Types of Research
Studies & Variables

Research in Business Studies

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Types of Research Studies

- Reporting
  - A summation of data
    - Forecasting data to achieve a deeper understanding
    - Generating statistics for comparison
  - Requires;
    - Adequate knowledge & skills with information sources
    - Little inference or conclusion drawing
  - Example;
    - Researchers need to know what information should be evaluated to value a company

Types of Research Studies

- Descriptive
  - Discover answers to the questions 5 W + H
    - Try to describe or define a subject
    - Involve data collection
    - Need research variables
      - Often involve interaction among variables

Types of Research Studies

- Explanatory
  - This type of research is grounded in theory
    - Theory is created to answer **WHY** & **HOW** questions
    - This research goes beyond description
      - Attempts to explain the reasons for the phenomenon that the descriptive study only observed
    - Research in the relationship among variables are often referred to as **CORRELATIONAL STUDY**

Types of Research Studies

- Predictive
  - Using theory as the foundation of research
    - Theory is used to explain the future phenomenon
      - Predicting future values
      - Forecasting gap values
    - Often used to respond to **WHY** questions
    - This research has a potential in contributing to the development of a better theory

Variables

- Variables are defined as “the property being studied”
  - Variables are symbols of events, acts, characteristics, traits, or attributes, which can be measured, and to which the researchers assign values
    - Dichotomous variables = only have 2 values
      - Male vs. female
      - Employed vs. unemployed
    - Discrete variables = have a certain value
      - Race, religion
    - Continuous variables = have a range of values
      - Temperature, income, expense, age, test scores

Variables

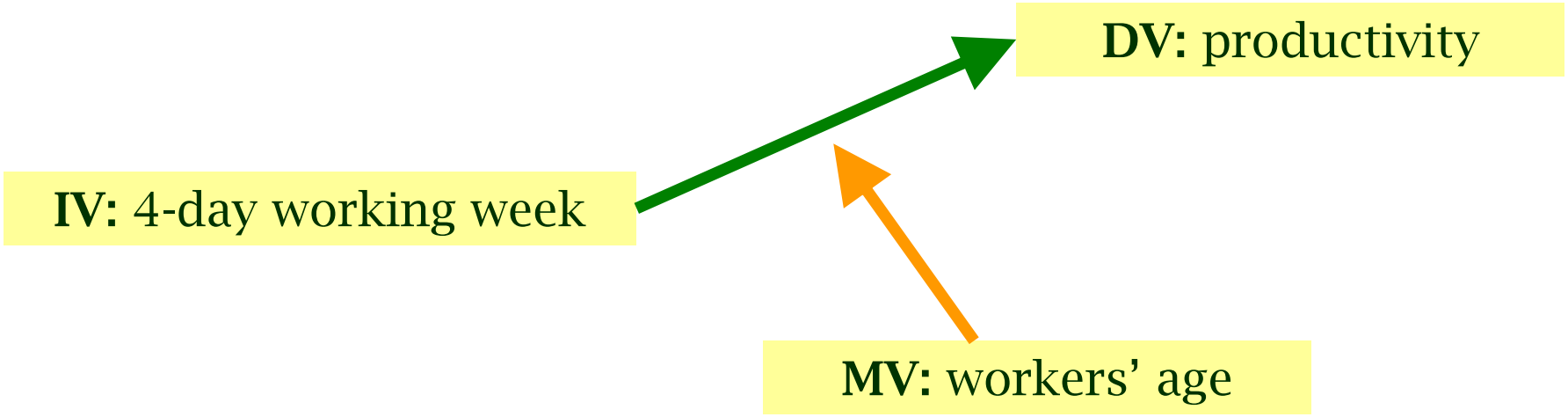
- **Independent variables (“IV”)**
  - predictor variables
  - have the ability to show relationships

- **Dependent variables (“DV”)**
  - criterion variables
  - have the measurement ability

Independent Variable	Dependent Variable
Predictor	Criterion
Presumed cause	Presumed effect
Stimulus	Response
Predicted from…	Predicted to…
Antecedent	Consequence
Manipulated	Measured outcome

Variables

- **Moderating variables ("MV")**
  - Interaction variables
  - the 2nd independent variable that in included because it is believed to have a significant contributory, or contingent effect on the original IV – DV relationships



  - Hypothesis
    - Introduction of 4-day working week will lead to higher productivity, especially for younger workers

Propositions, Hypothesis &
Model Development

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Propositions & Hypotheses

- Proposition
  - A statement about observable phenomena (concepts) that may be judged as true or false
  - When such a proposition is formulated for empirical testing, it is referred to as "**hypothesis**"
    - A declarative statement about the relationship between 2 or more variables
    - It is often a tentative & speculative nature

Roles of Hypotheses

- It guides the direction of the study
- It identifies facts that are relevant and those that are not
- It suggests which form of research design is likely to be most appropriate
- It provides a framework for organizing the conclusions that results

Descriptive Hypotheses

- Advantages
  - Encourages researchers to crystallize their thinking about the likely relationships to be found
  - Encourages them to think about the implications of a supported or rejected finding
  - It is useful for testing statistical significance

Descriptive Hypothesis Format	Research Question Format
In Jakarta, our market share is 15%	What is the market share for our market in Jakarta?
Indonesian residents are experiencing lower purchasing power	Are Indonesian residents experiencing lower purchasing power?
80% of PT. XYZ stockholders favor increasing the company's dividend payout ratio	Do stockholders of PT. XYZ favor an increased dividend payout ratio?

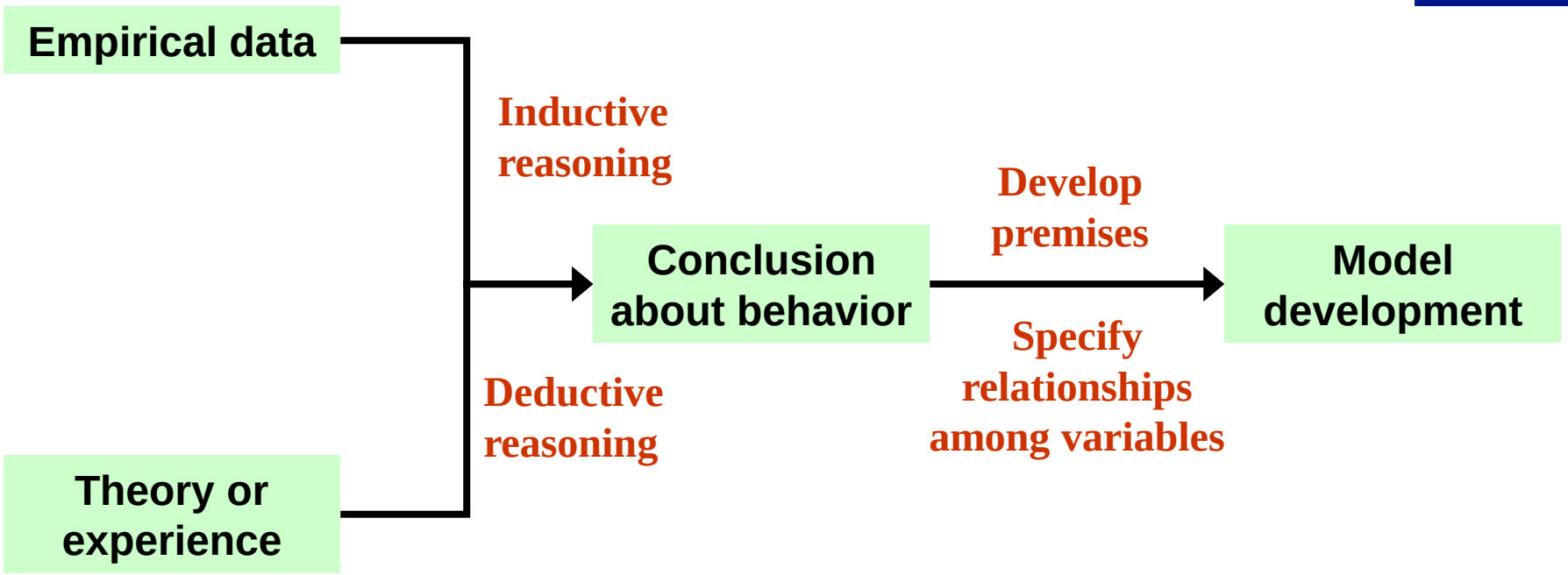
Relational Hypotheses

- Statements that describe a relationship between 2 variables with respect to some case
  - **Japanese cars** (variable) are perceived by **Indonesian consumers** (case) to be of **better quality** (variable) than **American cars** (variable)
    - Relationship between "country of origin" & "perceived quality" for the case of Indonesian consumers
  - **Correlational** hypothesis
    - Variables occur together in some specified manner without implying that one causes the other
      - Young women (under 35 years of age) purchase fewer unit of black tea than older women (above 35 years of age)

Relational Hypotheses

- Explanatory variables
  - There is an implication that the existence of, or a change in one variable causes, or leads to a change in the other variable
    - An increase in **family income** (IV) leads to an increase in the percentage of **income saved** (DV)

Model Development



- Sound reasoning
  - Finding correct premises
  - Testing the connections between facts & assumptions
  - Making claims based on adequate evidence

Model Development

- Scientific method
  - Puzzle-solving activity
  - Direct observation of phenomena
  - Clearly defined variables, methods & procedures
  - Empirically testable hypothesis
  - The ability to rule out rival hypothesis
  - Statistical rather than linguistic justification of conclusion
  - The self-correcting process

Research Process &
Question Hierarchy

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Research Process

- Secondary data
  - Indirectly obtained
  - Have at least 1 level of interpretation inserted between the events and its recording
  - Contain at least 1 characteristics

- Primary data
  - Directly obtained
  - May not have the necessary interpretation
  - May not contain any of the characteristics

Research Process

- Data analysis
  - Quantitative vs. qualitative analysis
- Data interpretation
  - Based on numbers
    - quantitative data interpretation
  - Based on managerial perspective
    - qualitative data interpretation
- Reporting

Question Hierarchy

- How ambiguous questions become actionable research
  - Management dilemma:
    - "what symptoms cause management concerns?"
    - "what environmental stimuli raise management interest?"
  - Management question:
    - "how can management eliminate the negative symptoms?"
    - "how can management fully capitalize on an opportunity?"
  - Research question:
    - "what plausible courses of action are available to management to correct the problem or take advantage of the opportunity?"
    - "which action plans should the management take?"

Question Hierarchy

- Investigative question:
  - "what does the manager need to know to choose the best alternative from the available courses of action?
- Measurement question:
  - "what should be asked or observed to obtain the information the manager needs?"
- Management decision:
  - "what is the recommended course of action, given the research findings?"

Question Hierarchy [example]

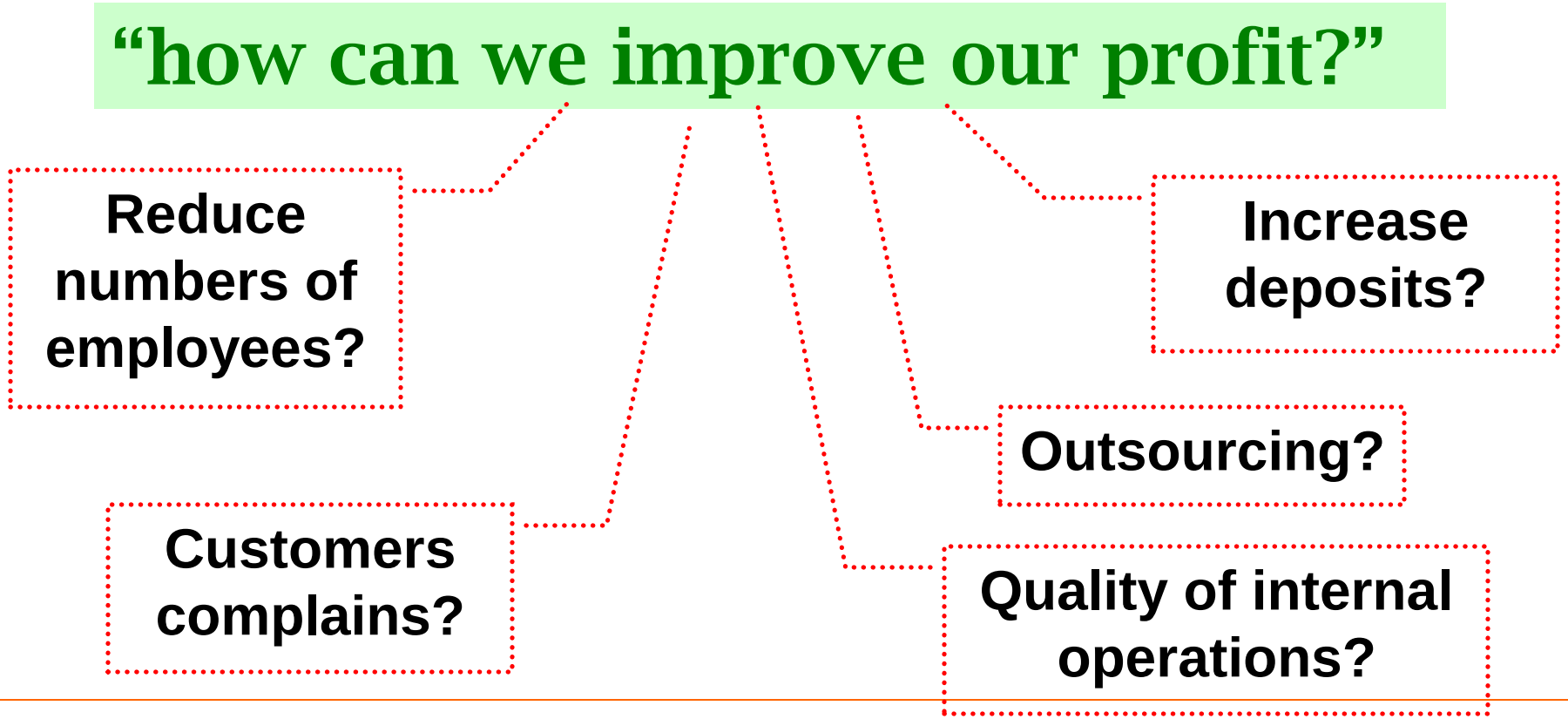
You are hired to help the new management of a local bank.

The president of the bank is concerned about **erosion of the bank's profitability**, and wants to turn this situation around. Profits have stagnated in recent years.

The president has stated the problem facing the organization and inform you this main issue to deal with; "**how can we improve our profit**?"

Question Hierarchy [example]

- Management dilemma: **bank's profitability**
- Management question: **how can we improve our profit?**



Question Hierarchy [example]

Categories	General Questions	Sample of Management Questions
Choice of Purpose or Choice of Objective	What do we want to achieve?	Should we reposition brand X as a therapeutic product from its current cosmetic positioning?
Generalization & Evaluation of Solutions (choices between concrete actions to solve problems, or take advantage of opportunities)	How can we achieve the ends that we seek? What should be done to improve customer care program for product repairs?	How can we achieve our 5-year goal of doubling sales & profits?
Troubleshooting or Control (monitoring or diagnosing ways an organization is failing to meet its goals)	How well is our marketing program meeting its goals? Why is our marketing program not meeting its goals?	What is our product line's sales-to-promotion cost ratio? Why does our department have the lowest sales ratio?

Question Hierarchy [example]

- Investigative questions
  - Represent the information that the decision maker needs to know
  - The questions the researcher must answer to satisfactorily arrive at a conclusion about the research question

    - What is the public's position regarding financial services & their use?
      - What specific financial services are used?
      - How attractive are various services?
      - What bank-specific & environmental factors influence a person's use of a particular service?

Question Hierarchy [example]

- What is the bank's competitive position?
  - What are the geographic patterns of our customers and of our competitors' customers?
  - What demographic differences are revealed among our customers and those of our competitors?
  - What descriptive words or phrases does the public associate with the bank? With the bank's competitors?
  - How aware is the public of the bank's promotional efforts?
  - What opinion does the public hold of the bank and its competitors?
  - How does growth in services compare among competing institutions?

Performance considerations

Attitudinal issues

(perceived service quality)

Behavioral issues

(ease of use)

Question Hierarchy [example]

- Measurement questions
  - The actual questions that researchers use to collect data
    - Questions on survey
    - Elements on an observation checklist
  - Pre-designed measurement questions
    - Questions that have been formulated and tested previously by other researchers
      - Recorded in literatures
  - Custom-designed measurement questions
    - Formulated questions specifically for the project at hand
      - Collective insights from activities in research process

Research in Business Studies

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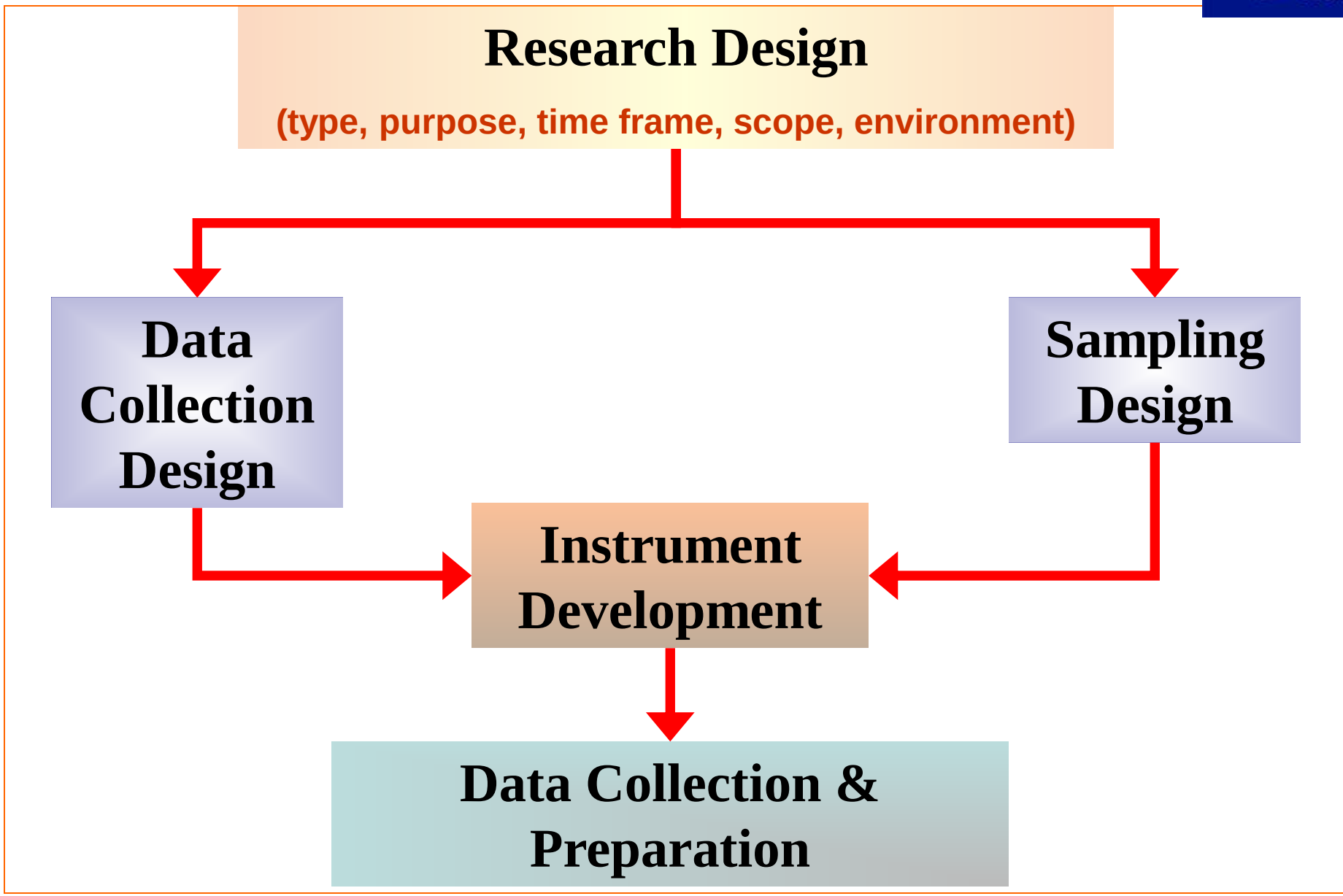
Research Design

- What is it?
  - Constitutes the blueprint for the collection, measurement & analysis of data
  - Aids the researchers in the allocation of limited resources by posing crucial choices in methodology
  - The plan & structure of investigation to obtain answers to research questions
    - Overall scheme of the research
  - Expresses the structure of the research problem
    - Framework, organization, configuration of the relationships among variables
  - Expresses the plan of investigation used to obtain empirical evidence on those relationships


Research Design
(type, purpose, time frame, scope, environment)
Data Collection Design
Sampling Design
Instrument Development
Data Collection & Preparation

Research Design

- Exploratory studies
  - It is useful when researchers lack of clear idea of the problems
    - Develop concepts more clearly
    - Develop operational definitions
  - Saves time and money

Pepsi needs a realistic understanding of the teen population

Sends out cameras to teens to take pictures of their lives as they really are

Interviews friends asking them about dreams, fears, cares & concerns

Interviews experts who build careers on understanding teen psychology

Visits common teen hangouts (observing teens behaviors away from adults)

Identify 5 main types of teenagers

Research Design

- Qualitative studies
  - In-depth interviews
    - Conversational rather than structural
  - Participant observation
  - Films, pictures, videotapes
  - Projective techniques & psychological testing
    - Thematic apperception test, games, role play
  - Case studies
    - In-depth contextual analysis of only a few events/conditions
  - Document analysis

- Types of qualitative studies
  - Secondary data analysis
    - Start with organization's data
    - Review prior studies & published documents
  - Experience survey
    - Questioning issues
      - What is being done?
      - What has been tried in the past without success? With success?
      - How have things changed?
      - What are the change-producing elements of the situation?
      - Who is involved in decisions
        - What role does each person play?
      - What problem areas and barriers can be seen?

- Focus groups
  - A group of people (6-10 participants)
  - Use the group dynamic to exchange ideas, feelings & experience on a specific topic

- Two-stage design
  - Clearly defining the research question
  - Developing the research design

    – Descriptive studies
      - Formal studies
      - Descriptions of phenomena, or characteristics associated with a subject population
      - Estimates of the proportions of a population that have these characteristics
      - Discovery of associations among different variables (correlational studies)

- Causal studies
  - Correlation between variables
  - Symmetrical relationship = 2 variables fluctuate together, but it is assumed that the changes in neither variable are due to changes in the other
  - Reciprocal relationship = 2 variables mutually influence, or reinforce each other
  - Asymmetrical relationship = changes in one variable (IV) are responsible for changes in another variable (DV)

Research Design

Type of Relationship	Nature of Relationship	Examples
Stimulus – Response	An event of change results in a response from some object	Changes in work rules lead to a higher level of worker output Increases in price lead to reduction in sales
Property – Disposition	An existing property causes a disposition	Age and attitudes about saving Gender and attitudes about social issues
Disposition – Behavior	A disposition causes a specific behavior	Opinions about brand and its purchase Job satisfaction and work output
Property – Behavior	An existing property causes a specific behavior	Social class and family savings patterns Age and sports participation

QUALITATIVE RESEARCH

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RESEARCH IN BUSINESS STUDIES

WHAT IS IT?

- Qualitative research

  - An array of interpretive techniques, which seek to describe, decode, translate & otherwise come to terms with the meaning, not the frequency of certain more or less naturally occurring phenomena in the social world

    - Designed to tell the researcher how (process), and why (meaning) things happen as they do

EXAMPLES ON QUALITATIVE RESEARCH

Decision Arena	Questions to be Answered
JOB ANALYSIS	Does the advancement through different job levels incorporate the necessary training to foster the strongest performance?
ADVERTISING CONCEPT DEVELOPMENT	What images should we use to connect with our target customers' motivations?
PRODUCTIVITY ENHANCEMENT	What actions could we take to boost worker productivity without generating worker discontent?
NEW PRODUCT DEVELOPMENT	What would our current market think of a proposed product idea? We need new products, but what should they be to take advantage of our existing customer perceived strengths? Which products will create the greatest synergy with our existing products in terms of ROI and distribution partner growth?

EXAMPLES ON QUALITATIVE RESEARCH

Decision Arena	Questions to be Answered
BENEFITS MANAGEMENT	Should our compensation plan be more flexible and customizable? How do employees perceive wellness-prevention programs as compared to corrective health programs in terms of value?
RETAIL DESIGN	How do consumers prefer to shop in our store? Do they shop with a defined purpose, or are they affected by other motives?
PROCESS UNDERSTANDING	What steps are involved in cleaning a wood floor? How is our product perceived or involved in this process?
MARKET SEGMENTATION	Why does one demographic or lifestyle group use our product more than another? Who are our customers, and how do they use our product to support their lifestyle? What is the influence of culture on product choice?

COMPARISONS

	QUALITATIVE	QUANTITATIVE
Focus	Understand & interpret	Describe, explain & predict
Researcher involvement	**High** – researcher becomes the participant, or catalyst	**Limited** - controlled to prevent bias
Research purpose	In-depth understanding (theory building)	Describe or predict (build and test theory)
Sample design	Non-probability, purposive	Probability
Sample size	Small	Large
Research design	May evolve or adjust during the course of the project Often uses multiple methods simultaneously **Consistency is not expected** Involves **longitudinal approach**	Determined before commencing the project Uses single method or mixed methods **Consistency is critical** Involves either a **cross-sectional** or a **longitudinal approach**

Repeated measures over an extended time, tracking changes in variables over time, which also includes panels or cohort groups

COMPARISONS

	QUALITATIVE	QUANTITATIVE
Participant preparation	Pre-tasking is very common	No preparation desired to avoid biasing the participants
Data type & preparation	Verbal or pictorial descriptions Reduced to **verbal codes** (sometimes with computer assistance)	Verbal descriptions Reduced to **numerical codes** for computerized analysis
Data analysis	**Human analysis** following computer or human coding; primarily non-quantitative Forces researchers to see the **contextual framework** of the phenomenon being measured – **distinction** between facts and judgments is **less clear** Always ongoing during the project	**Computerized analysis** – statistical & mathematical methods dominate this method of study Forces researchers to see the **content** of the phenomenon being measured – **distinction** between facts and judgments is **very apparent** Analysis may be ongoing during the project

COMPARISONS

	QUALITATIVE	QUANTITATIVE
Insights & meaning	**Deeper level of understanding is the norm**; determined by type & quantity of free-response questions Researchers' participation in data collection allows insights to form & be tested during the process	**Limited** by the opportunity to probe respondents & the quality of the original data collection instrument Insights follow data collection & data entry, with limited ability to re-interview participants
Research sponsor involvement	**May participate** by observing research in real time, or via recorded interviews	**Rarely** has either direct, or indirect contact with participants

COMPARISONS

	QUALITATIVE	QUANTITATIVE
Feedback turnaround	**Smaller sample sizes** make data collection faster for shorter possible turnaround Insights are developed as the research progresses, shortening data analysis	**Larger sample sizes** lengthen data collection; internet methodologies are shortening turnaround, but inappropriate for many studies Insights development follows data collection and entry, lengthening research process; interviewing software permits some tallying of responses as data collection progresses
Data security	More absolute given use of restricted access facilities & smaller sample sizes	Act of research in progress is often known by competitors; insights may be gleaned by competitors for some visible, field-based studies

COMPARISONS EXTRA

Qualitative methods	Quantitative methods
• Emphasis on understanding	• Emphasis on testing and verification
• Focus on understanding from respondent's/informant's point of view	• Focus on facts and/or reasons for social events
• Interpretation and rational approach	• Logical and critical approach
• Observations and measurements in natural settings	• Controlled measurement
• Subjective 'insider view' and closeness to data	• Objective 'outsider view' distant from data
• Explorative orientation	• Hypothetical-deductive; focus on hypothesis testing
• Process oriented	• Result oriented
• Holistic perspective	• Particularistic and analytical
• Generalization by comparison of properties and contexts of individual organism	• Generalization by population membership

PROCESS OF QUALITATIVE RESEARCH

- Key issues;
  - The level of question development in the management research question hierarchy prior to the commencing of qualitative research
  - The preparation of the participant prior to the research experience
  - The nature & level of data that come from the de-briefing of interviewers (or observers)

PROCESS OF QUALITATIVE RESEARCH

- Much of qualitative research involves the deliberate preparation of the participant
  - This is called pre-exercises (pre-tasking)
    - This is an important step to extract the desire details & meaning from the participants
      - Placing a product (with repeated instructions to use the product during the preparation period, before the actual interview)
      - Having the participants bring visual stimuli
        - » Family pictures, favorite items, or others
      - Having the participants to write a dialog of a hypothetical experience
        - » Conversation to handle complaints

QUALITATIVE RESEARCH METHODS

- Sampling
  - Non-probability sampling
    - It means that little attempt to generate a representative sample from the population
    - **Purposive sampling**
      - Researchers choose participants arbitrarily for their unique characteristics, experience, attitudes, perceptions, as conceptual/theoretical categories of participants develop during the interviewing process
      - Researchers seek new participants to challenge emerging patterns
    - **Snowball sampling**
      - researchers select individuals who have similar to or different characteristics from their own
    - **Convenience sampling**
      - researchers select any readily available individuals as participants

QUALITATIVE RESEARCH METHODS

- Interviews
  - The primary data collection technique for gathering data in qualitative research

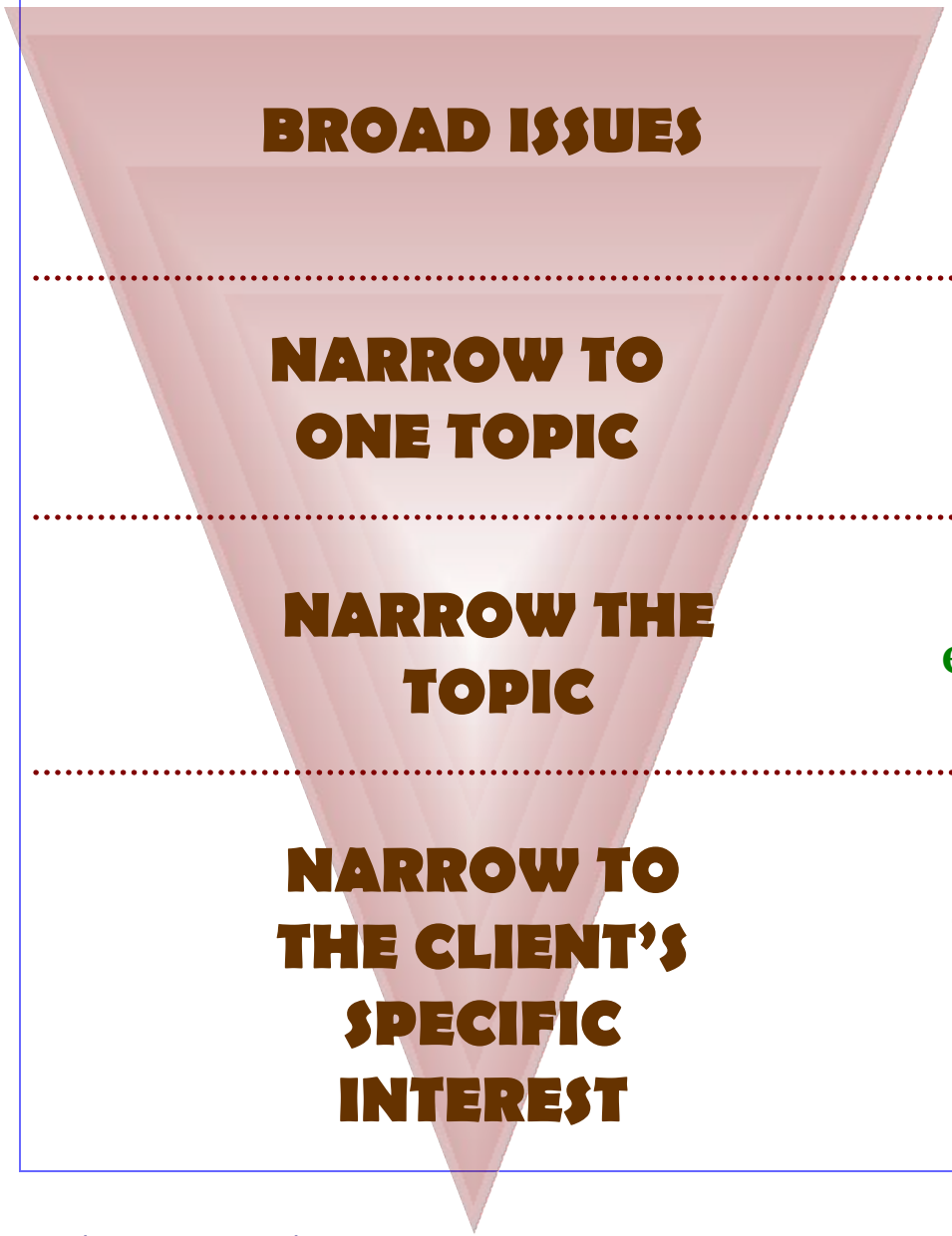
	Individual Interview	Group Interview
Research Objective	• Explore life of individual in-depth • create case histories through repeated interviews over time • test a survey	• orient the researchers to a field of inquiry, and the language of the field • explore a range of attitudes, opinions & behaviors • observe a process of consensus & disagreement • add contextual detail to quantitative findings
Topic Concerns	• detailed individual experiences, choices, biographies • sensitive issues that might provoke anxiety	• issues of public interest, or common concerns • issues where little is known, of a hypothetical nature

QUALITATIVE RESEARCH METHODS

	Individual Interview	Group Interview
Participants	• time-pressed participants, or those difficult to recruit (elites, or high-status participants) • participants with sufficient language skills (adults vs. youngsters) • participants whose distinctions would inhibit participation	• participants whose backgrounds are similar, or not so dissimilar as to generate conflict, or discomfort • participants, who can articulate their ideas • participants, who offer a range of positions on issues

- **Unstructured interview** = no specific questions, or order of topics to be discussed
- **Semi-structured interview** = usually starts with a few specific questions
- **Structured interview** = uses detailed interview guide similar to questionnaires

INTERVIEW QUESTION HIERARCHY



What do participants consider entertaining?

What type of movie do participants consider most entertaining?

What do participants find most entertaining about action movies?

Within action movies, how do the computer-enhanced, or computer-generated action sequences contribute to the movie's entertainment experience?

RECRUITMENT SCREENER

Types of Information	Description
Heading	Include project name, date of interviews, identity of screener
Screening requirements	Specify conditions that must be met to extend a prospect an offer to participate; may include quotas for various demographic, lifestyle, attitudinal, or usage questions
Identity information	Include name of prospect, address, phone, email
Introduction	Describe purpose of study in a motivational way. Completely “blind” studies do not motivate participation
Security questions	Reveal possible participant over-participation, or conflicts of interest; similar information on spouse, or immediate family members
Demographic questions	Determine match for age, gender, ethnicity, race, income, geography, employment status, or occupation
Product, brand usage, purchase questions	Establish frequency of use, purchase, loyalty, and other factors

QUALITATIVE RESEARCH METHODS

Projective techniques

- Word/picture associations
  - "tell me what you think of when you think of billy the kid"?
- Sentence completion
  - "complete this sentence: people who buy over the internet ……"
- Role play
  - "what will the customer comment when he/she sees the salesperson approaching in the used car dealership?"

QUALITATIVE RESEARCH METHODS

Projective techniques

- Thematic apperception test
  - Participants are confronted with a picture, and asked to describe how the person in the picture feels and thinks
- Component sorts
  - Participants are presented with flash cards containing component features, and asked to create new combinations
- Sensory sorts
  - Participants are presented with scents, textures, and sounds, usually verbalized on cards, and asked to arrange them by one or more criteria

QUALITATIVE RESEARCH METHODS

Projective techniques

- Laddering/benefit chain
  - Participants are asked to link functional features to their physical and psychological benefits, both real and ideal
- Imagination exercises
  - "if Pepsodent toothpaste were a college, what type of college would it be?"
  - Imaginary universe
    - » Participants are asked to assume that the brand and its users populate an entire universe; they then describe the features of this new world

QUALITATIVE RESEARCH METHODS

Projective techniques

- Imagination exercises
  - Visitor from another planet
    - » Participants are asked to assume that they are aliens and are confronting the product for the first time; they then describe their reactions, questions, and attitudes about purchase, or re-trial
  - Personification
    - » "If Nokia were a person, what type of person would Nokia be?
  - Authority figure
    - » Participants are asked to imagine that the brand is authority figure, and to describe the attributes of the figure

QUALITATIVE RESEARCH METHODS

Projective techniques

- Imagination exercises
  - Ambiguities and paradoxes
    - » Participants are asked to imagine a brand as something else
    - » Nokia computer
    - » Swatch cellular phones
    - » Pepsodent shampoo

- Semantic mapping
  - Participants are presented with a 4-quadrant map where different variables anchor the 2-axes; they then spatially organize universities in Jakarta – image, reputation, characteristics, majors, and other options

  - Brand mapping
    - » Perceptions on different brands

QUALITATIVE RESEARCH METHODS

Projective techniques

- Metaphor elicitation technique
  - Participants are pre-tasked to collect images that reveal how they feel about a research topic.

QUALITATIVE RESEARCH METHODS

- Individual depth interviews
  - Interaction between an individual interviewer & a single participant.
    - About 20 minutes on phone interview
    - About 2 hours on face-to-face interview
  - Advance materials are often provided

QUALITATIVE RESEARCH METHODS

- Group interviews
  - Data collection method using a single interviewer with more than 1 research participant
    - Size variation
      - Dyads (2), triads (3), mini-group (2-6), small group (6-10), super group (20)
    - Composition variation
      - Heterogeneous vs. homogeneous
      - Experts vs. non-experts

POSITIVE INFLUENCING FACTORS

- Recognition/ego enhancement
  - Moderator's expressed appreciation for participant contributions that amplify the understanding of issues
- Personal contribution
  - Participant's desire to be, and perception that his/her contributions are helpful
- Validation
  - Participant's need to have his/her feelings, attitudes, or ideas validated

POSITIVE INFLUENCING FACTORS

- Load-sharing
  - Participant's need to share something negative, or bothersome with others
- Personal growth
  - Participant's desire to increase knowledge, or understanding through new perspective
- Socialization
  - Participant's desire to meet new people, and make new friends in a "safe" environment

POSITIVE INFLUENCING FACTORS

- Expectation
  - Participant's accurate understanding of the purpose of the group discussion
- Extrinsic rewards
  - Participant's value perception of fee toward active participation in the group discussion

NEGATIVE INFLUENCING FACTORS

- Use of jargon
  - participants are unfamiliar with terminologies/jargons
- Ego threats
  - Participant's challenging another participant's knowledge of the subject
- Confusion
  - Participant's lack of understanding of the issue in the group discussion
- Time
  - Participant's concern about other obligations

NEGATIVE INFLUENCING FACTORS

- Dominating/monopolizing
  - Participant's attempting to take leadership, thus blocking contributions of others
- Memory decay
  - Participant's failure to remember the details of incidents
- In-articulation
  - Participant's inability to express ideas quickly & concisely

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RESEARCH IN BUSINESS STUDIES

OBSERVATION RESEARCH

WHAT IS IT?

- Observation research
  - The full range of monitoring behavioral and non-behavioral activities and conditions
    - Record analysis, physical condition analysis, linguistic analysis, spatial analysis
  - Qualifies as **scientific inquiry** when;
    - It is conducted specifically to answer research question
    - It is systematically planned and executed
    - Uses proper controls
    - Provides reliable & valid account of what happened
  - Besides collecting data visually, observation involves
    - Listening, reading, smelling, touching

WHAT IS IT?

- Observation research
  - Non-behavioral observation
    - Record analysis
      - Historical vs. current records
    - Physical condition analysis
      - Merchandise availability
      - Safety compliance
      - Inventory conditions
    - Physical process analysis
      - Manufacturing process
      - Traffic flows in distribution systems
      - Financial flows in the banking systems

WHAT IS IT?

- Observation research
  - Behavioral observation
    - Non-verbal analysis
      - Body movement
      - Motor expressions
      - Exchanged glances
    - Linguistic analysis
      - Tally of “ahh”, or “uhm” during presentation/discussions
    - Spatial analysis
      - How a person relates physically to others

WHAT IS IT?

- Observation research
  - Behavioral observation
    - Extra-linguistic analysis
      - Interactions between 2 people, or in a small group
      - Dimensions
        - » **Vocal** = pitch, loudness
        - » **Temporal** = rate of speaking, rhythm
        - » **Interaction** = tendencies to interrupt, dominate
        - » **Verbal stylistic** = vocabulary & pronunciation peculiarities, characteristic expressions

OBSERVER-PARTICIPANT RELATIONSHIP

- Direct observation
  - When observers are physically present & personally monitors what takes place
- Indirect observation
  - When recording is done by mechanical, photographic, or electronic means

OBSERVER-PARTICIPANT RELATIONSHIP

- Concealment
  - To shield observers from the object of their observation
    - One-way mirrors, hidden cameras, or microphones
    - Reducing observers' bias, but bring up **ethical issues**
  - Partial concealment
    - To reduce ethical concerns
- Participation
  - Observers enter the social setting, and acts as both an observer and a participant

OBSERVATION STUDIES

Research Class	Environment	Purpose	Research Tool
Completely unstructured	Natural setting	Generate hypotheses	None
Unstructured	Laboratory		None
Structured	Natural setting		Observation checklist
Completely structured	Laboratory	Testing hypotheses	Observation checklist

CONTENT OF OBSERVATION

FACTUAL	INFERENTIAL
Introduction/identification of salesperson & customer	Credibility of salesperson Qualified status of customers
Time & day of week	Convenience for the customer Welcoming attitude of the customer
Product presented	Customer interest in product
Selling points presented per product	Customer acceptance of selling points per product
Number of customer objections raised per product	Customer concerns about features & benefits
Salesperson's rebuttal of objection	Effectiveness of salesperson's rebuttal attempts
Salesperson's attempt to restore controls	Effectiveness of salesperson's control attempt Consequences for customer, who prefers interaction

CONTENT OF OBSERVATION

FACTUAL	INFERENTIAL
Length of interview	Customer's/salesperson's degree of enthusiasm for the interview
Environmental factors interfering with the interview	Level of distraction for the customers
Customer purchase decision	General evaluation of sales presentation skills

MEASUREMENT

Research in Business Studies

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SOME DEFINITIONS

- Concept
  - A bundle of meanings, or characteristics associated with certain events, objects, conditions, situations, or behaviors
- Construct
  - An image, or idea specifically invented for a given research and/or theory-building purpose
- Variable
  - An event, act, characteristics, trait, or attribute that can be measured, and to which researchers assign numerals, or values
  - A synonym for the construct

SOME DEFINITIONS

- Operational definition
  - A definition for a construct stated in terms of specific criteria for testing, or measurement
  - Refers to an empirical standard
    - Countable
    - Measurable

MEASUREMENT SCALES

Scale	Basic empirical operations	Typical use	Measures of averages
Nominal	Determination of equality and difference	Classification: – Male–Female – Occupations – Social class	Mode*
Ordinal	Determination of greater or less	Rankings: – Preference data – Attitude measures	Median*
Interval	Determination of equality of intervals	Index numbers: – Temperature scales	Mean*
Ratio	Determination of equality of ratios	Sales Units produced Number of customers	Mean*

* For definitions of these terms see p. 163

MEASUREMENT DIFFERENCES

- Error sources
  - The respondents
    - Opinion differences
      - Employee status, ethnic group, social class, closeness to certain places
  - Situational factors
    - Ensuring anonymity may improve truthfulness
  - The measurers
    - Rewording & paraphrasing
  - The instrument
    - Defective instruments

GOOD MEASUREMENT

- Validity
  - The extent to which a test measures what researchers wish to measure
- Reliability
  - Has to do with accuracy & precision of a measurement procedure
- Practicality
  - Concerns with a wide range of factors of economy, convenience & interpretability

VALIDITY

Types	What is Measured	Methods
Content Validity	Degree to which the content of the items adequately represents the universe of all relevant items under study	Judgmental Panel evaluation with content validity ratio
Criterion-related Validity	Degree to which the predictor is adequate in capturing the relevant aspects of the criterion	Correlation
Concurrent Validity	Description of the present; criterion data are available at the same time as predictor scores	Correlation
Predictive Validity	Prediction of the future; criterion data are measured after the passage of time	Correlation

VALIDITY

Types	What is Measured	Methods
Construct Validity	Answers the question, "what accounts for the variance in the measure?" Attempts to identify the underlying construct(s) being measured and determine how well the test represents it (them)	Judgmental Correlation of proposed test with established one Convergent-discriminant techniques Factor analysis Multitrait-multimethod analysis

RELIABILITY

Types	Coefficient	What is Measured	Methods
Test-Retest	Stability	Reliability of a test of instrument inferred from examinee scores; same test is administered twice to same subjects over an interval of less than 6 months	Correlation

RELIABILITY

Types	Coefficient	What is Measured	Methods
Parallel Forms	Equivalence	Degree to which alternative forms of the same measure produce same or similar results; administered simultaneously or with a delay. Interrater estimates of the similarity of judges' observations or scores	Correlation

RELIABILITY

Types	Coefficient	What is Measured	Methods
Split-half, KR20, Cronbach's Alpha	Internal consistency	Degree to which instrument items are homogeneous and reflect the same underlying construct(s)	Specialized correlational formulas

PRACTICALITY

- Economy
  - Data are not free
  - More items give more reliability
- Convenience
  - The more complex the concepts & constructs, the greater is the need for clear & complete instructions
    - A long completion time, complex instructions, participant's perceived difficulty with the survey & their rated enjoyment of the process also influence design

PRACTICALITY

- Interpretability
  - A statement of the functions the test was designed to measure & the procedures by which it was developed
  - Detailed instructions for administration
  - Scoring keys & instructions
  - Norms for appropriate reference groups
  - Evidence about reliability
  - Evidence regarding the inter-correlations of sub-scores
  - Evidence regarding the relationship of the test to other measure
  - Guides for test use

MEASUREMENT SCALES

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RESEARCH IN BUSINESS STUDIES

Business Research Methodology

INTRODUCTION

- Scales in business research are generally constructed to measure **behavior**, **knowledge**, and **attitudes**
  - Ethan is **convinced** that Toyota has great talent, terrific products, and superior opportunities for growth
    - This is a **cognitively**-based attitude
      - It represents Ethan's memories, evaluations, and beliefs about the properties of the object

Based on **logic** (reading, listening, verbal, analytical ability)

  - Ethan **loves** working at Toyota
    - This is an **affectively**-based attitude
      - It represent Ethan's feelings, intuition, values, and emotions toward the object

INTRODUCTION

- Scales in business research are generally constructed to measure behavior, knowledge, and attitudes
  - Ethan is **convinced** that Toyota has great talent, terrific products, and superior opportunities for growth
  - Ethan **loves** working at Toyota
  - Ethan **expects** to stay with the firm and work hard to achieve rapid promotion for greater visibility and influence
    - This is a **behaviorally**-based attitude
      - It represents Ethan's expectation and behavioral intentions toward his firm, and the instrumental behaviors necessary to achieve his future goals

ATTITUDES VS. BEHAVIOR

- The relationship is not straightforward
  - Attitudes & behavioral intentions do not always lead to actual behaviors
    - However, attitudes & behaviors are expected to be consistent with each other
      - Behaviors can influence attitudes
        - » Positive experience leads to a positive attitude
        - » Bad experience leads to a bad attitude
        - » Restaurants give out coupons for free-dining to erase the bad experience & attitude
  - Researchers treat attitudes as **hypothetical constructs** due to their complexity, and the fact that they are inferred from the measurement of data (not actually observed)

ATTITUDES VS. BEHAVIOR

- Factors affecting the application of attitudinal research
  - **Specific attitudes** are better predictors of behavior than general ones
  - **Strong attitudes** are better predictors of behavior than weak attitudes composed of little intensity, or topical interest
  - **Direct experiences** with the attitude object produce behavior more reliably

ATTITUDES VS. BEHAVIOR

- Factors affecting the application of attitudinal research
  - **Cognitive-based attitudes** influence behaviors better then affective-based attitudes

    Based on **logic** (reading, listening, verbal, analytical ability)
  - Using **multiple measurements of attitude**, or several behavioral assessments across time & environments improves prediction
  - Influence of **reference groups** & individual's inclination to conform to these influences improves the attitude-behavior relationship

ATTITUDE SCALING

- **Attitude scaling** is the process of assessing an attitudinal disposition using a number than represents a person's score on an attitudinal continuum ranging from an extremely favorable disposition to an extremely unfavorable one.

- **Scaling** is the procedure for the assignment of numbers (or other symbols) to a property of objects in order to impart some of the characteristics of numbers to the properties in question

ATTITUDE SCALING

- Selecting & constructing a measurement scale requires the considerations of factors
  - Research objective
  - Response types
  - Data properties
  - Number of dimensions
  - Balanced or unbalanced
  - Forced or unforced choices
  - Number of scale points
  - Rater errors

RESEARCH OBJECTIVES

- General types of scaling objectives
  - To measure characteristics of the participants, who participate in the study
    - Measure the customer's orientation of a change in corporate logo as favorable, or unfavorable
  - To use participants as judges of the objects, or indicators are presented to them
    - How satisfied people are with different design options on a corporate logo

RESPONSE TYPES

- Measurement scales
  - Rating scale
    - Is used when participants score an object without making a direct comparison to another object, or attitude
      - Evaluating the style of the new Honda Jazz on 5-point rating scale
  - Ranking scale
    - Constraints the participants to make comparisons & determining order among 2 or more properties of an object
      - Participants have to choose which one of a pair of cars have more attractive styling; Honda Jazz or Suzuki Swift

RESPONSE TYPES

- Measurement scales
  - Rating scale
  - Ranking scale
  - Categorization
    - Asks participants to put themselves in group of categories
      - Asking participants to identify their gender, or ethnic background
  - Sorting
    - Requires participants sort cards into piles using criteria established by the researchers
      - Images of cars on cards to represent perceived car performance

DATA PROPERTIES

- Decisions about the choice of measurement scales are often made with regard to the data properties generated by each scale
  - Nominal
    - Classify data into categories without indicating order, distance, or unique origin
  - Ordinal
    - Relationships of **“more than”** and **“less than”**, but have no distance, or unique origin

DATA PROPERTIES

- Decisions about the choice of measurement scales are often made with regard to the data properties generated by each scale
  - Nominal
  - Ordinal
  - Interval
    - Have both order and distance, but no unique origin
  - Ratio
    - Possess all 4 properties' features

NUMBER OF DIMENSIONS

- Measurement scales are
  - Uni-dimensional
    - One seeks to measure only 1 attribute of the participant or object
      - An actor's star power is his/her ability to "carry" a movie
  - Multi-dimensional
    - Recognizes that an object might be better described with several dimensions than on a uni-dimensional continuum
      - An actor's star power is measured in ticket sales, speed of attracting financial resources & TV coverage

BALANCED OR UNBALANCED

- Balanced rating scale
  - Has an equal number of categories above & below the midpoint
    - Equal number of favorable & unfavorable response choices from respondents
      - "very good – good – average – poor – very poor"

- Unbalanced rating scale
  - Has an unequal number of favorable & unfavorable response choices
    - "poor – fair – good – very good – excellent"
      - It is expected that the mean ratings will be near "good" & there will be a symmetrical distribution of answers
        - » This scale **does not** allow participants to express unfavorable choices

FORCED OR UNFORCED CHOICES

- Forced-choice rating scale
  - Requires participants to select 1 of the offered alternatives
    - Usually includes
      - "no opinion", "undecided", "don't know", "uncertain", or "neutral"
  - When researchers know that most participants have an attitude on the topic
    - It is reasonable to constrain participants to focus on alternatives carefully & do not casually choose the middle position
      - However, when many participants are clearly undecided, the scale does not allow them to express their uncertainties
        - » This scale becomes bias

FORCED OR UNFORCED CHOICES

- Unforced-choice rating scale
  - Provides participants with an opportunity to express no opinion when they are unable to make a choice among the available alternatives

NUMBER OF SCALE POINTS

Characteristics	Dichotomous	Multiple Choice	Checklist	Rating	Ranking	Free Response
Type of Scale	Nominal	Nominal, ordinal or ratio	Nominal	Ordinal or interval	Ordinal	Nominal or ratio
Usual Number of Answer Alternatives Provided	2	3 to 10	10 or fewer	3 to 7	10 or fewer	None
Desired Number of Participant Answers	1	1	10 or fewer	1 per item	7 or fewer	1
Used to Provide ……	Classification	Classification, order, or specific numerical estimate	Classification	Order or distance	Order	Classification, order, or specific numerical estimate

RATER ERROS

- Error of central tendency
  - Error from raters to give extreme judgments

- Error of leniency
  - Error from participants to be "easy raters", or "hard raters"
    - Mostly occur in educational institutions
      - A lecturer "prefers" to give easy scores
        - » To gain popularity from students as a "good/favorite lecturer"
        - » To receive good feedback/evaluation from students
        - » To maintain continuous appointment
        - » To receive salary/wages adjustments

RATER ERROS

- Halo effect
  - Systematic bias that the rater introduces by carrying over a generalized impression of the subject from one rating to another
    - A lecturer expects the students, who does well on the first question, to do well also on the second question.
    - A report is good simply because you like the format
    - Someone is intelligent because you agree with him/her
  - Difficult to avoid if the object being studied is **not clearly defined**, **not easily observed**, or **not frequently discussed**

RATER ERROS

- Minimizing errors
  - Countering errors of tendency & leniency
    - Adjust the strength of descriptive adjectives
    - Space the intermediate descriptive phrases farther apart
    - Provide smaller differences in meaning between the steps near the ends of the scale than between the steps near the center
    - Use more points in the scale
  - Countering hallo errors
    - Have the participants to rate 1 feature at a time
    - Reveal 1 feature at a time & participants cannot return & change his/her previously noted response
    - Periodically reversing the choices

RATING SCALES

- Simple attitude scales
  - Also known as "dichotomous scale"
    - Easy to develop
    - Relatively inexpensive
    - Can be designed to be highly specific
    - Rather subjective in nature
  - Offer 2 mutually exclusive response choices
    - Yes vs. No
    - Agree vs. Disagree
    - Important vs. Unimportant
    - Male vs. Female

RATING SCALES

- Simple attitude scales
  - Multiple choice, single-response scale
    - There are multiple options for participants, but only 1 answer is sought
      - Primary choices should cover 90% of the range
      - The remaining 10% should be categorized as “others”
  - Multiple choice, multiple-response scale
    - Also known as “checklist”
    - Allows participants to select 1 or several alternatives

RATING SCALES EXAMPLE

"I plan to purchase an Apple computer in the next 12 months"

- ☐ yes
- ☐ no

"What newspaper do you read most often for financial news?"

- ☐ Kompas
- ☐ Media Indonesia
- ☐ Bisnis Indonesia
- ☐ The Jakarta Post
- ☐ Others (specify ……)

RATING SCALES EXAMPLE

"Check any of the sources below that you have consulted prior to making the actual purchase on a car"

- ☐ Newspapers
- ☐ Magazines
- ☐ Internet
- ☐ Family members
- ☐ Used & New car salespersons
- ☐ Others (specify ……..)

RATING SCALES

- Likert Scales
  - Developed by Rensis Likert
  - Summated rating scales
    - Consist of statements that express either a favorable, or an unfavorable attitude toward the object of interest
      - Participants are asked to agree or disagree with each statement
      - Each response is given a numerical score to reflect its degree of attitudinal favorableness
        - » Scores may be summed to measure the participant's overall attitude

    - "Online newspapers are superior to traditional newspapers"

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
(5)	(4)	(3)	(2)	(1)

RATING SCALES

- Likert Scales
  - "1" is the least favorable
  - Variations of Likert Scale
    - 5-scale; 7-scale; or 9-scale
    - More scales mean
      - Better approximation of a normal response curve
      - Extraction of more variability among respondents
  - This scale is popular among researchers
    - Easy to construct
    - More reliable
    - Provide a greater volume of data
    - This scale produces interval data

RATING SCALES

- Semantic differential scales
  - measures the psychological meanings of an attitude object using bi-polar adjectives
    - Researchers use this scale for studies on **brand** & **institutional image**
  - Based on the proposition that an object can have several dimensions of **connotative meaning**
    - The meanings are located in multi-dimensional property space (semantic space)
    - Connotative meanings are suggested, or implied meanings, in addition to the explicit meaning of an object

RATING SCALES

- Efficient & easy way to secure attitudes from a large sample
  - These attitudes may be measured in direction & intensity
- A standardize technique, which can be repeated
- Provides an interval data

Toyota Auto2000

High Quality								Low Quality
Fast								Slow
Friendly								Unfriendly
Professional								Unprofessional
Expensive								Cheap
Satisfied								Unsatisfied

RATING SCALES EXAMPLES

Evaluation	Potency	Activity
Good - bad	Hard – soft	Active – passive
Positive - negative	Strong – weak	Fast – slow
Optimistic - pessimistic	Heavy – light	Hot – cold
Complete - incomplete	Masculine – feminine	Excitable – calm
Timely - untimely	Sever – lenient	
	Tenacious - yielding	

Sub-categories of Evaluation

Meek Goodness	Dynamic Goodness	Dependable Goodness	Hedonistic Goodness
Clean - dirty	Successful – unsuccessful	True – false	Pleasurable – painful
Kind - cruel	High – low	Reputable – disreputable	Beautiful – ugly
Sociable - unsociable	Meaningful – meaningless	Believing – skeptical	Sociable – unsociable
Light - dark	Important – unimportant	Wise – foolish	Meaningful – meaningless
Harmonious - dissonant	Progressive – regressive	Healthy – sick	

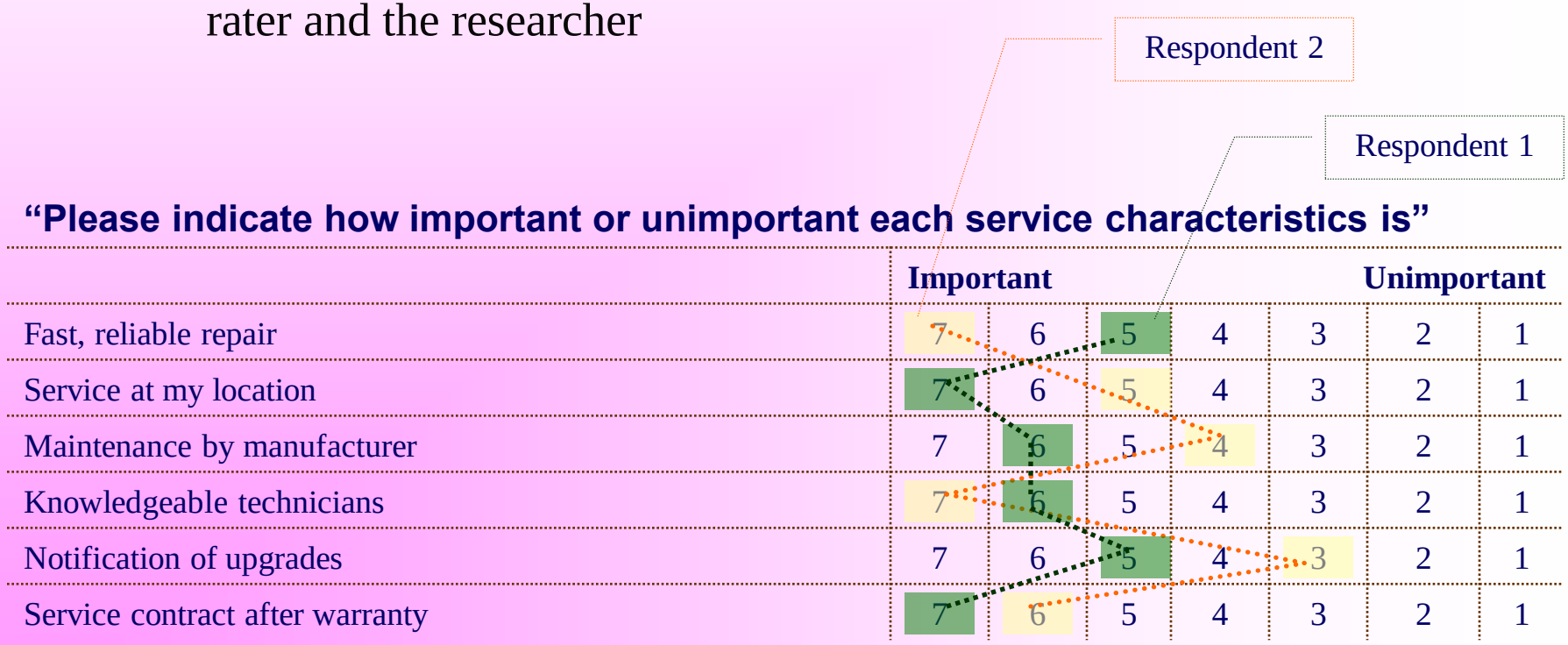
RATING SCALES

- Numerical rating list scales
  - Have equal intervals that separate their numeric scale points
  - Participants write a number from the scale next to each item

Extremely Favorable	5	4	3	2	1	Extremely Unfavorable
Employee's cooperation in teams						
Employee's knowledge of task						
Employee's planning effectiveness						

RATING SCALES

- Multiple rating list scales
  - It accepts a circled response from the participants
  - This scale provides interval data
  - The layout facilitates visualization of the results
    - The mental map of the participant's evaluation is clearly evident to the rater and the researcher



RATING SCALES

- Stapel scales
  - Used as an alternative to the semantic differential scales
    - Especially when it is difficult to find bi-polar adjectives that match the investigative questions
    - The scale is composed of the word, or phrase identifying the image dimension
    - It provides interval data
  - Constant-sum scales
    - Participant allocates points to more than 1 attribute, such that they total a constant sum
      - You have 100 points to distribute among the following characteristics of Teddy Binatu®
        - » Pressing quality .....
        - » Price .....
        - » Delivery service .....
        - » Phone courtesy .....
        - » Total 1 0 0

RATING SCALES

- Stapel scales
  - Constant-sum scales
  - Graphic rating scales
    - This scale provides interval data
    - Originally created to enable researcher to distinguish fine differences
    - Theoretically, an infinite number of ratings are possible, if participants are sophisticated enough to differentiate and record them.
      - Participants put their marks along a continuum
    - It is difficult to code the responses and analyze such codes

Never ____X____ Always

Important ____X____ Unimportant

RATING SCALES

- Ranking scales
  - Participants are directly compares 2 or more objects & makes choices among them
    - Frequently participants are asked to select one as the “best”, or the “most preferred”
  - Paired-comparison scale
    - Participants can express attitudes unambiguously by choosing between 2 objects
    - This scale provides ordinal data

For each pair of city cars listed, place a check mark next to the one you would MOST PREFER, if you had to choose between the two	
……. Honda Jazz ……. Suzuki Swift	…… Suzuki Swift …… Toyota Yaris
……. Suzuki X-Over ……. Honda City	…… Honda City …… Suzuki Baleno

RATING SCALES

- Ranking scales
  - Paired-comparison scale
  - Forced ranking scale
    - Listing attributes that are ranked relative to each other
    - This method is faster than paired comparisons
    - It is easier & more motivating to participants
      - 5 ranking is preferable as more item to rank becomes difficult for participants

Rank Suzuki Swift features in your order of preference. Place "1" next to the most preferred, "2" by the second choice, and so forth	
…….. Engine size	……. Choice of colors
…….. Audio system	……..... Size
…… "young" image	……. Brand

RATING SCALES

- Ranking scales
  - Paired-comparison scale
  - Forced ranking scale
  - Comparative scale
    - Ideal if participants are familiar with the standard
    - Researchers treat data as interval data since the scoring reflects an interval between the standard & what is being compared

Compared to your previous car, the new car is

Superior		About the same		Inferior
1	2	3	4	5

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PROBABILITY

NON-PROBABILITY

SAMPLING

Research in Business Studies

INTRODUCTION

- Basic idea of sampling is that by selecting some of the elements in population, the researchers can draw conclusions about the entire population

- Why sample?
  - Lower cost
  - Greater accuracy of results
  - Greater speed of data collection
  - Availability of population elements

PROBABILITY SAMPLING

- Simple random sampling
  - This is the purest form of probability sampling
    - Unrestricted to any elements/factors
  - Population element has a known & equal chance of selection

$$selection\% = \frac{samplesize}{populationsize}$$

  - Appear easy to implement, but it is impractical
    - Requires a list of population
    - Can be time consuming
    - Expensive
    - Can require larger sample sizes than other probability methods

PROBABILITY SAMPLING

- Systematic sampling
  - Every k^{th} element in the population is sampled
  - Beginning with a random start of an element in the range of 1 to k

$$k = skip = \frac{populationsize}{samplesize}$$

  - Simple & flexible to implement
  - Watch for
    - Periodicity
      - hours, days, weeks, months
    - Monotonic trend
      - Population list varies from the smallest to the largest

PROBABILITY SAMPLING

- Stratified sampling
  - Segregated populations into several mutually exclusive sub-population ("strata")
    - College students
      - Class level – major – gender
  - Proportionate sampling
    - The sample size follows the population elements

Disproportionate sampling indicate that the sample size does not follow the population elements

  - Reasons
    - Increase a sample's statistical efficiency
    - Provide adequate data for analyzing the various strata
    - Enable different research methods & procedures to be used in different strata

PROBABILITY SAMPLING

- Cluster sampling
  - Divided population into groups of elements, with some groups randomly selected for study
    - Families in the same block are often similar in
      - Social class, income level, ethnicity
  - Conditions that foster the use of cluster sampling
    - Need for more economic efficiency
    - Frequent unavailability of a practical sampling frame for individual elements

PROBABILITY SAMPLING

Stratified Sampling	Cluster Sampling
Divide the population into a **few** sub-groups	Divide the population into **many** sub-groups
Each sub-group has **many** elements in it	Each sub-group has **few** elements in it
Sub-groups are selected according to some criterion that is related the variables under study	Sub-groups are selected according to some criterion of ease or availability in data collection
Try to secure **homogeneity within** sub-groups	Try to secure **heterogeneity within** sub-groups
Try to secure **heterogeneity between** sub-groups	Try to secure **homogeneity between** sub-groups
Randomly choose elements from within each sub-group	Randomly choose several sub-groups to study in-depth

PROBABILITY SAMPLING

- Double sampling
  - It may be more convenient to collect some information by sample, and then use this information as the basis for selecting a sub-sample for further study
    - Telephone survey to discover who are interested
    - Telephone survey to discover the degree of their interests
      - Interested vs. degree of interests

PROBABILITY SAMPLING

Type	Description	Advantages	Disadvantages
SIMPLE RANDOM Cost: high Use: moderate	Each population element has an equal chance of being selected into the sample Sample drawn using random number table/generator	Easy to implement with automatic dialing & with computerized voice response systems	Requires a listing of population elements Takes more time to implement Uses larger sample sizes Produces larger errors
SYSTEMATIC Cost: moderate Use: moderate	Selects an element of the population at the beginning with a random start, and following the sampling skip interval selects every k^{th} element	Simple to design Easier to use than the simple random Easy to determine sampling distribution of mean or proportion	Periodicity within the population may skew the sample & results If the population list has a monotonic trend, a biased estimate will result based on the start point

PROBABILITY SAMPLING

Type	Description	Advantages	Disadvantages
STRATIFIED Cost: high Use: moderate	Divides population into strata & uses simple random on each stratum. Results may be weighted & combined	Researchers controls sample size in strata Increased statistical efficiency Provides data to represent & analyze sub-groups Enables use of different methods in strata	Increased error will result if sub-groups are selected at different rates Especially expensive if strata on the population have to be created
DOUBLE Cost: moderate Use: moderate	Process includes collecting data from a sample using a previously defined technique Based on the information found, a sub-sample is selected for further study	May reduce costs, if first stage results in enough data to stratify, or cluster the population	Increased costs, if indiscriminately used

PROBABILITY SAMPLING

Type	Description	Advantages	Disadvantages
CLUSTER Cost: moderate Use: high	Population is divided into internally heterogeneous sub-groups Some are randomly selected for further study	Provides an unbiased estimate of population parameters, if properly done Economically more efficient than simple random Lowest cost per sample, especially with geographic clusters Easy to do without a population list	Often lower statistical efficiency [more errors] due to sub-groups being homogeneous rather than heterogeneous

Hypothesis Testing

Analysis & Presentation of Data

Introduction

- Scientific reasoning
  - **Inductive** reasoning
    - Moves from specific facts to general
    - No guarantee that inductive conclusions are flawless
      - With aids of probability estimates, inductive conclusions can be qualified with a certain degree of confidence
  - **Deductive** reasoning
    - Moves from general to specific

Inferential statistics (estimation of population values & testing statistical hypothesis)

Introduction

- Inferential Statistics
  - Estimation of population values
  - Testing statistical hypothesis

- Classical Statistics
  - Found in major statistics textbooks & widely used in research applications.
  - Represent an objective view of probability in which the decision making rests totally on an analysis of available sampling data.

Introduction

- Bayesian Statistics
  - This is an extension of the classical statistics
  - Consists of **subjective probability estimates**
    - Stated in terms “degrees of belief”
    - Based on general experience rather than on specific collected data

Univariate Statistics

- Test of statistical significance
- Hypothesis testing one variable at a time

Null hypothesis
Alternative hypothesis

Hypothesis is defined as;
Unproven proposition

Supposition that tentatively explains certain facts or phenomena

Assumption about nature of the world

Null Hypothesis is a statement about the status quo (no difference)

Alternative Hypothesis is a statement that indicates the opposite of the null hypothesis

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Significance Level

- Critical probability in choosing between the null hypothesis and the alternative hypothesis
  - Critical Probability
  - Confidence Level
  - Alpha
  - Probability Level selected is typically .05 or .01
  - Too low to warrant support for the null hypothesis

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The Logic of Hypothesis Testing [1]

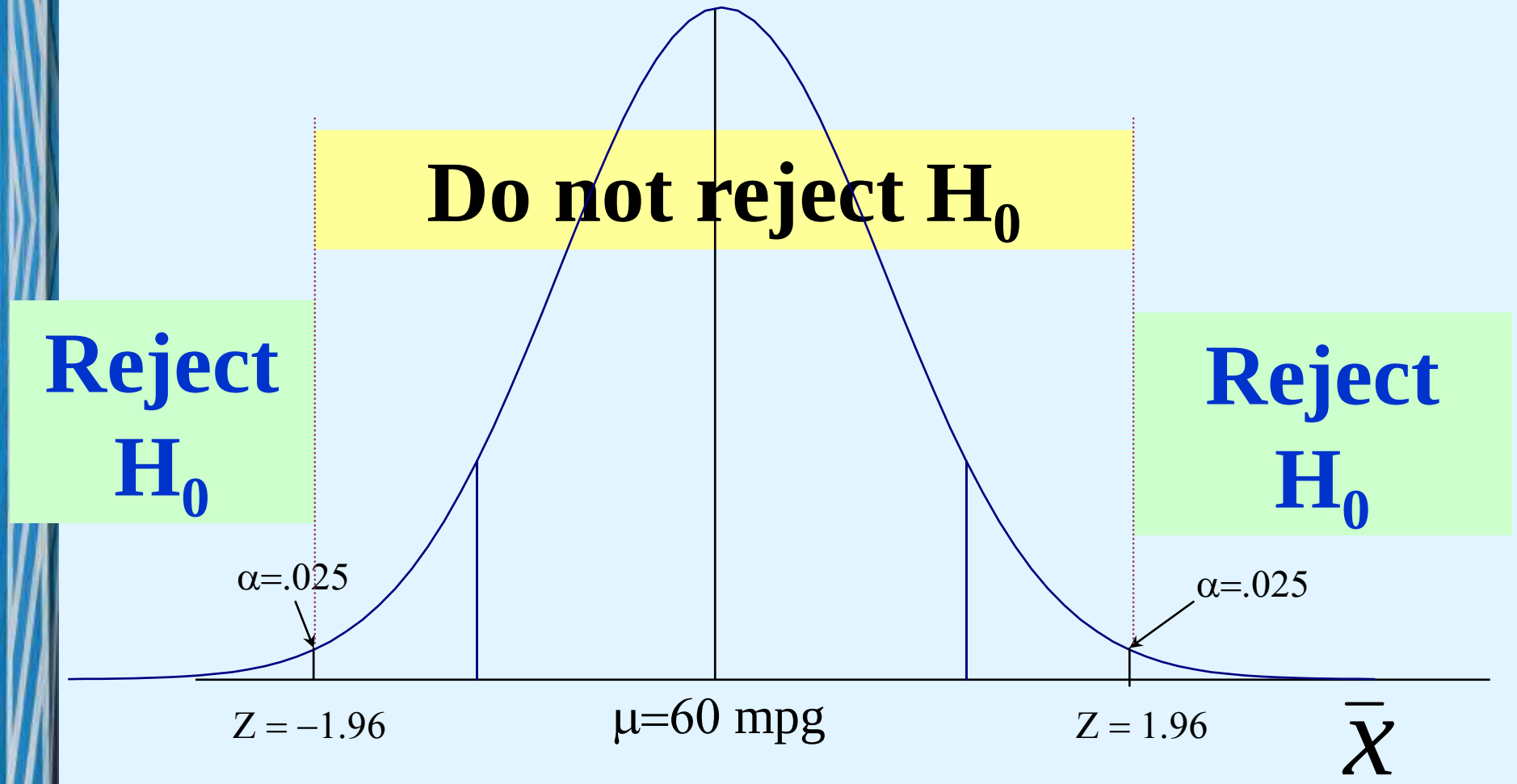
- Classical tests of significance
  - Null hypothesis (H_0)
  - Alternative hypothesis (H_1 or H_A)
  - H_0 = a statement that **no difference exists** between the parameter
  - H_1 = a statement that **differences exists** between the parameter

The Logic of Hypothesis Testing [1]

- For example
  - H_0 = The average miles per gallon for city cars **does not change** from 60 mpg
  - H_1 = The average miles per gallon for city cars **does change** from 60 mpg
    - This means that the alternative hypothesis correspond with **2-tailed tests (non-directional tests)**, which consists of 2 possibilities;
      - The average mpg is more than 60 mpg
      - The average mpg is less than 60 mpg

2-Tailed Tests

- For example, you choose level of significance = 5%

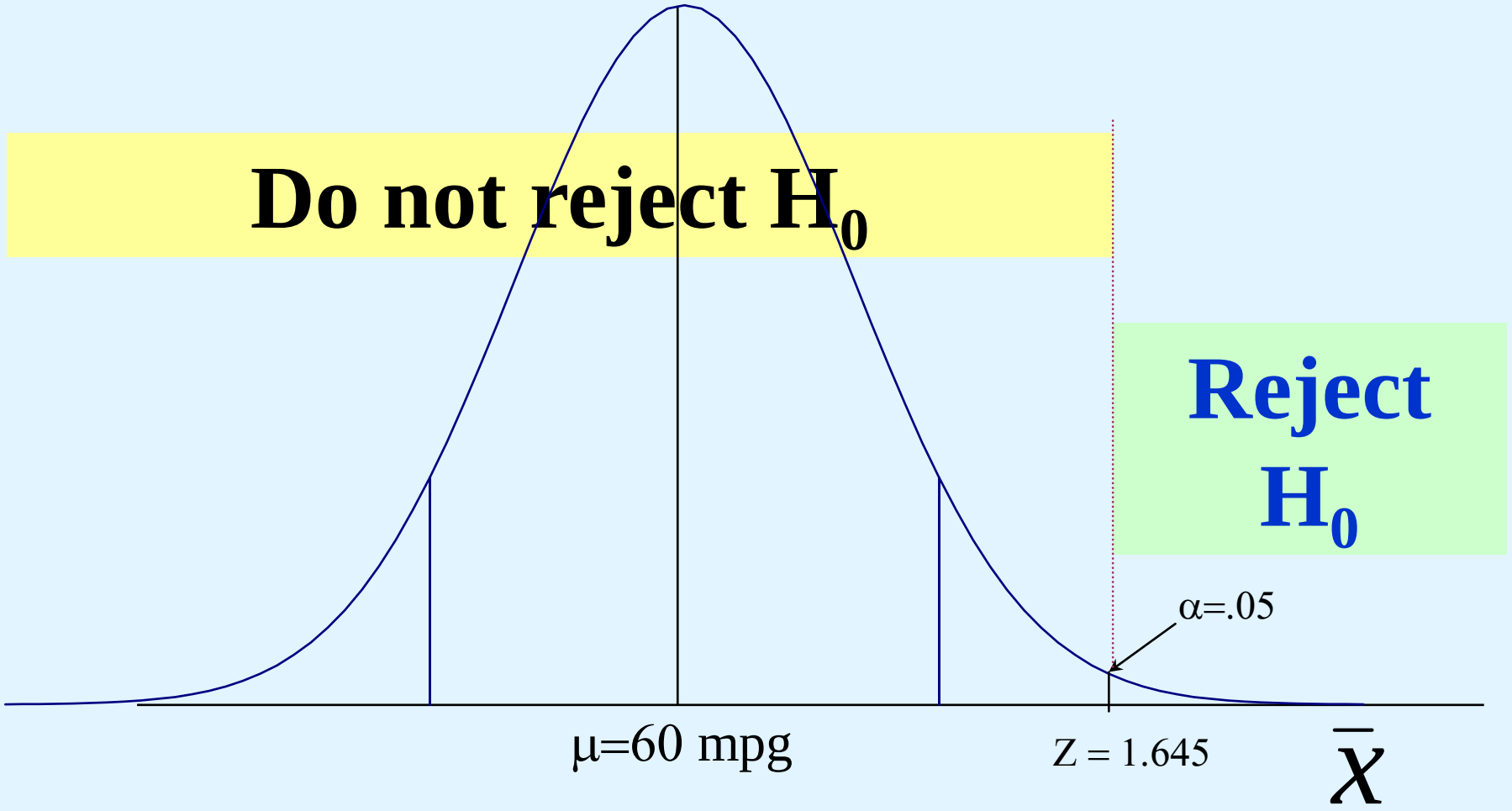


The Logic of Hypothesis Testing [2]

- For example
  - H_0 = The average miles per gallon for city cars **does not change** from 60 mpg
  - H_1 = The average miles per gallon for city cars **has increased** from 60 mpg
    - This means that the alternative hypothesis correspond with **1-tailed tests (directional tests)**, which consists of only 1 possibility;
      - The average mpg is more than 60 mpg

2-Tailed Tests

- For example, you choose level of significance = 5%



Type I and Type II Errors

	Accept H_0	Reject H_0
H_0 is true	**Correct Decision** Power of Test Probability = 1- α no error	**Type I error** Significant level probability = α
H_0 is false	**Type II error** Power of Test Probability = β	**Correct Decision** Power of Test Probability = 1 - β no error

Statistical Testing Procedures[1]

- State H_0
- Choose the statistical test
  - Power of efficiency of the test
    - Using the same level of significance with smaller sample size
  - How the sample was originally drawn
  - The nature of the population
  - Type of measurement scale used

Statistical Testing Procedures[2]

- Select the desired level of significance
  - The most common level is between 0.01 – 0.05
    - This depends on **how much risk the researcher is willing to accept**, and **how much tolerance in making potential errors**.
      - The larger the α, the lower the β

Rejecting H_0 when H_0 is true

Accepting H_0 when H_0 is false

Statistical Testing Procedures[3]

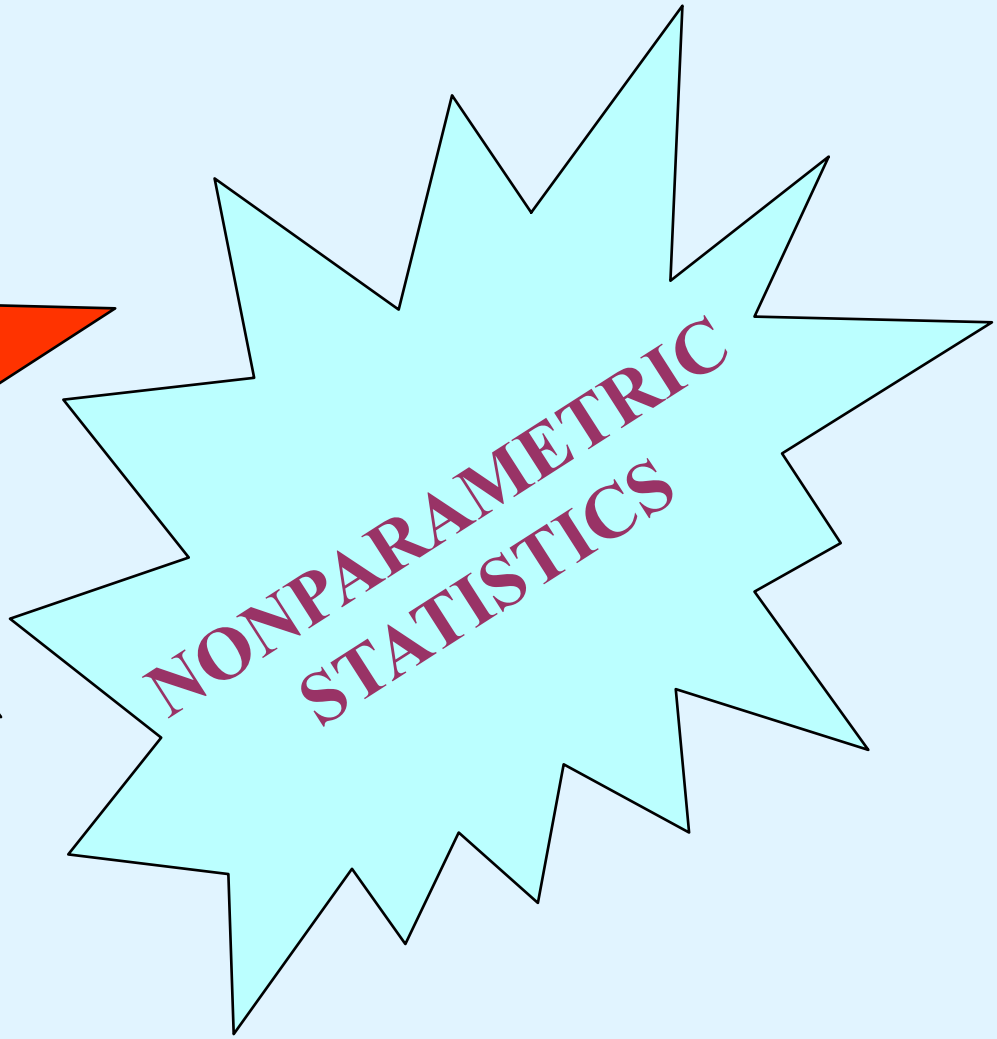
- Compute the calculated difference value
  - This is done using formula for the appropriate significance test to obtain the calculated value
    - Using various statistical software
- Obtain the critical test value
  - Critical value is the criterion that defines the region of rejection from the region of acceptance of the H_0
- Interpret the test
  - If the calculated value is larger than the critical value, H_0 is rejected, and conclude that H_1 is supported

Probability Values (p-value)

- P-value is the probability of observing a sample value as extreme as, or more extreme than, the value actually observed, given that H_0 is true.
- For example;
  - P-value = 0.0062, and α = 0.05
    - Therefore, it can be concluded that since p-value is considerably less than a, H_0 is rejected.
      - The probability of making a wrong conclusion is a mere 0.0062, or 0.62%

Tests of Significance

- Types of Tests;



Tests of Significance

- Parametric tests:
  - more powerful because the data are derived from **interval** and **ratio** measurements
- Non-parametric tests:
  - Used to test hypothesis with **nominal** and **ordinal** data

Parametric Tests

- Assumptions;
  - Observations must be independent
    - The selection of any one case should not affect the chances for any other case to be included in the sample
  - Observations should be drawn from normally distributed populations
  - These populations should have equal variances
  - The measurement scales should be at least interval

Parametric Tests

- Normality of a distribution
  - Normal probability plot
    - This plot compares the observed values with those expected from a normal distribution
  - De-trended plot
    - This plot evaluates the deviations from the straight line
    - Expects points to cluster without pattern around a straight line passing horizontally
- Analysis of variance or regression
  - Using statistical software

Non-Parametric Tests

- Have fewer & less stringent assumptions
- Do not specify normally distributed populations, or equality of variance

- Use **nominal** & **ordinal** data
  - May also be used with **interval** & **ratio** data

- Easy to understand & use

How to Select a Test?

- Researcher must consider the following **main questions**;
  - Does the test involve 1 sample, 2 samples, or more samples (k sample)?
  - If 2 samples, or k samples are involved, are the individual cases independent or related?
  - Is the measurement scale nominal, ordinal, interval, or ratio?

How to Select a Test?

- Researcher must consider the following **additional questions**;
  - What is the sample size?
    - if there are several samples, are they of equal size?
  - Have the data been weighted?
    - Have the data been transformed?

Selecting Tests Using the Choice Criteria

Measurement Scale	One-Sample Test	Two-Sample Tests		K-Sample Tests	
		Related Samples	Independent Samples	Related Samples	Independent Samples
Nominal	Binomial χ^2 one-sample test	McNemar	Fisher exact test χ^2 two-samples test	Cochran Q	χ^2 for k samples
Ordinal	Kolmogorov-Smirnov one-sample test Runs test	Sign test Wilcoxon matched-pairs test	Median test Mann-Whitney U Kolmogorov-Smirnov Wald-Wolfowitz	Friedman two-way ANOVA	Median extension Kruskal-Walls one-way ANOVA

Selecting Tests Using the Choice Criteria

Measurement Scale	One-Sample Test	Two-Sample Tests		K-Sample Tests	
		Related Samples	Independent Samples	Related Samples	Independent Samples
Interval & Ratio	T-test Z-test	T-test for paired samples	T-test Z-test	Repeated measures ANOVA	One-way ANOVA N-way ANOVA

One-Sample Tests

- These tests are used when researchers have a **single sample**, and wish to test the hypothesis that it comes from a specified population

The example of a table for your questionnaire design

1. Questionnaire Design for General Statements

Variable	Sub-Variables (Indicators)	Statements	Scale
This is for general questions only. This is beneficial for future stories in data analysis and interpretation	GENDER	What is your gender? a) Male, b) Female	Nominal
	AGE	What is your age? a) Below 18, b) 19-25 c) 26-35 d) 36-45 e) 46-55 f) 56 and above	Nominal
	OCCUPATION	In which industrial sector do you work? a) Energy Sector, b) Finance and Banking, c) Hospitality, d) Commerce, e) Healthcare, f) Others	Nominal
	INCOME	What is your income? a) < QR 2000 b) QR 2000 - QR 10999 c) QR 11000 - QR 19999 d) QR 20000 - QR 28999 QR e) QR 29000 and greater	Nominal
	RESIDENTIAL AREA	In which residential area do you live in? a) West Bay, b) Barwa City, c) Al-Khor City, d) Al-Messaied City, e) Others	Nominal

2. Questionnaire Design for Other Variables

Variables	Sub-Variables (Indicators)	Statements	Scale
DIVERSITY	EXPERIENCE	How long have you been working in Qatar? a) Below 1 year, b) 1-2 years c) 3-4 years d) 5 years and above	Nominal
		My company understands the value of an employees' diverse work experience.	LIKERT
	EDUCATION	What is your educational level? a) High School, b) Undergraduate, c) Graduate, d) Doctoral, e) Others	Nominal
		My company understands the value of an employees' diverse educational backgrounds.	LIKERT
	RELIGION	What is your religion? a) Muslim, b) Protestant, c) Roman Catholic, d) Hindu, e) Buddhist, f) Others	Nominal

Variables	Sub-Variables (Indicators)	Statements	Scale
		My company understands the value of religious tolerance and provides benefits (ex. Christmas holidays for Christians, etc.).	LIKERT
	ETHNICITY	What is your ethnicity? a) Javanese, b) Sundanese, c) Malay, d) Madurese, e) Batak, f) Others	Nominal
		My company understands the importance of having ethnic diversity in the workplace.	LIKERT
	MARITAL STATUS	What is your marital status? a) Single, b) Engaged, c) Married with children, d) Married w/o children e) Divorced, f) Others	Nominal
		My company provides marital benefits (ex. finances for accommodation and children's schooling, maternity leave).	LIKERT
JOB SATISFACTION	SALARY	I am compensated very well for the work that I do.	LIKERT
		The company's benefits meet my needs completely.	LIKERT
	JOB SECURITY	I am confident that I will be working for my company a year from now.	LIKERT
		I am not easily replaceable by my company.	LIKERT
	WORK CONDITIONS	I am well-informed about the possible safety hazards of my workplace.	LIKERT
		The physical work conditions (e.g. heating, ventilation, space, cleanliness) are excellent.	LIKERT
	POLICIES	The company's policies and procedures are comprehensible.	LIKERT
		The policies and procedures at my workplace are heavily monitored and well-enforced.	LIKERT
	RELATIONSHIPS	I have productive friendships with my colleagues or teammates at work.	LIKERT
		I have excellent workplace relations with my supervisors and/or higher-ups.	LIKERT
	SUPERVISION	My supervisor provides me with comprehensive feedback.	LIKERT

Variables	Sub-Variables (Indicators)	Statements	Scale
		My supervisor or higher ups gives fair treatment to all employees.	LIKERT
WORK MOTIVATION	ACHIEVEMENT	I possess a sense of accomplishment from my work.	LIKERT
		I possess a sense of pride after finishing tough work assignments.	LIKERT
	RECOGNITION	I am recognized by my colleagues for the work that I do.	LIKERT
		I am recognized by my superiors for my contributions.	LIKERT
	THE WORK ITSELF	I find my job to be interesting and/or challenging.	LIKERT
		My job makes good use of my skills and abilities.	LIKERT
	RESPONSIBILITY	I am given excellent levels of autonomy in the work that I do.	LIKERT
		I always feel in control, responsible and involved in the work that I do.	LIKERT
	ADVANCEMENT	Job promotions exist for all job levels and positions.	LIKERT
		There exist achievable opportunities for promotion in my role.	LIKERT
	GROWTH	I am provided with opportunities to improve my work skills.	LIKERT
		I have the training and managerial support to do my job correctly.	LIKERT
EMPLOYEE LOYALTY	OBEDIENCE	I have no issues in adhering to all the rules and regulations valid within my company.	LIKERT
		I have no issues in performing all duties given by my superiors.	LIKERT
	RESPONSIBILITY	I possess a sense of responsibility to meet the needs of all internal and external stakeholders.	LIKERT
		I act against those who exhibit irresponsible behaviors that can cause harm to my company and its objectives.	LIKERT
	DEDICATION	I'm always happy to suggest solutions for problems that are encountered at my workplace.	LIKERT

Variables	Sub-Variables (Indicators)	Statements	Scale
		I always try to help my colleagues or superiors whenever needed.	LIKERT
	INTEGRITY	When I make mistakes, I have no problems at all admitting them to those that were affected.	LIKERT
		I always consider the moral and ethical values of my decisions in the workplace.	LIKERT