

ACADEMIC PROGRAMME: BSCS COMPUTER SCIENCE

COURSE CODE AND TITLE: BSCS 305: COMPUTING RESEARCH METHODS

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BASIC RESEARCH TERMS

Expected Learning Outcomes:

By the end of this lesson, you should be able to:

- i. Understand the basic terms used in research
- ii. Known the basic items that are found in a research

Introduction

- ❖ As a researcher, it is important to understand the basic terms in research
- ❖ This will help in understanding the research concept
- ❖ Practical examples will be provided as much as possible

Population

- ❖ Population refers to an entire group of individuals, events or objects having a common observable characteristic
- ❖ This means that population is the aggregate of all that conforms to a given specification
- ❖ Examples of populations in research:
 - ❖ All form four students in Kenya
 - ❖ All computer programmers in Kenya
 - ❖ All office blocks over four stories high in urban areas of the country
 - ❖ All indigenous trees in national forests
- ❖ A researcher will first define the population that they will generalize the results
- ❖ The researcher will want to generalize results to an absolute population
- ❖ This is referred to as the "Target Population" or "Universe"
- ❖ The number of members of a population may be large or scattered over a wide geographical area

- ❖ It will require a lot of time, money, and personnel to locate all members of the population
- ❖ Researchers draw samples from accessible population (or manageable population)
- ❖ Researchers might not be able to achieve generalizability of the results
- ❖ It is because of the challenge of generalizability that researchers must demonstrate that the accessible population must be comparable to the target population in the characteristics that appear most relevant to the study
- ❖ This concept is referred to as population validity – this is a way of establishing that the accessible population is representative of the target population
- ❖ This will ensure that the generalization to the accessible population can be applied to the target population confidently
- ❖ Examples of accessible population:
 1. All form four students in the constituency
 2. All diabetic students attending clinics in Thika hospitals
 3. All web-based programs being used in shops in Kenya
 4. All agricultural extension officers in Central Kenya

Sample

- ❖ This is a smaller group obtained from the accessible population
- ❖ Helps to further reduce the participants of the study – it would still take a lot of time, and resources to work with the accessible population
- ❖ Each member or case in the sample is referred to as subject - also referred to as “respondents” or “interviewees”
 1. Two hundred form four students from a particular constituency
 2. One hundred diabetic patients from Thika clinics
 3. 500 middle income residential housing units completed within the last three years in Mombasa

Sampling

- ❖ Sampling is the process of selecting a number of individuals for a study in such a way that the individuals selected represent the large group from which they were selected
- ❖ The individuals selected form the sample and the large group from which they were selected is the population
- ❖ The role of sampling is to ensure that the researcher secures a representative group which will enable the researcher to gain information about the population

- ❖ Various methods have been developed to enable researchers get the sample from a population

Variable

- ❖ A variable is a measurable characteristic that assumes different values among the subjects
- ❖ It is a logical way of expressing a particular attribute in a subject
- ❖ Some variables are attributes that are expressed quantitatively - for example, age is expressed in years, height in meters, area in square meters, and weight in kilograms
- ❖ Some variables are expressed in categories – for example occupation might be expressed in farmer, engineer, and teachers. Gender is expressed in male or female, color might be expressed in brown, black, and white
- ❖ Variables might be classified as dependent, independent, intervening, or confounding and antecedent

Conceptual or Theoretical Definitions of Variables

- ❖ Conceptual or theoretical definition of a variable is a way of specifying precisely what we mean when we use a particular term to refer to a variable
- ❖ As a researcher you have a working definition of a variable
- ❖ For example “financial management” within a household is theoretically defined or conceptualized as the process involved in administering income within a family
- ❖ “Age” is conceptualized as the period between the day one was born and present date – either in years or months
- ❖ Sometimes researchers find it hard to agree on working definition of a particular variable
- ❖ In most cases, such variables is a combination of several other concepts
- ❖ One example, socio economic status – this variable can meaningfully be defined by reference to other measurable concepts like income, education level, occupation, property owned, etc.
- ❖ They are surrogates which are used to conceptualize the variable socio-economic status
- ❖ It is important to include only those surrogates that appear relevant to your studies

Operational Definition of Variables

- ❖ Operational definition is the measurement of a variable
- ❖ Describes the operations that will be used to measure a variable
- ❖ Can be stated either quantitatively or qualitatively

Examples

- ❖ The operational definition of age is the number of years or date of birth
- ❖ Type of instruction can be categorized as either lecture, group discussion, odl, etc
- ❖ Other variables can be operationalized with the use of **indicators**
- ❖ Indicators are observable evidence of the degree of presence or absence of the variable one is interested in
- ❖ For example the variable “financial management” in a family may be operationalized by reference to the following indicators: budgeting, income and expenditure review, use of credit cards, and saving practices – if there are high indicators in a family, it would mean high levels of “financial management”
- ❖ Other variables that are operationalized with the use of indicators include intelligence, work performance, and emotional attitude

Data

- ❖ Data refers to all information a researcher gathers for his or her study
- ❖ There are two types of data: **primary** and **secondary** data
- ❖ Primary data is the data that the researcher collects from the field i.e from the subjects in the sample
- ❖ They can be expressed as values obtained from the operational definition of the variables in the study – values are normally in form of frequency distributions
- ❖ Secondary data refers to the information a researcher obtains from research articles, books, casual interviews
- ❖ Data may also be classified as quantitative (numerical) or qualitative (words, phrases)

Parameter

- ❖ A parameter is a characteristic that is measurable and can assume different values in the population
- ❖ The difference between a variable and parameter is a parameter is a population characteristic while a variable is related to a characteristic of a sample drawn from the population
- ❖ A parameter, for example, is Kenya’s per capita income

Statistics

- ❖ Statistics is the science of organizing, describing and analyzing quantitative data
- ❖ Statistics is also used to refer to indices which are derived from data through statistical procedures – for example means, standard deviation, correlation coefficient, and beta coefficient

- ❖ An index which is descriptive of a population is referred to as a parameter
- ❖ This means that the mean of a sample is a statistic while the mean of population is parameter
- ❖ A sample statistic is assumed to be an unbiased estimate of the population parameter

Descriptive statistics

- ❖ Descriptive statistics are indices that describe a given sample
- ❖ Examples of descriptive statistics include measures of central tendency (mean, mode, median), measures of dispersion (range, standard deviation, variance) distributions (percentages, frequencies) and relationships (correlations)

Inferential statistics

- ❖ Inferential statistics are a branch of statistics which researchers use to draw inferences about a given phenomenon in the population
- ❖ Such inferences are based on the results from a randomly selected sample
- ❖ The purpose of inferential statistics is to test hypotheses and enable the researcher generalize the results from the sample to the population

Objectives

- ❖ An objective is any kind of desired end or condition
- ❖ Objectives in research studies refer to specific aspects of the phenomenon under study that the researcher desires to bring out at the end of the research study
- ❖ For example, a researcher may want to carry out a study on the factors that contribute to failure of Information Systems in SMEs in Kenya– the objectives of the study would be:
 1. Establish the technology adoption of SMEs in Kenya
 2. Explore how SME technologists are knowledgeable of installed information systems installed
 3. To identify the steps taken by IT managers to curb IS failures in SMEs
 4. Identify causes of IS failures in SMEs in Kenya

Literature review

- ❖ Literature review involves locating, reading and evaluating reports of previous studies, observations and opinions related to the planned study
- ❖ Leads to appreciating and understanding the research that has been done in one's area of interest

Problem statement

- ❖ A problem statement is a specific statement that clearly conveys the purpose of the research study
- ❖ The statement focuses on the phenomenon that the researcher desires to describe, predict, control, or explain
- ❖ It can also be expressed in question form

Units of analysis

- ❖ The unit of analysis, also called the unit of statistical analysis, refers to those units that we initially describe for the purpose of aggregating their characteristics in order to describe some larger group or abstract phenomenon
- ❖ Units of analysis are therefore the individual units about which or whom descriptive or explanatory statements to be made
- ❖ Individual human beings are the most typical units of analysis for social scientific research
- ❖ Examples of groups whose members might be units of analysis at the individual level include students, residents, voters, parents, teachers, and farmers
- ❖ Groups can also act as units of analysis
- ❖ Other units of analysis at the group level include married couples, cities, or geographical regions, churches, colleges, supermarkets

Units of observation

- ❖ A unit of observation is the subject, object, item or entity from which we measure the characteristics or obtain the data required in the research study
- ❖ This unit can be an individual person, a house, all pupils in a class, an animal, etc
- ❖ In majority of studies, units of observation is also the unit of analysis

Hypothesis

- ❖ A hypothesis is a researcher's anticipated explanation or opinion regarding the result of the study
- ❖ Example, in a study on the factors that affect adoption of new technology in a hospital, a researcher may hypothesize that management support is a critical factor in the success of new technology

Theory

- ❖ A theory is a set of concepts or constructs and the interrelations that are assumed to exist among those concepts
- ❖ A theory provides the basis for establishing the hypotheses to be tested in the study

- ❖ A good theory can be logically broken down into a set of hypotheses which can then be verified through experiments or observations
- ❖ Observations and experiments hence provide the basis for empirical generalizations
- ❖ The process of developing hypotheses from theories and then testing these hypotheses through observations or experiments is called deductive logic
- ❖ Inductive logic, on the other hand, is the process of constructing hypotheses, and then theory from repeated observation

Further E-Resource Readings

Lune, H., & Berg, B. L. (2016). *Qualitative research methods for the social sciences*. Pearson Higher Ed.

7.0 REFERENCE JOURNALS

Lazar, J., Feng, J. H., & Hochheiser, H. (2017). *Research methods in human-computer interaction*. Morgan Kaufmann.