

Problem Identification and Hypothesis



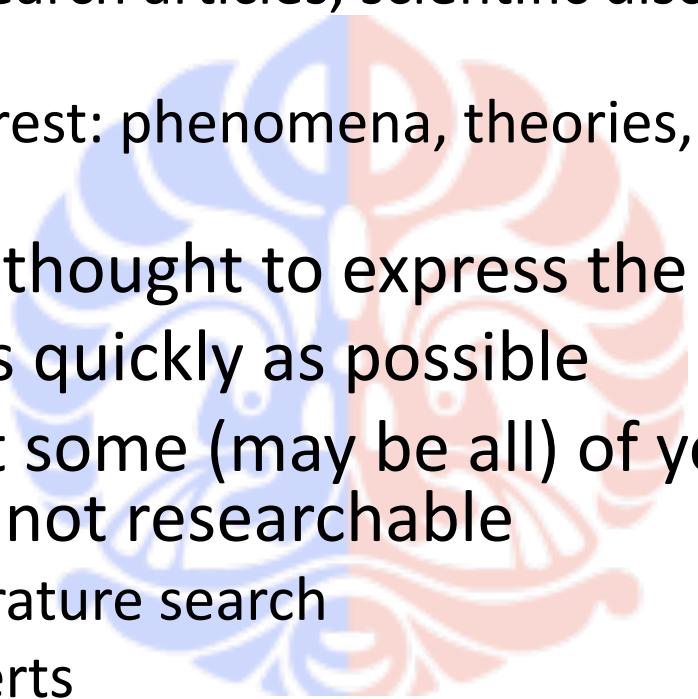
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RESEARCH METHODOLOGY
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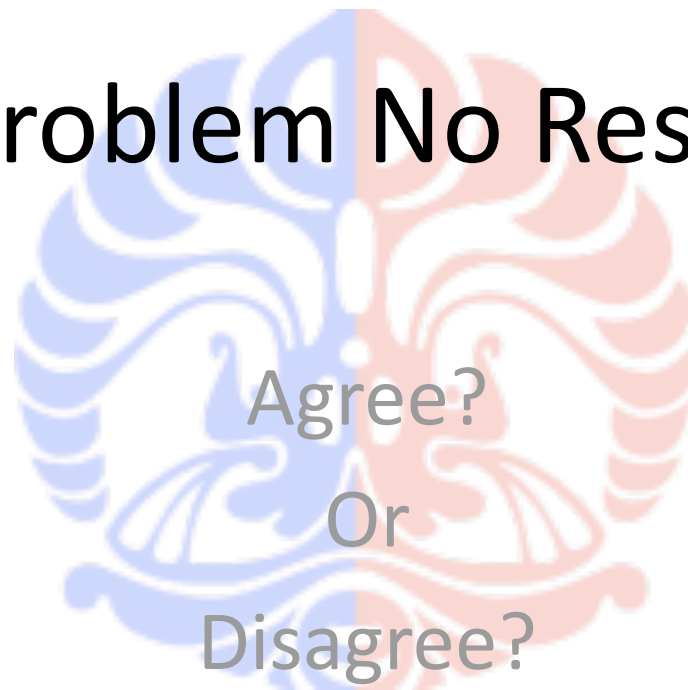
Session Objectives

- To understand the first step of conducting research: state general problem
- To be able to identify specific research problems
- To be able to construct hypothesis or research questions
- To be able to determine research objectives

Problem Identification

- Determine a well define general problem
 - Sources: research articles, scientific discussion, experience, etc.
 - Point of interest: phenomena, theories, previous research results, etc.
 - Exercise your thought to express the problems
 - Write them as quickly as possible
 - Be ready, that some (may be all) of your general problems are not researchable
 - Conduct literature search
 - Consult experts
- 

No Problem No Research

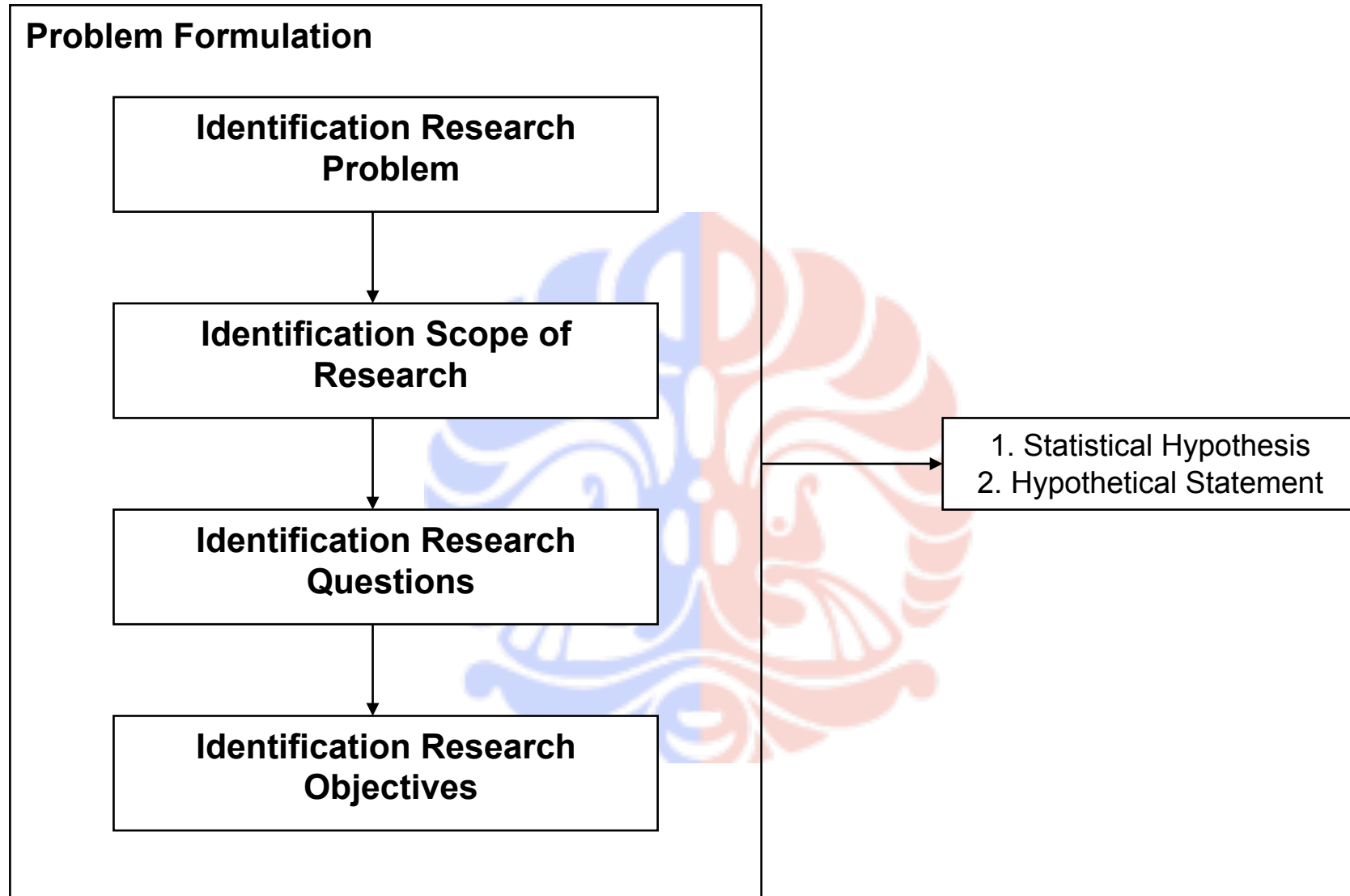


Agree?

Or

Disagree?

Problem Formulation



Hypothesis

- Basically, there are two types of hypotheses:
 - Hypothetical statement
 - Statistical hypothesis
- Hypothetical statement does not use statistical analysis
 - Apakah IT dapat meningkatkan kinerja perusahaan?
 - Biasanya menggunakan pendekatan kualitatif
- Statistical hypothesis uses statistical analysis.
 - Menggunakan pendekatan kuantitatif.

Statistical Hypothesis

$$H_0 : \mu = 0$$

$$H_1 : \mu \neq 0$$

$$H_0 : \mu \leq 0$$

$$H_1 : \mu > 0$$

$$H_0 : \mu \geq 0$$

$$H_1 : \mu < 0$$

- Two-tail hypothesis: Reject H_0 if calculated value is either smaller than $-z_\alpha$ ($-t_\alpha$) or greater than z_α (t_α)

- One-tail hypothesis: Reject H_0 if calculated statistics value is greater than z_α (t_α)

- One-tail hypothesis: Reject H_0 if calculated statistics value is smaller than $-z_\alpha$ ($-t_\alpha$)

Statistical Hypothesis Test: Steps

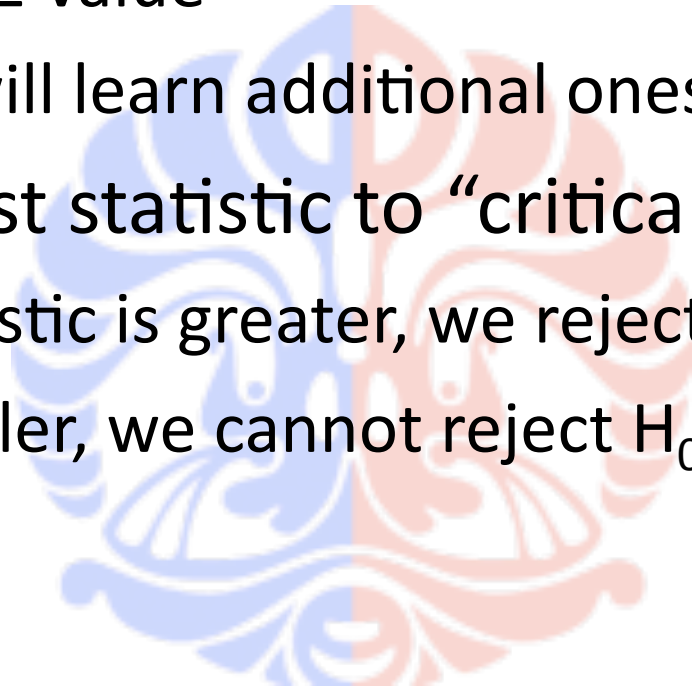
1. State the research hypothesis (“alternate hypothesis), H_1
2. State the null hypothesis, H_0
3. Choose an α -level (alpha-level)
Typically .05, sometimes .10 or .01
4. Look up value of test statistic corresponding to the α -level (called the “critical value”)
 - Example: find the “critical” t-value associated with $\alpha=.05$

5. Use statistics to calculate a relevant test statistic.

- T-value or Z-value
- Soon we will learn additional ones

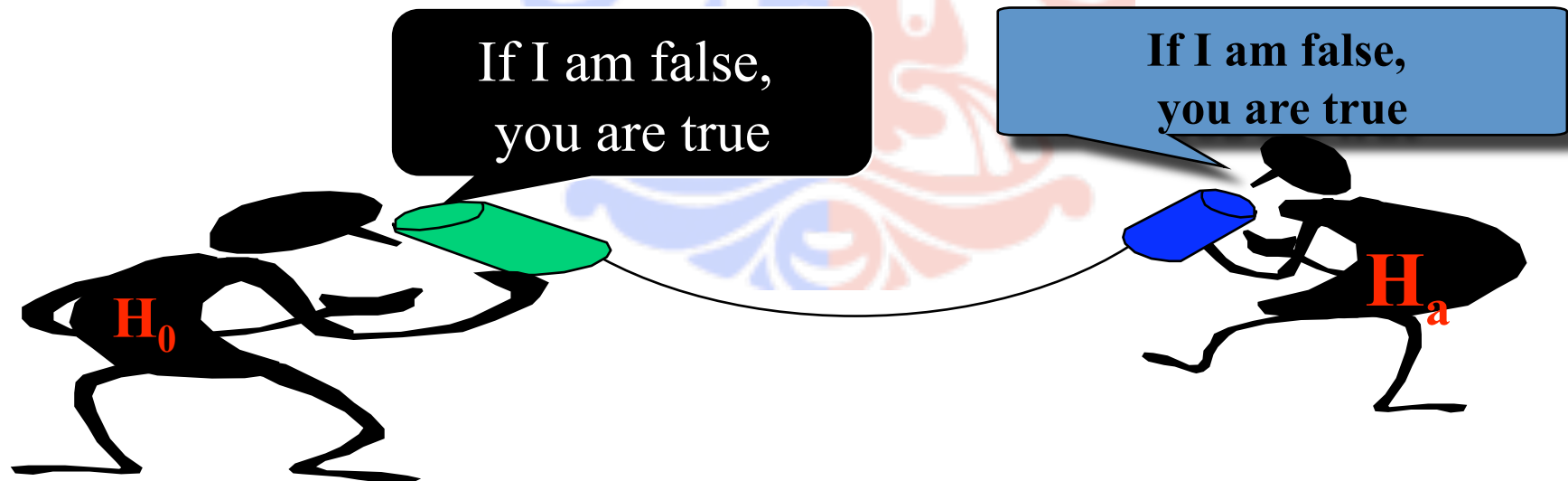
6. Compare test statistic to “critical value”

- If test statistic is greater, we reject H_0
- If it is smaller, we cannot reject H_0



Hypothesis Test: Errors

- When we falsely reject H_0 , it is called a ***Type I error***
- When we falsely fail to reject H_0 , it is called a ***Type II error***
- In general, we are most concerned about Type I errors... we try to be conservative



Taken in Combination, There are Four Possibilities

	Researcher	
	Accepts H_0	Rejects H_0
H_0 is true	Correct decision Probability = $1 - \alpha$	Type I error Probability = α
H_0 is false	Type II error Probability = β	Correct decision Probability = $1 - \beta$

Determine Research Objectives

- Make sure you have a strong reason why such research is worth of doing
 - Study the impact?
 - Study the usage?
 - Etc.
- Research objective should reflect the solution of the problem
 - If you can not state the problem, you can not state the objective
- Build your reasons based on facts (previous studies, existing problems, etc.)
- (See slide: the aims of research)

Q/A

- Write several general problems related to CS and IT.
- Build argument why such general problems are worth to research.
- Express your experience in stating hypothesis
 - Hypothetical statement
 - Statistical hypothesis