

BBS 4th Year Business Research Methods Notes

Chapter 4: Measurement, Scaling, and Sampling

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Variables: is a symbol of an event, act, characteristics, trait or attributes that can be measured & assigned categorical values. It is characters, facts, qualities, signal, figure & symbols are variables.

Types of Variables:

- ① **Independent variables:** influences dependent variables (in +ve or -ve way). Do not change due to change in other " but change in it, changes other variables.
- ② **Dependent variables:** Independent variables में बदलाव होने पर ये variables में change होगा, इसे " dependent variables "।
Dependent " is variable of primary interest to researchers.

Innov. of new product → Sales

Independent variables

Dependent variables.

- ③ **Moderating variables:** Variable that affects the nature of the relationship betⁿ independent & dependent variables. For eg: the effect of varying levels of stress in diff. employees influences the relationship betⁿ mgt style & retention.

- ④ **Intervening variables:** Variable that surfaces betⁿ the time the independent variable operate to influence the dependent variable & their impact on the dependent variable.

Effective Training → Employee commitment
↓
Tenure of Job

Measurement:

Assigning no. or symbols to any product or event or issue or characteristics as per the certain pre-specified rule is measurement.

It is the composition of following processes:-

- (i) Selectⁿ of observable empirical events,
- (ii) Developing set of rules: a scheme for assigning no. or symbols.
- (iii) Applying rules to each observⁿ of that event.

Nature/Characteristics of Good Measurement

The tools to be used in measurement should be simple & able to ↑ efficiency of a researcher.

- (i) **Validity**: related with rationality of measuring tools. Refers to the ability of a measuring tool to measure what it intends to measure.
 - (a) **Content Validity**: Face validity. Refers to adequate coverage of the concept. The more scale items represents the concept of the research topic; the instrument has greater validity.
 - (b) **Criterion-related validity**: refers the success of measures used for predicⁿ or estimⁿ. Helps to establish correlⁿ betⁿ actual & st. work.
 - (c) **Construct Validity**: Is internal validity. If a measure confirms the predicted correlⁿ with other theoretical proposition then such measure possesses construct validity.
- (ii) **Reliability**: Refers to the act of generating stable & consistent results when instruments are used in diff. sample & situatⁿ.
" of research depend on nature of data, validity & reliability instrument & result. Highly reliable data provides accurate results. Stable & consistent result is possible with help of reliable data.

measurement should have following qualities to be reliable:-

- ① Stability ② Equivalence ③ Internal consistency.

reliability can be measured using following methods:-

① Test-retest method:-

If correlⁿ is $\uparrow$ = measuring instruments are $\uparrow$ reliable
& vice-versa.

② Alt. or parallel form method:-

③ Split-half method:- shows correlⁿ betⁿ 2 half of instruments.

It shows the degree to which instruments are similar
& reflect the same construct under study.

④ Inter-rater method:-

③ **Practability**:- instruments developed to measure the attitude of people must be applicable in practice. Practability should have following qualities:-

① **Economy**:- Instrument should be less expensive, i.e. there should be trade off betⁿ ideal research project & budget available for the research.

② **Convenience**:- Give attentⁿ on design & layout of questionnaire. Questionnaire with clear instruction.

③ **Interpretability**:- questionnaire designer to provide detail informⁿ for the interpretⁿ of the results. Detail instructⁿ for administrⁿ, scoring keys & instructⁿ, norms for reference grp, evidence about reliability etc. to be provided by instrument designer.

Scaling:

Activity of creating continuous values for the objects as per the importance of measured characteristics they possess. This can be done in two ways:

- (a) making a judgement about some characteristics of an individual & then placing them directly on a scale that has been defined in terms of characteristics.
- (b) Creating questionnaire in such a way that the score of individual responses assigns him a place on a scale.

Attitude measurement:

Every individual have their own culture, behaviour & experience. Attitude of human being is developed on the basis of culture, behaviour & experience. A rxn made by a person over any event, product or other thing that is known as attitude.

Attitude measurement is an act of converting the qualitative info into quantitative facts. Such measurement can be developed in the following ways:

- (a) Researcher can review the literature in depth & select measuring scales which were used by previous research.
- (b) Researcher may use the scale as it is as used by prev. researcher or modifying in the existing scale.
- (c) Researcher can develop new measurement scale. New scale must be valid. Do following work to develop new scale:
 - (i) specify domain of construct
 - (ii) Collecting data & info.
 - (iii) Assessing the reliability
 - (iv) Creating sample
 - (v) Purgifying measures
 - (vi) Assessing the validity
 - (vii) Developing basic norms of measurement tool.

Techniques for Developing Attitude Scale

- ① **Choice** ÷ Respondents were given no. of altv. & asked to choose.
- ② **Ranking** ÷ " or various altv. ~~researcher~~ 2 persons rank in order
- ③ **Rating** ÷ " or for product or event & qly, characteristics estimate
of course.
- ④ **Sorting** ÷ Respondents or concepts ~~researcher~~ 2 order on basis of arrange
of course. (priority/value)

Scale Construction for Attitude Measurement

① **Arbitrary Scale** ÷ ~~if~~ sometimes researcher develops new rational & app. method if he/she feels that the subject of study is absolutely new & new method is essential for the measurement of attitude then such scale is Arbitrary scale. Researcher should be able to show reliability & validity of such scale.

② Summated rating scale or Likert Scale [dev. by Rensis likert] ÷

It requires the respondents to indicate a degree of agreement or disagreement with each of a series of statements. Every respondents are provided value that shows the ° of agreement & disagree of respondents. Attitude of all respondents are measured adding all the values provided to each statements. Thus it is known as summated rating scale.

Procedures ÷

- Researcher collects large no. of statements,
- Prior test is made. Small grp of people are asked to give response-
- Responses are recorded
- Total score of each respondent is obtained
- Find out that statement which have highest discriminatory power.

③ Differential scale or Thurstone Scale: [dev. by L.L. Thurstone]

The selectⁿ of item is made by a panel of judges who evaluate the items in terms of relevancy to the topic area & unambiguous in applicⁿ.

Procedure:-

- Researcher gathers large no. of statements.
- Statements are presented to panel of judges, each of them arranged in various groups. Judges categorize those state.
- disagreement statements by judges are discarded.
- Scale value of any one state. is computed as the median position to which it is assigned by grp of judges.
- State. whose median values are spread evenly from one extreme to other extreme is taken. Such taken statements (selected) constitutes final scale to be adminis^t to respondents.

④ Cumulative or Guttman Scale: [by Louis Guttman]

Gathers series of state. on which respondents express his/her agreement or disagreement. statements forms a cumulative series. For eg:- If a respondent shows +ve response on statement no. 4 then it is assumed that he/she is favourable on state. no. 1, 2, 3. If he/she shows -ve response ^{on state no. 4} then it is assumed that he/she is unfavourable on state. no. 1, 2, 3.

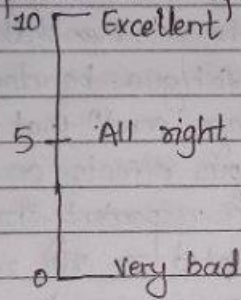
Procedures:-

- selecting state in clear terms on basis of issue/objectives.
- Pre-testing of " on sample of about 100 people.
- Arranging stat. on basis of high response & low response.
- Favourableness or unfavourableness indicate ^{at} response ^{or} remove ^{if} 1
- determining coefficient of reproducibility. $\left[\text{no. of errors, reprod.} = \frac{1 - \text{no. of errors}}{\text{no. of responses}} \right]$
- Respondent value is assessed on the basis of favourable answers by them.

Scales Commonly Used in Business Research | social science research

① Likert Scale.

② **Graphic Rating Scale**: Respondents are asked to indicate their response to a particular qn. by placing a mark at the app. point to express their opinions. Eg: On scale of 0 to 10:



③ **Itemized Rating Scale**: Researcher provides category of responses out of which respondents select one that is most relevant for answering the qn. under study.

④ **Rank Order Rating Scale**: Respondents are asked to rank the given items or product on the basis of their priority.

⑤ **Semantic Differential Scale**: It is a 7 point rating scale with end point associated with bipolar levels that have implied meanings. Bipolar objectives such as 'beautiful' or 'ugly'.

⑥ **Other Simple Scales**:

① **Simple Category Questions**: [**Dichotomous Scale**] : It provides two mutually exclusive choices such as yes or no, impo or unimp. Useful for demographic qn.

② **Multiple Choice Qn**: multiple choices provided to respondent ^{ask for one correct ans.}

③ **Open ended Qn**: Respondents are asked to give their own opinion in subjective form. No options are provided to them.

Sources of Measurement Problems

Measurement should be precise & unambiguous in a research study. However, objective is not oftenly met. Researcher must be aware about the sources of errors in measurement. Sources of errors:-

- ① **Related to respondents:** respondent may be reluctant to express -ve feelings or it may be possible that he/she may have little knowledge. Factors like, fatigue, boredom, anxiety etc also affect.
- ② **Related to situation:** Any condⁿ that places a strain on interview can have serious effects on the interviewer-respondent rapport. For eg: Chief of respondent's interview time & interview chief's related to respondent might be reluctant to express his/her correct opinion.
- ③ **Related to measurer:** Interviewer can distort the value of response by recording or reordering gr. His behaviour, style & looks may encourage or discourage certain replies from respondents. Errors may also arise due to wrong coding, faulty tabulation, etc.
- ④ **Related to instruments:** Defective measuring instrument. Use of complex words beyond understanding of respondents, 'ambiguous' meanings, poor priority, inadequate space for replies etc are things that makes measuring instrument defective.

Sampling:

A populⁿ is the entire collectⁿ of all observⁿ of the interest for the research. Representative portion of the populⁿ is selected for the study that is known as sample. The process of selecting the sample based on the nature & necessity of research is known as sampling.

Census Study:- Researcher studies entire individual, area & group.

Sampling Study:- " studies by selecting few sample.

Reasons for selecting sample:

- lowers cost
- Provides greater accuracy
- Helps to greater speed of data collectⁿ
- Inaccessible populⁿ.

Sampling process:

Sample should not be selected in hunches but it should be selected following certain process. Process is given below:

- ① **Define the population:** Population should be defined in terms of elements, sampling units & time. Defining a populⁿ incorrectly may render the results of the study meaningless or even misleading.
- ② **Specify the sampling frame:** Sampling frame is the list of elements from which the sample is drawn. It can be telephone directory, & employee roster, voter list etc. Thus it is one in which every element of the populⁿ is represented.
- ③ **Specify the sampling unit:** It is the unit that represents every characteristics of populⁿ. Sampling is based on sampling frame but determinⁿ of sampling unit depends upon subject & nature of research & research design. It can be geographical one or such as state, district etc.
- ④ **Determinⁿ of sample size:** no. of items which are to be selected as sample from populⁿ is sample size. Able to capture all elements of populⁿ, attain goal of research. Optimum size to be selected that fulfills: efficiency, representativeness, reliability etc.
- ⑤ **Prepⁿ of plan for sampling:** Researcher to formulate plan. Sampling plan provide guidelines to operationalize the S.D & S.S. SP decides which are to be taken while selecting sample & it use.
- ⑥ **Select the sample:** req. substantial amt of office & field work. Selected sample should represent the population & be useful.

Types of Sampling:-

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Probability Sampling

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Non-probability Sampling

(A) **Probability Sampling**:- Sampling technique where every element has equal chance of being selected as sample. Researcher cannot also estimate which element will be selected. It is used when there is necessity of generalizing findings of research.

Techniques:-

(a) **Simple Random Sampling**:- every element in populⁿ has equal chance of being selected. Req. samples are selected using lottery method, no order method, random no. test etc. Useful when researcher need to generalize the findings of the research in populⁿ.

(b) **Systematic Sampling**:- random selectⁿ of 1st item from systematically ordered populⁿ & then selectⁿ of sample items at Kth interval. Sampling Interval to be calculated.

$$SI(K) = \frac{\text{Popul}^n \text{ size } (N)}{\text{Sample size } (n)}$$

(c) **Stratified Sampling**:- Strata = overlapping homogenous groups in populⁿ. Method which represents samples in proportionate rate from the diff. grp. of populⁿ is stratified sampling. ^{It} Req. to represent diff. secⁿ of populⁿ in study like; male & female, educated & uneducated. This sampling is suitable.

(d) **Cluster Sampling**:- Cluster is the heterogeneous group that is in the populⁿ. It identifies clusters that are heterogeneous internally. Every cluster contains many elements into the single element so, it is considered as small populⁿ. Sampling, where a grp. is selected as sample having all elements of the populⁿ is cluster sampling. Cluster as

sample select for random sampling method (use for) detail study of selected cluster to find result. clusters are heterogeneous within themselves. Easy data collect suitable in absence of suitable sampling frame. Frames are needed for selected cluster only.

⑤ **Non-Probability Sampling**: There is no equal chance of selecting as sample to each unit & sampling is made based on pre-plan. Findings can't be generalized because samples are selected with specific purpose. ~~the~~ chance of biasness in selecting sample.

⑥ **Purposive or judgemental sampling**: samples are selected based on researcher's judgement. Researcher sets the bases & those units are selected as sample. " should know every unit of popn & their features. Generally, expert use this sampling.
 यदि researcher की specific info चाहिए है, तो, तो method appropri.

⑦ **Quota Sampling**: Popn is divided into diff. grps based on their nature, features, qualities etc & sample is selected from each grp in a certain rate. Findings cannot be generalized.

⑧ **Convenience Sampling**: Researcher की सुविधा अनुसार sample select जै. It is used when there is ↑ limit of time & resources.

⑨ **Self-selecting Sampling**: Researcher gives info. to respondents through media & respondents provide info. on the basis of informn received through media. Who provide info. on basis of info. are sample. less valid & less reliable.

⑩ **Snow ball Sampling: Reference sampling**. If popn is not fixed Researcher select 1 or few sample whose profile is fit to get the info & on the basis of ~~this~~ reference of those sample, other sample are selected. Problem is to maintain reln with the first person or sample unit.

Sampling Errors:-

Error that arises as a result of taking a sample from a popⁿ rather than using the whole popⁿ is sampling error.

Types:-

- (a) **Popⁿ specific errors**: occurs when researcher does not understand who should be surveyed.
- (b) **Sample frame error**: occurs when wrong sub-popⁿ is used to select a sample. Use of telephone directories to research on people who do not use telephones.
- (c) **Selectⁿ error**: occurs when respondents self select their participⁿ in the study - only those that are interested to respond. Can be controlled by going extra lengths to get participⁿ.
- (d) **Non-response**: occurs when respondents are diff. than those who do not respond. may be due to the potential respondent was not contacted or they refuse to respond.
- (e) **Errors in taking samples**: occur because of variation in the no^{or} of representativeness of the " that responds. Can be controlled by careful sample design, large samples etc.

Methods of Minimizing Sampling Errors

- Increasing the sample size,
- Cross check: various sources or response check list
- Unbiased sampling, use statistical methods.
- App. sampling design
- Clear questionnaire.

Non-Sampling Errors

Errors which are incurred from other sources than selection of sample are non-sampling errors. May arise at the time of planning & execution of survey, collection, processing & data analysis. Due to wrong selection of questions, wrong understanding & response of respondents etc.

Types:

- (a) Errors of poor sampling design: Researcher fails to identify appropriate respondent & proper planning for selecting sample.
- (b) Over & Under Coverage: selecting more or less elements while selecting samples.
- (c) Misinterpretation of questions: If researcher uses difficult & ambiguous words, respondents may interpret questions differently.
- (d) Processing errors: May be errors in coding, decoding, editing & analyzing the data.
- (e) Respondent related errors: If respondent do not give response or give response or not able to give response, or researcher not able to record those response properly.
- (f) Errors of Researcher: due to weak definition of variables, wrong method selection, preparation of weak questionnaire by researcher.
- (g) Measuring errors: due to weakness in measuring instruments.

Methods of minimizing Non-Sampling Errors:

- Checking sampling process → Use of experts
- Questionnaire preparation considering respondent level → checking data processing & analysis.
- Pilot survey: get feedback & improve questionnaire.
- Fix procedures: procedure for involving respondents.
- Competent manpower use.
- Provide information: Surveyor tells experience to respondents.
- Provide training: training to surveyor.

