ADVANCE RESEARCH METHODS QUANTITATIVE & QUALITATIVE TECHNIQUES

Final SEMESTER ASSIGNMENT

(Time Allowed: 06 hours)

Marks:50

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Q1. Distinguish between basic and applied Research. (10 Marks)

Answer. Basic Research

Basic research is also known as Fundamental research or pure research since it is mainly concerned with the improvement of scientific knowledge. The purpose of basic research is simply to gather more information to further understand existing phenomena. Hence, basic research is purely theoretical as it delves into basic laws and principles.

Basic research is more theoretical since it generally generates theories and explores information which may not be presently applied.

While applied research is more practical and descriptive in nature as it seeks to alleviate current problems in various fields and is mostly concerned with end-usage. Applied research is largely particular as it is focused on very specific topics which seek to answer certain problems.

Note: Basic research is meant to expand one's current knowledge while applied research is aiming to solve particular life problems.

Q2. What are the basic steps for conducting a research? Explain with a schematic diagram. (10 Marks)

Answer The process is initiated with a question or problem (step 1)

- Next, goals and objectives are formulated to deal with the question or problem (step 2)
- Then the research design is developed to achieve the objectives (step 3)
- Results are generated by conducting the research (step 4)
- Interpretation and analysis of results follow (step 5)

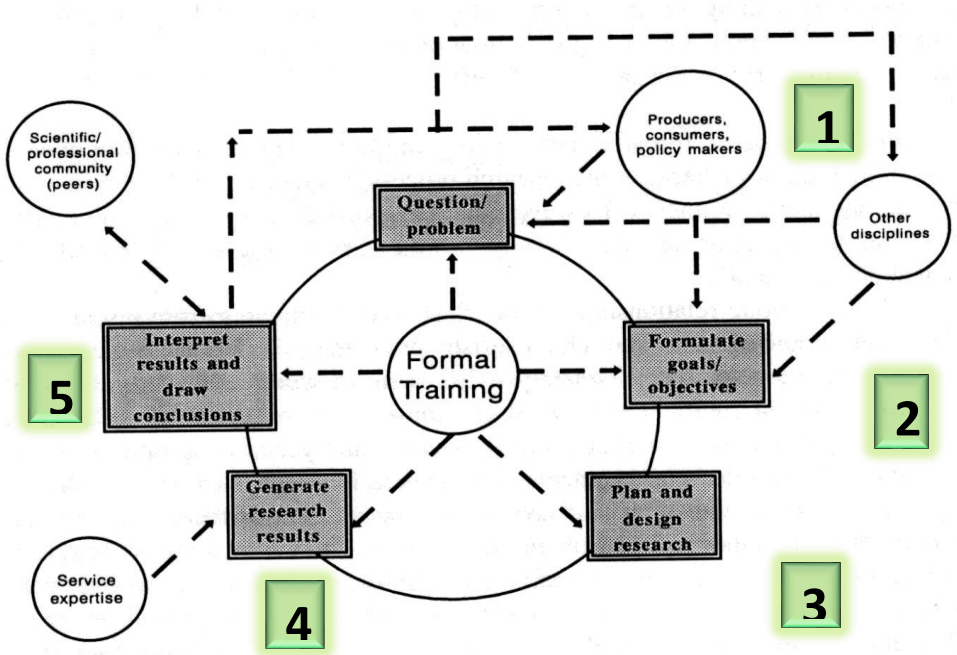


Figure 2.2. Schematic of research process.

1. **Question/Problem:** A research problem is a statement about an area of concern, a condition to be improved, a difficulty to be eliminated, or a troubling question that exists in scholarly literature, in theory, or in practice that points to the need for meaningful understanding and deliberate investigation.
2. **Formulate goals/objectives:** There is great importance of formulating a good research problem. A good research problem has many features; it is specific in nature, highly relevant to our subject area. objective will precisely say what should be researched
3. **Plan and design research:** The research design is framework for planning our research and answering our research questions. Creating a research design means making decision about:
   - The type of data we need
   - The location and timescale of the research
   - The participants and sources
   - The variables and hypothesis
   - The method for collecting and analyzing data
4. **Generate research results:** In this step we can generate result
5. **Interpret result and draw conclusion:** state the significance or implications of our experimental findings and recommend areas of our feature research.
   Here we conclude our result and compare it with problem statement that either we get the desire result or not?

Q3. Differentiate between any two types of research methodology. (10Marks)

Answer

1. **Quantitative research** is expressed in numbers and graphs. It is used to test or confirm theories and assumptions. This type of research can be used to establish generalizable facts about a topic.

Quantitative research is used when we want to confirm or testing something (a theory or hypothesis)

Common Quantitative methods include experiments, observations recorded as numbers, and surveys with closed-ended questions.

Example

We survey 300 students at our university and ask them questions such as: "on a scale from 1-5, how satisfied are you with your professors?"

We can perform statistical analysis on the data and draw conclusions such as: "on average students rated their professors 4.4".

2. **Qualitative research** is expressed in words. It is used to understand concepts, thoughts or experiences. This type of research enables us to gather in-depth insights on topics that are not well understood.

Qualitative research is used when we want to understand something (concepts, thoughts and experiences)

Common qualitative methods include interviews with open-ended questions, observations described in words, and literature reviews that explore concept and theories.

Example

We conduct in-depth interview with 15 students and ask open ended questions such as "how satisfied are you with your studies?", "What is the most positive aspects of your study program?" and "when can be done to improve the study program?"

Based on the answers we get we can ask follow-up questions to clarify things.

Q4. Give an introduction to Mixed Methods Research and identify situations in which mixed methods research can be applied. (10 Marks)

Answer

A mixed method research means the combination of different qualitative and quantitative methods of data collection and data analysis in one empirical research project.

Situations in which mixed methods research can be applied

You are measuring a concept on an instrument. You have a sense that scores are not telling you

The entire story. If you just asked a few people about the concept you might obtain a better understanding…mixed methods research provides a more complete understanding of the research problem than either quantitative or qualitative alone.

You look over the instruments available to study a concept. They were developed from a different sample/population than the one you are studying. You consider that you will need to develop an instrument before you can administer it to your sample… Mixed method is a methodology for developing better, more context specific instruments.

■ You have gathered data about a factors that predict a concept on several instruments. Although you have general information about the importance of predictors, you can only guess as to what explains why the results occurred…Mixed methods helps to explain results (or how mechanisms work) in causal models

You are conducting an intervention study. You have an intervention that was developed by other researchers. You are not certain that it will work with the sample you are studying…Mixed methods is a way to explore first to determine if an intervention will work.

■ We want to evaluate the performance of an organization. This calls for understanding the expected outcomes of the organization (needs assessment), designing some instruments to measure those outcomes, and then helping to explain why the outcomes occurred…Mixed methods is an approach to tie together several steps in an evaluation process.

Q5. Give a brief overview of your final research project. (10 Marks)

Answer

I want to do my final research in Blockchain; here is the basic concept and futures of Blockchain technology

What is Blockchain?

A **blockchain** is a constantly growing ledger which keeps a permanent record of all the transactions that have taken place in a secure, chronological, and immutable way.

Let's breakdown the definition,

- **Ledger:** It is a file that is constantly growing.
- **Permanent:** It means once the transaction goes inside a blockchain, you can put up it permanently in the ledger.
- **Secure:** Blockchain placed information in a secure way. It uses very advanced cryptography to make sure that the information is locked inside the blockchain.
- **Chronological:** Chronological means every transaction happens after the previous one.
- **Immutable:** It means as you build all the transaction onto the blockchain, this ledger can never be changed.

A blockchain is a chain of blocks which contain information. Each block records all of the recent transactions, and once completed goes into the blockchain as a permanent database. Each time a block gets completed, a new block is generated.

Note: A blockchain can be used for the secure transfer of money, property, contracts, etc. without requiring a third-party intermediary like bank or government. Blockchain is a software protocol, but it could not be run without the Internet (like SMTP used in email).

Who uses the blockchain?

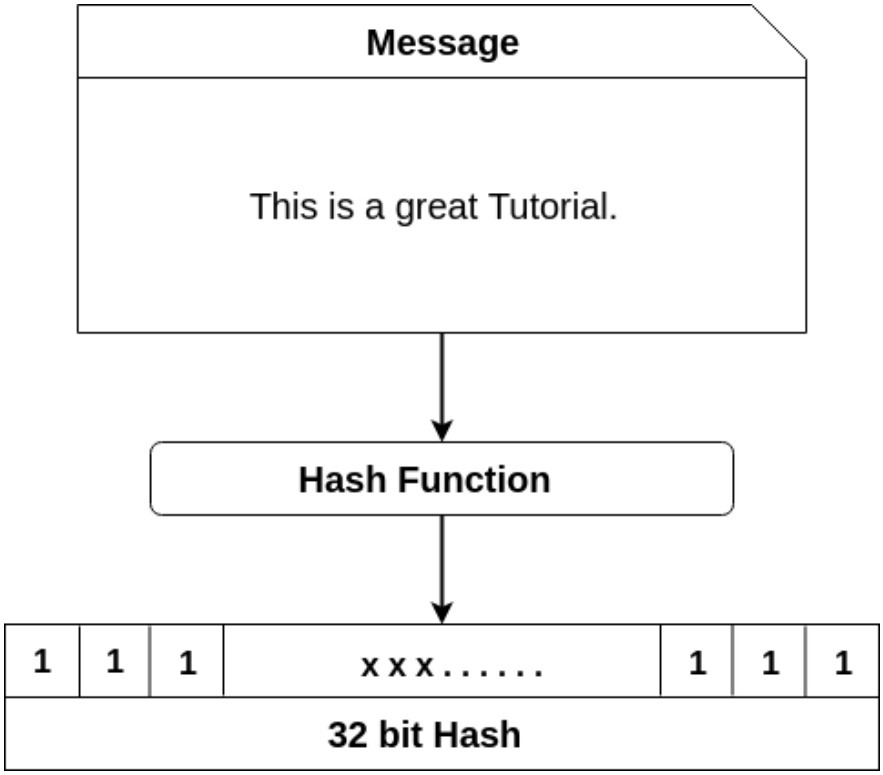
Blockchain technology can be integrated into multiple areas. The primary use of blockchain is as a distributed ledger for crypto currencies. It shows great promise across a wide range of business applications like Banking, Finance, Government, Healthcare, Insurance, Media and Entertainment, Retail, etc.

Need of Blockchain

Blockchain technology has become popular because of the following.

Time reduction: In the financial industry, blockchain can allow the quicker settlement of trades. It does not take a lengthy process for verification, settlement, and clearance. It is because of a single version of agreed-upon data available between all stakeholders.
Unchangeable transactions: Blockchain register transactions in a chronological order which certifies the unalterability of all operations, means when a new block is added to the chain of ledgers, it cannot be removed or modified.
Reliability: Blockchain certifies and verifies the identities of each interested parties. This removes double records, reducing rates and accelerates transactions.
Security: Blockchain uses very advanced cryptography to make sure that the information is locked inside the blockchain. It uses Distributed Ledger Technology where each party holds a copy of the original chain, so the system remains operative, even the large number of other nodes fall.
Collaboration: It allows each party to transact directly with each other without requiring a third-party intermediary.
Decentralized: It is decentralized because there is no central authority supervising anything. There are standards rules on how every node exchanges the blockchain information. This method ensures that all transactions are validated, and all valid transactions are added one by one.

Blockchain Hash Function
A hash function takes an input string (numbers, alphabets, media files) of any length and transforms it into a fixed length. The fixed bit length can vary (like 32-bit or 64-bit or 128-bit or 256-bit) depending on the hash function which is being used. The fixed-length output is called a hash. This hash is also the cryptographic byproduct of a hash algorithm. We can understand it from the following diagram.



The hash algorithm has certain unique properties:

1. It produces a unique output (or hash).
2. It is a one-way function.

In the context of crypto currencies like Bitcoin, the blockchain uses this cryptographic hash function's properties in its consensus mechanism. A cryptographic hash is a digest or digital fingerprints of a certain amount of data. In cryptographic hash functions, the transactions are taken as an input and run through a hashing algorithm which gives an output of a fixed size.

SHA-256

A Bitcoin's blockchain uses SHA-256 (Secure Hash Algorithm) hashing algorithm. In 2001, SHA-256 Hashing algorithm was developed by the National Security Agency (NSA) in the USA.

How does the hashing process works?

For this hash function, we are going to use a program developed by Anders Brownworth. This program can be found in the below link.

Anders Brownworth Hash Program: https://anders.com/blockchain/hash.html

Now if we type the text: "**This is a great tutorial**."

We will find the corresponding Hash:

1. 4bc35380792eb7884df411ade1fa5fc3e82ab2da76f76dc83e1baecf48d60018

> **Note:** If we write the same text again in a data section, it will always give the same output. It is because you are creating a message digest of that one's specific amount of data.