DEVELOPING INSTRUMENT - IDENTIFYING VARIABLES

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Data collection

- Gather information about one’s study
- Method of data collection:
  - Qualitative vs Quantitative
- Sources of information/Data:
  - Primary – get the information first-hand
  - Secondary – use existing records

(Kumar, 2011)
Observation – a purposeful, systematic & selective way of watching and listening to a phenomenon of study.

Types of observation:
- Participant – researcher participate in the activity.
  - Examine reaction of people on wheelchair. Study the reaction by sitting on a wheelchair
- Non-Participant Observation – not involved in the activity
  - Observe the reaction

Problems with observation method
- Hawthorne effect
- Observer bias
- Different interpretation from different observer
- Incomplete observation

Situations observation can be made:
- Natural
- Controlled
Recording observation

- Narrative recording – write brief notes during observation, soon after complete the observation make detailed notes in narrative form.
  - Qualitative approach
- Using scale – record observation based on scale. Does not have to spend time taking notes, but may lead to errors such as error of central tendency, elevation effect and halo effect.
  - Quantitative approach

Interview

- Verbal interchange, often face-to-face where the interviewer tries to get information. Beliefs, opinion from another person.
- Structure or unstructured
  - Structured
    - Can be qualitative or quantitative:
      - Advantage of structured: Uniformity
  - Unstructured
    - Qualitative
Types of interview (qualitative):
- In-depth
- Focus Group

Disadvantage of interview
- Time consuming
- The quality of data depends upon the:
  - quality of interaction
  - Quality of the interviewer
- Bias
Instrument Development - questionnaire

- Questionnaire – a written list of questions responded by respondents.
  - Respondent read the Q, interpret what is expected and write down their answer.
  - Respondent make own interpretation to the statements. Therefore it’s important for the questionnaire to be clear and easy to understand.
    - Layout of questionnaire should be easy to read & pleasant to the eye
    - Sequence of question should be easy to follow.

Things that you need to know about instrument development using questionnaire

- How to design your questionnaire – types of question to ask.
  - Determine the scaling/response format – for unobserved variables/attitudinal scale
  - Type of question – open vs close ended (scaling needed)
- How to collect your data – mailed, website, group administered
- Knowing the measurement scale – relate to your data analysis & your scaling
- Validity and reliability of instrument
Ways of administering questionnaire

- **Mailed questionnaire** – send Q to respondent by mail. Major problem: low response rate.
- **Collective/group administered** – Administer to a group of respondent eg: people attending functions, student in classroom. After responding can immediately collect the Q. High response rate.
- **Administration in public place** – administer Q at shopping complex, hospital etc.
- **Phone interview** – call respondent. Researcher ask question – respondent respond.
- **Others** – email, internet, fax
- Important to write cover letter for mailed/drop & collect method

Forms of question

- Open ended – possible response are not given
- Close ended – possible answers are given in Q
Kita tidak boleh memudaratkan orang lain, tidak kira apa bentuk faedah yang akan diperolehi.

*The existence of potential harm to others is always wrong, irrespective of the benefits to be gained.*
The response format/rating scale/scaling

- **Scale** = A measure that captures the intensity of a person’s behaviors or feelings.
- **Some Commonly Used Scales**
  - **Likert Scale.** - most frequently used.
  - A statement is followed by several levels of agreement: strongly agree, agree, no opinion, disagree, strongly disagree. This five-point scale is commonly used, but other scales, from four to ten points, can be used as well
  - Assumption: each statement/item has equal weight or value in reflecting the variable/construct
  - [http://www.gifted.uconn.edu/siegle/research/instrument%20Reliability%20and%20Validity/Likert.html](http://www.gifted.uconn.edu/siegle/research/instrument%20Reliability%20and%20Validity/Likert.html)
  - **Semantic Differential** – measures meaning or attitude using bipolar adjectives
    - Good, , , , , , , Bad
  - **Simple categorical scale** – Yes-No; Male-Female

Other types of scaling

- **Thurston scale** – each item has no equal weight.
  - See example: [http://www.napce.org/documents/research-design-yount/12_scales_4th.pdf](http://www.napce.org/documents/research-design-yount/12_scales_4th.pdf)

- **Guttman scale** – ask question about an attribute progressively
  - See example: [http://www.csupomona.edu/~smemerson/nbu-program-eval/week7.htm](http://www.csupomona.edu/~smemerson/nbu-program-eval/week7.htm)
Formulating effective question

- Simple, everyday language
- Avoid ambiguous question – contains more than one meaning
- Avoid double barrel questions
  - Example: I am satisfied with my work and my boss.
- Don’t ask question based on presumption.
  - How many cigarettes do you smoke daily?
- Avoid leading question – leads a respondent to answer either positively or negatively.

Seeking permission in your data collection – ethical issue

- Institutional or organizational (e.g., school district)
- Site-specific (e.g., company)
- Individual participants
- Parents of participants who are not considered adults
- Faculty approval (e.g., university or college)

- Advantages & disadvantages of questionnaire
- Advantages & disadvantages of interview
Why Measure?

- Measurement = assigning numbers to empirical events, objects, properties or activities in compliance with a set of rules.
- Some reasons:
  - evaluate an explanation
  - test a hypothesis
  - provide empirical support for a theory
  - make a decision about phenomena of study
- More relevant to quantitative research than qualitative research.
- What is measured – variables of study
  - Conceptual definition
  - Operational definition – defines a variable in a specific measurement and testing criteria.

*Figure 5.1 Conceptualization and Operationalization Abstract Construct to Concrete Measure*

(Neuman, 2009)
What is a variable?

- A concept that can be measured (Kumar, 2005)
- A property that can take on different value (Kerlinger 1986).
- A variable is a characteristic that can take on different values.
  - Variable vs constant
  - Constant – characteristic that is same for every member
  - Example:
    - Variable: Gender, CGPA, attitude
    - Constant: Study undergraduate student. Status of the student as undergraduate.

Difference between concept vs variable

- Concept – mental image, subjective view, understanding of a concept may differ from person to person, cannot be measured.
- Variable – measurable on any four types of measurement scale.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effectiveness</td>
<td>Gender (Male/Female)</td>
</tr>
<tr>
<td>Rich</td>
<td>Religion</td>
</tr>
<tr>
<td>Domestic violence</td>
<td>Attitude</td>
</tr>
<tr>
<td>Academic dishonesty</td>
<td>Cheating behavior</td>
</tr>
</tbody>
</table>
### Converting concepts into variables

- **Variable serve as an indicator to the concept.**

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Indicators</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rich</td>
<td>Income Asset</td>
<td>Gross Salary per annum Value of house and care owned</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>Productivity Quality</td>
<td>Quantity of produced per day Number of customer complaints</td>
</tr>
</tbody>
</table>

### Variables in our study

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Conceptual definition</th>
<th>Operational definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turnover intention</td>
<td>An employees intention to voluntarily change jobs or companies. (Schyns, Torka, Goessling, 2007)</td>
<td>An employees intention to voluntarily change companies</td>
</tr>
<tr>
<td>Organizational justice</td>
<td></td>
<td>Procedural justice Distributive justice Interactional justice</td>
</tr>
</tbody>
</table>
Types of Variable

- Independent variable (IV) – the variable that is responsible for bringing about change in a phenomenon/situation.
  - Also known as predictor variable, exogenous variable
- Dependent variable – the outcome of the change brought about by the IV.
  - Also known as outcome variable, endogenous variable.

Example

Job Satisfaction (IV) \(\rightarrow\) Intention to leave (DV)
Measurement Scale of the variable

Types of measurements:

- **Nominal**
  - Categorical variable
  - Dichotomous variable (2 categ.)
  - Polytomous variable ( >2 categ.)

- **Ordinal**
- **Interval**
  - Continuous variable
  - Have continuity in the measurement
- **Ratio**

Measurement - process of assigning numbers to characteristics according to a defined rule. Not all measurement is the same.

Types of measurements

- **Nominal** – classification of indiv., object, status etc.
  - Data categories are mutually exclusive (an object can belong to only one category).
  - Data categories have no logical order.
  - Dichotomous – Gender
  - Polytomous - Ethnic Group.
- **Ordinal** - classification of indiv., object, status – ranked in a certain order (have logical order).
  - Example: Income group, Age group, Attitudinal scale.

- **Interval** – all characteristics of ordinal scale + uses a unit of measurement that enables the responses to be placed at equally spaced intervals.
  - Unit of measurement has arbitrary starting – **no true zero**. Zero mean something.
    - Temperature, Attitude scale, Test Score
      - $0^\circ$ Celsius – temperature is Cold. It does not mean No temperature.

- **Ratio** - all characteristics of an interval scale + there is a True Zero.
  - The scale has one property in addition to the properties of an interval scale – It has a true zero point that reflects an absence of the characteristic measured.
  - Example: Income, height, number of children
    - Zero means - no income, no height, no children
### Types of scale vs measurement scale

<table>
<thead>
<tr>
<th>Scale/response format</th>
<th>Measurement scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Likert scale</td>
<td>Ordinal</td>
</tr>
<tr>
<td>2. Categorical scale by certain order.</td>
<td></td>
</tr>
<tr>
<td>1. Thurston scale</td>
<td>Interval</td>
</tr>
<tr>
<td>2. Semantic Differential Scale</td>
<td></td>
</tr>
<tr>
<td>Guttman scale</td>
<td>Ratio</td>
</tr>
<tr>
<td>Simple categorical scale without any order.</td>
<td>Nominal</td>
</tr>
</tbody>
</table>

### Validity

- **Validity:** the degree to which the researcher has measured what it is designed to measure.
- **Are we measuring what we think we are measuring?**
- **Types of validity**
  - Face and Content (representative of all possible questions that could be asked)
  - Criterion validity (scores are a predictor of an outcome or criterion they are expected to predict)
  - Construct (determination of the significance, meaning, purpose, and use of the scores)
How to Create Good Measures: Reliability and Validity

Face & content validity

- **Face validity** – subjective agreement among professionals that the scale logically appears to reflect accurately what it intends to measure
- **Content validity** – ensure items and questions cover the full range of the issue/variable to be measured.

Source: Adapted from Babbie (2004:145).
Criterion validity

- Criterion validity – 2 types:
  - Predictive validity – the degree of the instrument can forecast an outcome.
  - Test scores are collected first; then at later time the criterion measure is collected.
    - Measure test score in DCE3002 with student work self-efficacy. Highly predictive if highly correlated.
  - Concurrent validity – how well an instrument compares with a second assessment concurrently done. Calculate the concurrent validity by correlating the scores.

Construct validity

- Assess whether the scores from an instrument contributes to the total variance observed in a phenomena (variables)/construct of study.
- The greater the variance attributable to the construct the higher the validity of the instrument.
- Use statistical technique – Factor Analysis.
Reliability

- Reliability: Scores from measuring variables that are stable and consistent
  - Consistent – when collect an information more than once using the same instrument get similar result.

- Example: Bathroom scale

- Types of reliability
  - Test-retest (scores are stable over time).
  - Administer instrument once, and then second time under the same condition. If scores are reliable they will highly correlate (.60)
  - Alternate forms (equivalence of two instruments)
    - Use 2 instrument both measuring the same variables and relating the scores
  - Alternate forms and test-retest
    - Administer test twice and uses an alternate form of the test from the 1st administration to the 2nd administration.
  - Inter-rater reliability (similarity in observation of a behavior by two or more individuals)
  - Internal consistency (consistent scores across the instrument)

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Measurement of variable

- Development of instrument to measure variable of study
- Content of an instrument:
  - Demographic profile – choose RELEVANT demographic profile
  - Variable of study to be measured
    - develop your own scale/instrument to measure the variable, or
    - Adopt or adapt from instruments developed by other researcher.

- 3 types:
  - Kuder-Richardson split half test. Used when:
    - Items on an instrument are scored true or false as categorical scores
    - Response are not influenced by speed
    - Items measure a common factor
    - Estimates only half of the instrument (10 items – assess only 5 items)
  - Spearman-Brown formula – similar to Kuder-Richardson, but estimates the full instrument
Cronbach alpha/coefficient alpha:
- Items scored as continuous variables (strong agree to disagree)

Conducting pre-testing
- Identify potential problems in understanding and interpreting the question
- To ascertain validity and reliability of your instrument
Internal consistency

- Individual scores are internally consistent across the items on the instrument.
- If someone completes items at the beginning of the instrument positively then they should answer the questions later in the instrument in a similar way.
- 3 types of internal consistency test

How to look for instrument developed by other researcher

- Look for instrument in Journals:
  - Research/empirical paper. [Check at METHOD section, Look for: Measures/Instrument/Variable section.
  - Papers on scale or instrument development/construction
Criteria for Choosing a Good Instrument

- Have authors developed the instrument recently?
- Is the instrument widely cited by other authors?
- Are reviews available for the instrument?
- Does the procedure for recording data fit the research questions/hypotheses in your study?
- Does the instrument contain accepted scales of measurement?
- Is there information about the reliability and validity of scores from past uses of the instrument?

Measurements

Attitudes toward Academic Dishonesty

Student attitudes toward the acceptance of academic dishonesty were measured using a 20-item scale developed by Rawwas and Isakson (2000) that measures various forms of collegiate cheating. Respondents were asked the extent to which they agreed (vs. disagreed) with each of the 20 items in the scale. A standard 5-point Likert-type scale was adopted. A confirmatory factor analysis was performed, and it supported the original study by Rawwas and Isakson (2000) that identified four significant and distinct dimensions (see Table 1). According to Peterson (1994) and Nonnany (1978), the reliabilities of all four dimensions were generally acceptable (α > .70 for the American sample and α > .65 for the Chinese group; see coefficient alphas in Table 2).

While the original labeling of these dimensions in the Rawwas and Isakson study (2000) was adopted from the wording used by Muñey and Vitulli (1992) for their Consumer Ethics scale, the present wording has been changed to better reflect the reality of each of the dimensions and improve reader comprehension. The first factor has been labeled Receiving and Abetting Academic Dishonesty. The most significant characteristics of these six actions are that they are (1) almost universally perceived as unethical and (2) must be im
Tugasan Bonus (Markah – 5%)
Mengenalpasti instrument kajian.
1. Pelajar dikehendaki mengenalpasti satu instrument yang berkaitan dengan pemboleh-ubah yang dikaji.
2. Pelajar perlu memerihalkan instrumen yang telah digunakan seperti berikut:
   1. Skala pengukuran yang diguna
   2. Nilai alpha (Conbrach alpha – bagi menentukan kebolehpercayaan instrument tersebut)
   3. Bilangan Item
   4. Sama ada instrument tersebut mengukur satu konstruk/dimensi atau mengukur beberapa dimensi bagi sesuatu pembolehubah. Apakah dimensi-dimensi tersebut.

Tarikh penyerahan: Minggu ke 8

Tugas Kumpulan:
Submit your conceptual and operational definition of the variables of study
Tarikh penyerahan: Minggu ke 8