

ACADEMIC PROGRAMME: BSCS COMPUTER SCIENCE

COURSE CODE AND TITLE: BSCS 305: COMPUTING RESEARCH METHODS

LECTURER'S NAME: PHILIP BTOK

LECTURER'S CONTACTS: Phone No.: 0723683409 Email: philip.bittok@gmail.com

RESEARCH CONCEPT

Expected Learning Outcomes:

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

- i. Understand the sources of knowledge
- ii. Understand the types of research
- iii. Understand philosophies of research

Introduction

- ❖ Research is important in this century than ever before
- ❖ Many issues that have come up:
 - Climate change
 - Data explosion
 - Internet of things (IoT)
 - Security of information
 - This class will cover the meaning of research, sources of knowledge, and the relationship between research, science, and theory

Definition of Research

- ❖ To research is to carry out a diligent inquiry or a critical examination of a given phenomenon
- ❖ It involves a critical analysis of existing conclusions or theories with regard to newly discovered facts – research is a continuous search of knowledge and understanding of the world around us
- ❖ Mouly (1978) defines research as a process of arriving at effective solutions to problems through systematic collection, analysis and interpretation of data

Purposes of Research

- ❖ The main purpose of research is to discover new knowledge – it means to get new facts with their correct interpretation. Though other sources are available, but research is the most efficient and reliable one
- ❖ To describe a given phenomenon – accurate identification of any event will involve giving detailed description like the color, weight, height, change over time, and size
- ❖ It enables prediction - this is the ability to predict event A given event B e.g the movement of the moon, sun, and earth helps us identify accurately lunar and solar eclipses
- ❖ Enables control – in laboratory experiments, one phenomenon is manipulated in order to exert control over another (Usually a drug is administered to a given sample and another one (control group) is left at normal conditions)
- ❖ Enable explanation of a phenomena – this is achieved through accurate observation and recording of a given phenomenon and explain the factors that cause its occurrence
- ❖ Enables theory development – formulating concepts, laws, and generalization about a given phenomenon

Sources of Knowledge

- ❖ Research is an important source of knowledge – this is because it is objective and follows a systematic procedure
- ❖ Experience is another common source of knowledge – human beings learn through experiences of life although no two human beings have the same experiences in life
- ❖ Tradition is another source of knowledge – we all have a culture which we adopt when we are born
 - Acquisition of this knowledge is through indoctrination and socialization
 - In computing, knowledge can be passed through company policies and Standard Operating Procedures (SOPs) and we get them through orientation
 - Authority as a source of knowledge
 - Experts are the common source where they give their expert opinions about something
 - We are likely to accept the opinion of computer security experts about using biometrics security system than when a computer vendor tells us
 - Intuition has also been said to be another source of knowledge – intuition is the perception, or explanation or insight into a phenomena by instinct

Research and Science

- ❖ The terms research and science are often used interchangeably
- ❖ They have different meanings
- ❖ We have stated that research is a critical examination or inquiry to discover facts

- ❖ Science is defined as
 - a systematic knowledge of natural or physical phenomena;
 - truth that is ascertained through observation, experiment, and induction
 - Ordered arrangement of facts known under classes or heads
 - Theoretical knowledge as distinguished from practical
 - Knowledge of principles and rules of invention, construction, and mechanism as distinguished from art
 - This shows that research and science are concerned with the discovery of new facts
 - In research, facts are often collected to serve a useful purpose; the focus is on the application – hence we talk about applied research
 - In science, facts are collected to test or develop theory – the focus is basic research
- ❖ When research is done to solve an issue, it is “action research” for example doing research to look for a way to improve security in bank ATMs
- ❖ In other times, research is done in order to test theoretical concepts in real situations so that generalizable application can be developed – this is usually referred to as “applied research”
- ❖ Research that is theory-guided is referred to as basic research

Research and Scientific Theory

- ❖ Scientific method assumes that phenomena are orderly and that their causes are not only discoverable but can also be manipulated
- ❖ The assumptions form the basis of scientific theory
- ❖ A theory is defined as a system of explaining phenomena by stating constructs and the laws that interrelate these constructs to each other
- ❖ A construct is a concept, abstraction or idea drawn from a specific
 - – For example in Maslow's Theory of Motivation, human behavior is assumed to be goal-oriented.
 - Basic food, safety, social, and self-actualization are the constructs in the theory
 - Maslow proposed that the constructs are related to one another in an invariant sequence
 - Each level has to be fulfilled before the next level manifests itself

Types of Research

- ❖ There are different types of research that include:
 - Exploratory
 - Descriptive
 - Analytical
 - Predictive

Exploratory research

- ❖ This research is most appropriate when few or no previous studies exist
- ❖ The aim is to look for patterns, hypotheses, or ideas that can be tested and will be form the basis for further research
- ❖ The appropriate research techniques that will be most appropriate here would include case studies, observation, and reviews of previous related studies and data

Descriptive research

- ❖ This study is useful when one wants to identify and classify the elements or characteristics of the subject, e.g amount of money lost because of post-election violence
- ❖ The most appropriate technique that is used to collect, analyze, and summarize data in this type of research is quantitative

Analytical research

- ❖ In this research, there is an extension of the reasons why some phenomenon is happening.
- ❖ The researcher might want to understand why something is happening.
- ❖ In this type of research, we would be interested in explaining reason behind something like explain why there was post-election violence, why many computer programs fail in a certain department
- ❖ One important feature for this kind of research is to be able to identify the different factors or variables that are involved

Predictive research

- ❖ In this kind of research, there is an intelligent inquiry into a future possibility of some phenomenon happening.
- ❖ The future possibilities are based on analysis of current evidence of cause and effect
- ❖ Example is predicting of possibility of future election violence

Research approach

- ❖ There three ways in which research can be done
- ❖ 1) It can be quantitative/qualitative
- ❖ 2) Applied/Basic
- ❖ 3) Deductive/Inductive
- ❖ In many cases, research will combine a number of approaches. A research can be both quantitative and qualitative

Quantitative Research

- ❖ The emphasis of this research approach is on collecting and analyzing numerical data
- ❖ The main concentration is measuring the scale, range, and frequency.
- ❖ This research type is highly detailed and structured and results can be easily collated and presented statistically

Qualitative Research

- ❖ In this research approach, it is more subjective than quantitative research
- ❖ It involves examining and reflecting on the less tangible aspects of a research subject like values, attitudes, and perceptions
- ❖ Because this research is easier to start, it can be easier to interpret and present the findings
- ❖ The findings can also be challenged easily

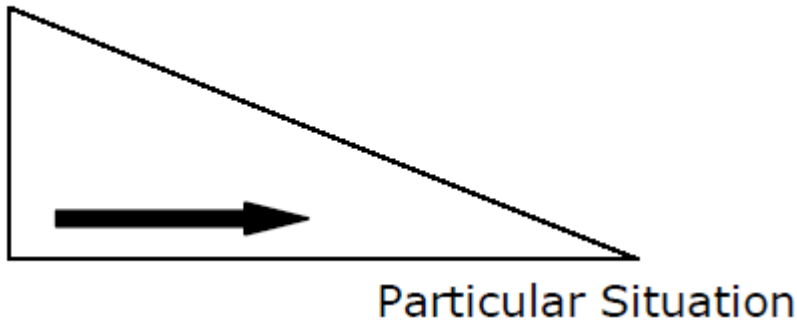
Basic/Applied Research

- ❖ The main objective of research is to improve knowledge generally
- ❖ There is no particular applied purpose in mind at the onset
- ❖ Applied research is designed from the start to apply the findings to a particular situation
- ❖ Many students in school of management are required to undertake applied research for a particular problem

Deductive

- ❖ In the deductive approach, it will move from general/theories to specific particular and situations.
- ❖ The particular phenomenon is deduced from the general phenomenon

General ideas



- ❖ From this approach, one would be required to have a clear theoretical position prior to collection of data
- ❖ If we have an example of a situation where we would like to learn what the word professional means to a range of people
- ❖ You might want to research the subject and learn a number of definitions from a number of professional associations
- ❖ You could then test this definition on a range of people using a questionnaire, structured interviews, or group discussion
- ❖ Still in our research, we could decide to select the range of people basing on gender, age, or occupation
- ❖ The data that has been collected could then be collated and the results analyzed and presented
- ❖ This approach offers researchers a relatively easy and systematic way of testing established ideas on a range of people

Inductive

- ❖ In this approach, you might start by talking to a range of people on how they understand 'professional'
- ❖ From this discussion you could start to assemble the common elements and then start to compare these with definitions gained from professional associations
- ❖ The data gathered can then be collated and the results analyzed and presented
- ❖ This approach might lead you to come up with a new definition of the word – or it might not!
- ❖ Good when looking for a new way of looking at a subject

Research Philosophies

- ❖ There are two main research philosophies or positions

- ❖ 1) Positivist – can also be referred to as quantitative, objectivist, scientific, experimentalist, or traditionalist
- ❖ This approach is founded on the belief that the study of human behavior should be conducted in the same way as studies conducted in the natural sciences
- ❖ 2) Phenomenological – can also be referred to as qualitative, subjectivist, humanistic, interpretative
- ❖ Phenomenological approaches is concerned with understanding behavior from the participants own subjective frames of reference

Positivist	Phenomenological
<ul style="list-style-type: none"> • Surveys • Experimental Studies • Longitudinal Studies • Cross-sectional Studies 	<ul style="list-style-type: none"> • Case Studies • Action Research • Ethnography (participant observation) • Participative Enquiry • Feminist Perspectives • Grounded Theory

Positivist Methodologies

- ❖ Survey - surveys involve selecting a representative and unbiased sample of subjects drawn from the group you wish to study
- ❖ The main methods of asking questions are by face-to-face or telephone interviews
- ❖ There are two types of survey – descriptive survey is where there is concern about the identifying and counting the frequency of a particular response among the survey group or an analytical survey which concerned with relationship between different elements (variables) in a sample group

Experimental studies

- ❖ Done in carefully controlled and structured environments and enable the causal relationships of phenomena to be identified and analyzed
- ❖ The variables can be manipulated or controlled to observe the effects on the subjects studied
- ❖ Studies done in laboratories tend to offer the best opportunities for controlling the variables in a rigorous way, although field studies can be done in a more real-world environment
- ❖ In the laboratory experiment, the artificiality of the situation can affect the response of the people that are studied

- ❖ In the field studies, the researcher does not have control of the variables that are being observed

Longitudinal Studies

- ❖ These are studies that are done over a long period of time to observe the effect that time has on the situation that is being studied and also to collect primary data of these changes
- ❖ This type of study takes a long period of time
- ❖ It might not be possible to be done in a short taught courses

Cross-Sectional Studies

- ❖ It involves at looking at data from a population at one specific point in time
- ❖ An example is a survey of stress-management levels of the youth and adults
- ❖ This is like a snapshot of the results that someone might be interested

Phenomenological Methodologies

- ❖ The methods here include:
 - Case studies
 - Action research
 - Ethnography
 - Participative inquiry
 - Feminist perspective
 - Grounded theory

Case Studies

- ❖ Case studies offer an opportunity to study a particular subject for example one organization in depth, or a group of people, and usually involves gathering and analyzing information.
- ❖ The information gathered could either be qualitative or quantitative
- ❖ Case studies could be used to formulate theories or be:
 - Descriptive, where the current practice is described in great detail
 - Illustrative – where the case studies illustrate new practices adopted by an organization
 - Experimental – where the difficulties of adopting new practices or procedures are examined

- Explanatory – where the theories are used as a basis for understanding and explaining practices or procedures
- Researchers are increasingly using autobiography as a means of collecting information from small groups or respondents to seek patterns, and underlying life issues. An example is where it can be used to trace the influence of variables such as social class, gender and educational experience on career development and career progression, or lack of it, within an organization. It can be time-consuming as it requires trust to be developed between the researcher and participants

Action Research

- ❖ Action research involves intervention by a researcher to influence change in any given situation and to monitor and evaluate the results
- ❖ The researcher, who will be working with the client, will identify the objective, and explores ways that this might be done
- ❖ The researcher will enter into the situation with new techniques
- ❖ It requires active involvement between the two

Ethnography (Participant Observation)

- ❖ This research evolved from anthropology and the close study of societies
- ❖ It is more known as participant observation
- ❖ It is where the researcher will normally become a working member of the group situation that is being observed
- ❖ The main aim is to be able to understand the situation from the inside
- ❖ The researcher will share the same experience with the participants and is effective in small groups
- ❖ Ethnography could be overt (when everyone knows it is happening) or covert (when the subject(s) being observed for research purposes are unaware it is happening)

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.