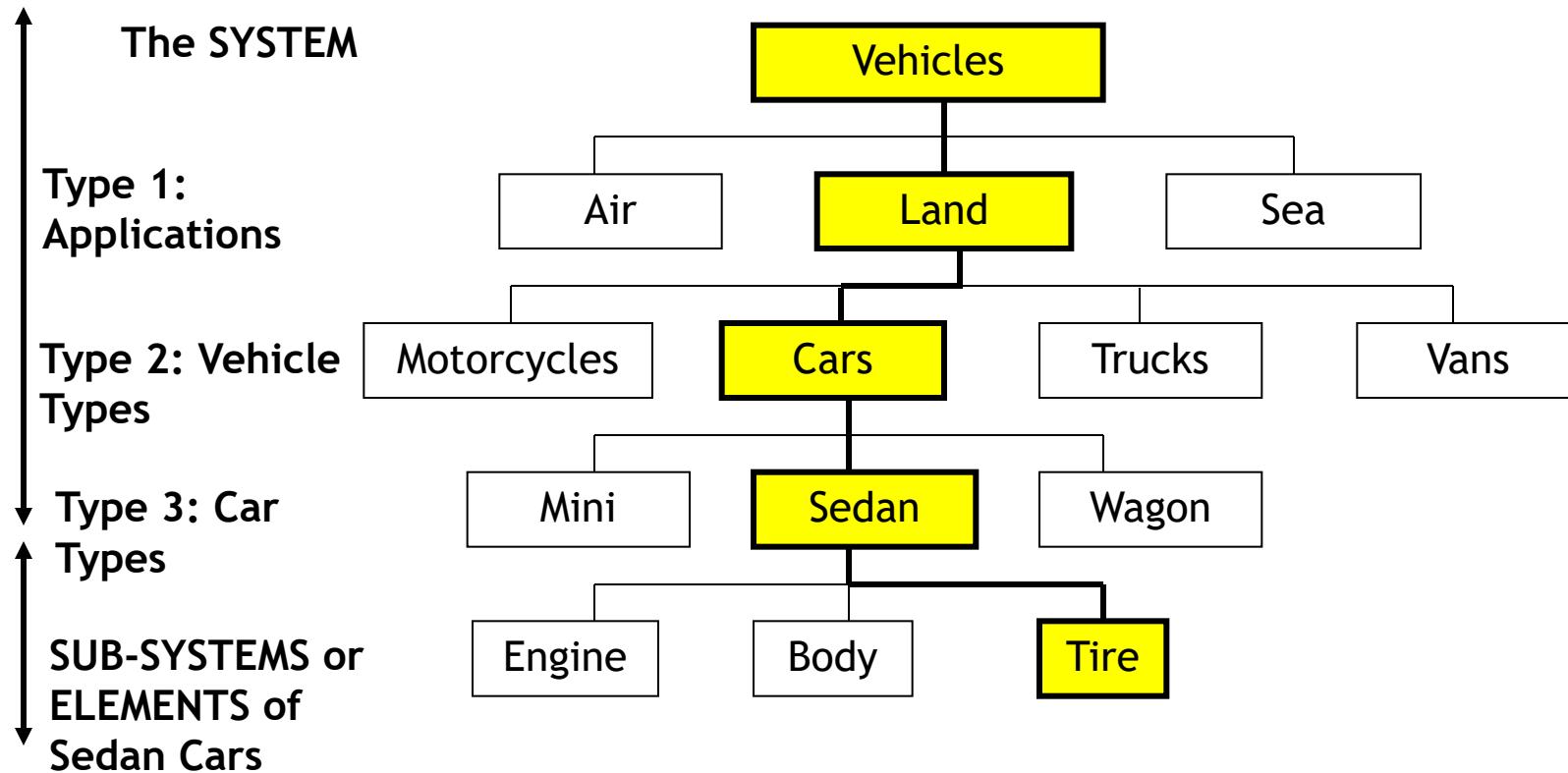
## SUB-SYSTEM OR ELEMENT Layers

4. At the next layer after the last layer of **SYSTEM**, identify the **SUB-SYSTEMS/ELEMENTS** of the **SYSTEM**
5. For the next layers, identify the **types** of the SUB-SYSTEM
6. Continue Step 5 until you exhaust the types/applications of the SUB-SYSTEM
7. Repeat Steps 4 through 6 for the next elements depending on the depth you want

# THE SCOPE LAYERS: AN EXAMPLE

General Topic

Factors Influencing the Performance of Motor Vehicles



# HOW TO CHOOSE AN OPTION: PROCEEDING TO THE NEXT LEVEL

Availability of  
Expertise

Availability of  
Facility

Required Time

Complexity of  
research

Novelty

Cost

Performance

Completeness of  
knowledge/  
solution

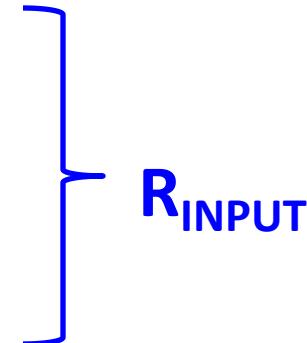
Importance:  
Applicability,  
Impact, Urgency

# RESEARCH QUALITY

Defining quality of research:

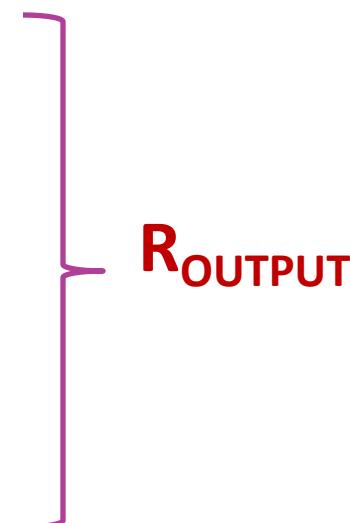
Using **LOWEST COST**:

- **SHORTEST TIME**
- **SIMPLEST METHOD**
- **LEAST RESOURCES**



To obtain **BIGGEST IMPACT**

- **WIDEST APPLICATION**
- **MOST CRITICALLY NEEDED**
- **BEST PERFORMANCE**
- **MOST COMPLETE**
- **MOST NOVEL/INNOVATIVE**



$$\text{RESEARCH GAIN, } R_{GAIN} = R_{OUTPUT} / R_{INPUT}$$

# THE IMPORTANCE OF SYSTEM LAYER

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- The more detail the layers, the less the assumption, the better
- Every time there is a jump between the layers, an assumption is made (thus, a justification is required)
- One can choose any way he/she likes to arrange the sequence of layers
- However, Issues of the same theme should be in the same layer
- The Issues Layers indicate
  - The scope of critical reviews (what to get from the papers)
  - The focused issues (designation of issues)
  - The rationale in choosing issues to study (to move from one level to the next)
  - The Problem Statement

# SAMPLE SYSTEMS AND ELEMENTS

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BIL	SYSTEM	ELEMENTS	SUB-ELEMENTS
1.	Car	Body; Engine; Tire	Body: Hood, Bonnet, Chassis Engine: Piston, Shafts,
2.	Computer	Software; Casing; Electronics;	Software: Operating Systems, Applications
3.	Human	Physical body, Mind; Soul	Physical: Head, Limbs, Torso etc
4.	School	Buildings; Teachers; Students; Administrators; Rules; Curriculum;	Buildings: Admin., Classrooms, Halls
5.	Tourism Industry	Tourists; Hotels; Transportations; Rules	Tourists: Local, Foreign

# **IDENTIFYING THE TYPES**

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- Types can be defined based on any categories:

- 1.Size**
- 2.Application/Usage**
- 3.Models**
- 4.Standards**
- 5.Technology**
- 6.Methods/Techniques**

# NOTICE

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System must be at the top, followed by its types

Sub-system must be at the lower layer, and followed by its types

One can choose any way he/she likes to arrange the sequence of the types within a System or a Sub-system. However, Issues of the same type should be in the same layer

The more detail the layers, the less the assumption, the better

Every time there is a jump between the layers, an assumption is made (thus, a justification is required as to the validity of the assumption)

One can choose any way he/she likes to arrange the sequence of layers

However, Issues of the same theme should be in the same layer (apply the layering checking mechanism)

Perform extensive literature reviews

# HOW TO CHOOSE AN OPTION: PROCEEDING TO THE NEXT LEVEL

Availability of  
Expertise

Availability of  
Facility

Required Time

Complexity

Novelty

Cost

Performance

Importance:  
Impact, Urgency

# EXERCISE 2

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## 1. Simulation : SCOPE layers

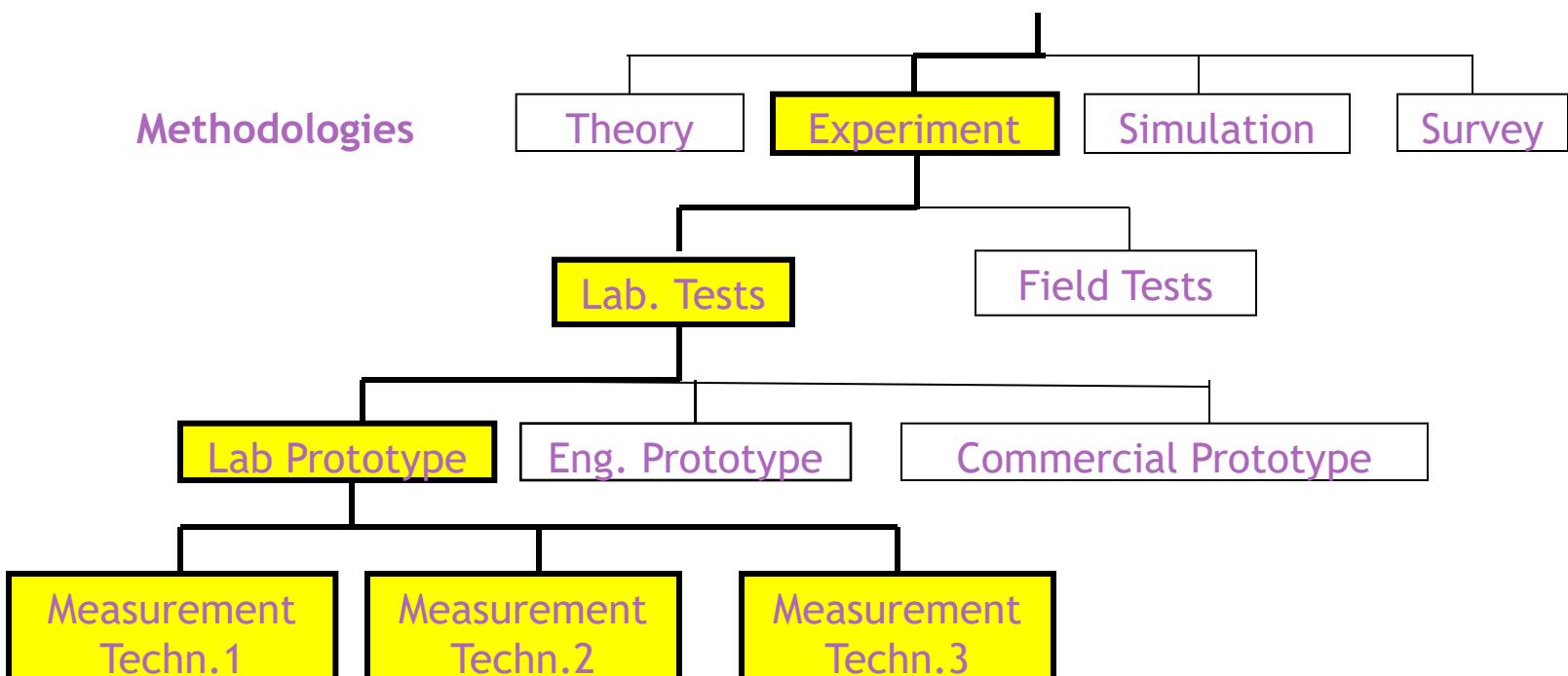
(Common SCOPE layers – by instructor)

## 2. Hands on : SCOPE layers

(Participants are requested to construct their own SCOPE layers) – individual or in groups.

# STEP 3: THE METHODOLOGY LAYERS

8. For the 1<sup>st</sup> Methodology Layer, identify and choose the General Methods to use i.e Theory, Simulation, Experiment, Survey
9. For the subsequent layers, identify and choose the test environments, the level of prototypes, and the techniques to use



# THE IMPORTANCE OF METHODOLOGY LAYER

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- To define the specific methods adopted
- To designate which methods are of higher priorities
- To avoid ambiguities in the approach taken
- To reduce assumptions

# EXERCISE 3

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## 1. Simulation : METHODOLOGY layers

(Common METHODOLOGY layers – by instructor)

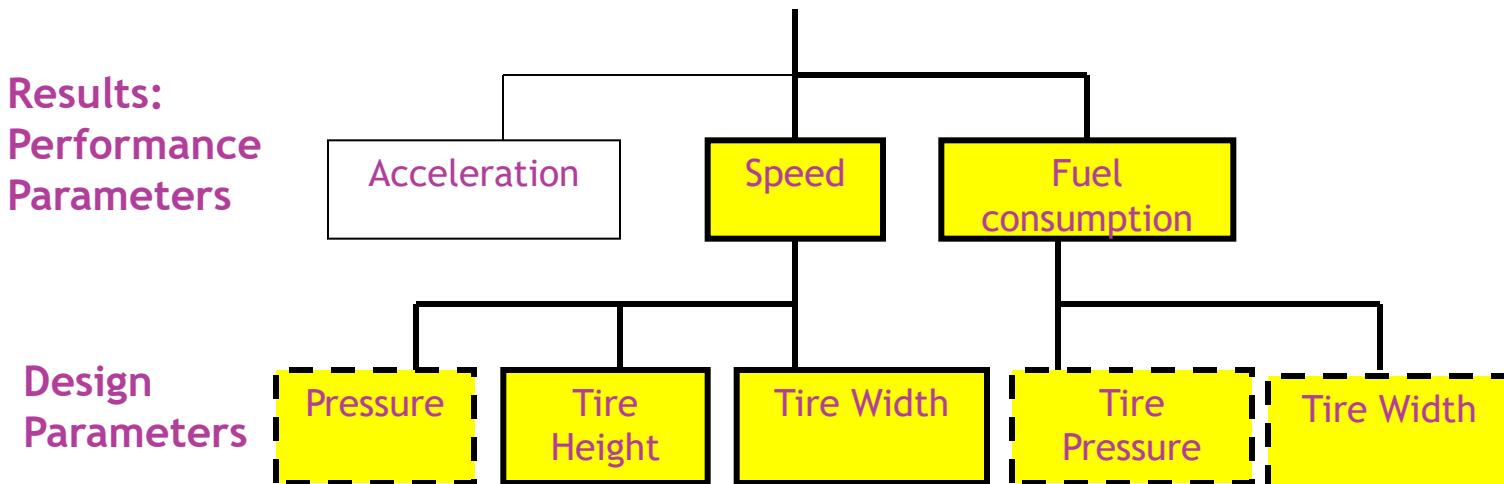
## 2. Hands on : METHODOLOGY layers

(Participants are requested to construct their own METHODOLOGY layers) – individual or in groups

# STEP 4: THE RESULT LAYERS

The **RESULTS** Layer consist of Performance Parameters(PP) followed by Design Parameters (DP).

10. Identify PPs. PPs (associated with the Outputs) – refer model
11. Identify DPs under the corresponding PPs. DPs are associated with the Internal and External factors
12. Identify the ones with higher priorities (dotted lines)



# THE IMPORTANCE OF RESULT LAYER

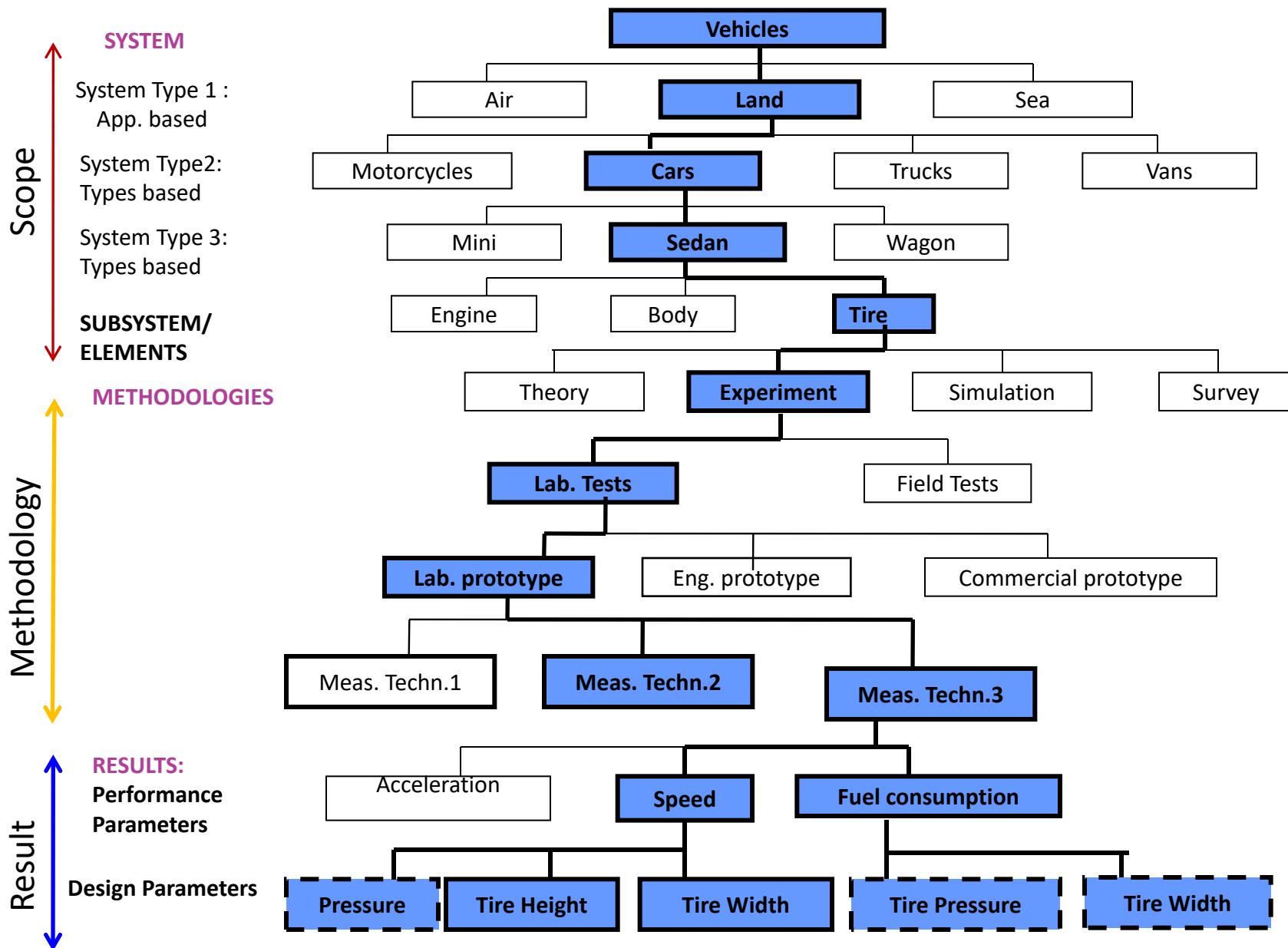
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- The Results Layers help in:
  1. Identifying the expected results, and how many of them
  2. Setting the priorities and designation of results
  3. Identifying the possible analyses e.g. comparative studies
  4. Organizing reports/thesis/papers
  5. Designating sub-projects

# EXERCISE 4

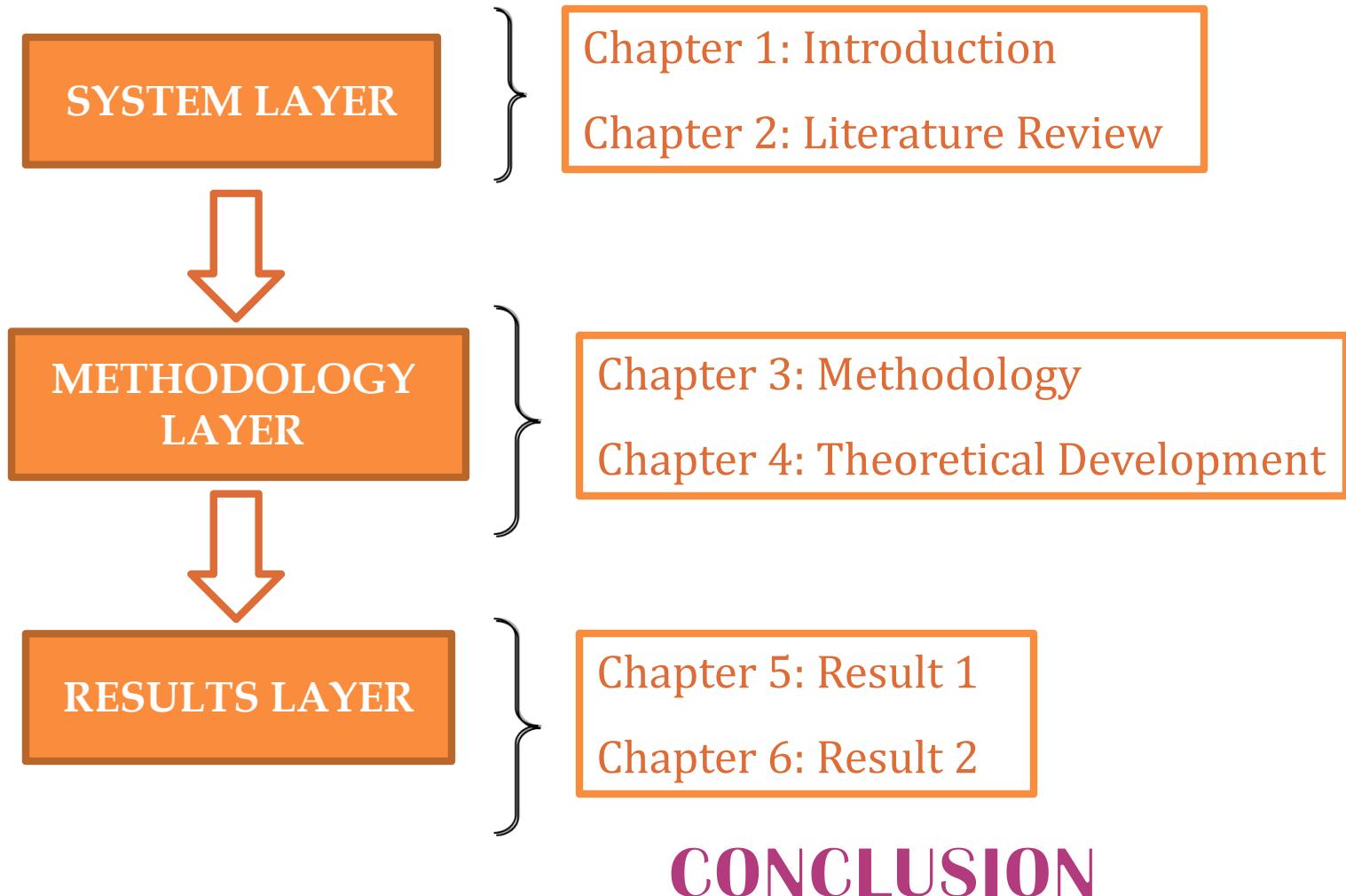
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- 1. Simulation: RESULTS layers**  
**(Common RESULTS layers – by instructor)**
  
- 2. Hands on: RESULTS Layers**  
**(Participants are requested to construct  
their own RESULTS layers)**



# PLANNING FOR THESIS WRITING

## TITLE



## CONCLUSION

# EVALUATING A K-CHART™

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- Is there any jump?
- What assumptions have been made?
- Are the assumptions justifiable?
- Are the options at each layer exhaustive?
- How are the options made to move to the next layers?
- What could be potential titles?
- How many results are expected?
- How many good papers can be expected?

# CONCLUSION

- Most existing tools are suitable for macro level research planning
- K-Chart™ is a micro-level research management & planning tool
- It is useful for planning, execution and completion of a research project
- K-Chart™ is constructed based on Tree Diagram concept; focus and expand processes

# THANK YOU