



# Research Methodology (BCT 304)

**Raj Kumar Thapa, PhD**  
**Assistant Professor**  
**Gandaki University**



# Unit I

## Introduction to the Research

# Concept of research

## What is Research?

- **Definition:**
  - Research is a systematic and organized effort to gain new knowledge, solve problems, or validate existing theories through a structured process.
- **Purpose of research:**
  - It aims to contribute to the understanding of a subject, expand knowledge, and provide a basis for decision-making.
- **Key characteristics:**
  - Systematic: Follows a planned and organized approach.
  - Empirical: Relies on observable evidence.
  - Critical: Involves evaluation and analysis.
  - Logical: Follows a rational and reasoned process.
  - Replicable: Results can be verified by others.

# Concept of research

## What is Research?

- **Research versus Information Gathering:**
- Research goes beyond simply gathering information; it involves critical analysis, interpretation, and the generation of new insights.



<https://www.pinterest.com/pin/596797388092070403/>

# Concept of research

## Why Research?

- **Advancing Knowledge:**
  - Research is the engine that propels academic and technological progress.
- **Problem Solving:**
  - It provides solutions to practical challenges and contributes to decision-making.
- **Informed Decision-Making:**
  - Research findings inform policies, strategies, and actions.
- **Continuous Learning:**
  - A dynamic process that encourages a continuous quest for understanding and improvement.

# Objectives of research

- The purpose of research is to discover answers to questions through the application of scientific procedures.
- The main aim of research is to find out the truth which is hidden and which has not been discovered as yet.
- Though each research study has its own specific purpose, we may think of research objectives as falling into a number of following broad groupings:
  1. To gain familiarity with a phenomenon or to achieve new insights into it (studies with this object in view are termed as exploratory or formulative research studies);
  2. To portray accurately the characteristics of a particular individual, situation or a group (studies with this object in view are known as descriptive research studies);
  3. To determine the frequency with which something occurs or with which it is associated with something else (studies with this object in view are known as diagnostic research studies);
  4. To test a hypothesis of a causal relationship between variables (such studies are known as hypothesis-testing research studies).

# Motivation in research

- What makes people to undertake research? This is a question of fundamental importance.
- The possible motives for doing research may be either one or more of the following:
  1. Desire to get a research degree along with its consequential benefits;
  2. Desire to face the challenge in solving the unsolved problems, i.e., concern over practical problems initiates research;
  3. Desire to get intellectual joy of doing some creative work;
  4. Desire to be of service to society;
  5. Desire to get respectability.

However, this is not an exhaustive list of factors motivating people to undertake research studies. Many more factors such as directives of government, employment conditions, curiosity about new things, desire to understand causal relationships, social thinking and awakening, and the like may as well motivate (or at times compel) people to perform research operations.

# Nature and Types of Research

## Nature of Research?

### Three main characteristics:

#### 1. Exploratory:

- Involves investigating an unfamiliar topic to gain insights.
- Often used in the early stages of research.

#### 2. Descriptive:

- Aims to describe and characterize a phenomenon.
- Provides a detailed account of the subject under study.

#### 3. Explanatory:

- Seeks to explain the relationship between variables.
- Goes beyond description to identify the 'why' and 'how'.



# Nature and Types of Research

## Types of Research:

### 1. Basic Research:

- Pure or fundamental research.
- Seeks to expand theoretical knowledge.
- Often curiosity-driven.

### 2. Applied Research:

- Practical application of knowledge.
- Solves specific, real-world problems.
- Addresses immediate concerns.

### 3. Quantitative Research:

- Involves numerical data and statistical analysis.
- Aims for objectivity and precision.
- Common in scientific and experimental studies.

### 4. Qualitative Research:

- Focuses on non-numerical data (e.g., words, observations).
- Aims for depth and understanding.
- Common in social sciences and humanities.

# Nature and Types of Research

## Research process

### Seven key steps

#### 1. Problem definition:

- Clearly define the research problem or question.

#### 2. Literature review:

- Review existing studies and literature related to the topic.

#### 3. Research design:

- Plan the overall approach and methodology.

#### 4. Data collection:

- Gather data according to the research design

#### 5. Data analysis:

- Analyze the collected data using appropriate methods.

#### 6. Interpretation:

- Interpret the findings and draw conclusions.

#### 7. Reporting:

- Communicate the research process and results through a report or presentation.

# Nature and Types of Research

## Ethical Considerations

- **Participant consent:**
  - Obtain informed consent from individuals involved in the research.
- **Confidentiality:**
  - Protect the privacy of participants and sensitive information.
- **Integrity:**
  - Conduct research with honesty and integrity.
- **Responsible conduct:**
  - Uphold ethical standards throughout the research process.

# Scientific research and its process

## What is scientific research?

- **Definition:**
  - Scientific research is a systematic and empirical investigation into phenomena, conducted to expand knowledge and contribute to the understanding of natural or social world.
- **Systematic inquiry:**
  - Follows a structured and organized approach to ensure precision and reliability.
- **Empirical observation:**
  - Relies on direct observation and evidence obtained through the senses.

# Scientific research and its process

## Scientific research process

### 1. Problem identification:

- Clearly define the research problem or question to be addressed.

### 2. Literature review:

- Survey existing research to understand what is known and identify gaps in knowledge

### 3. Hypothesis formulation:

- Develop a clear and testable hypothesis based on the literature review.

### 4. Research design:

- Plan the methodology and procedures for data collection.

### 5. Data collection:

- Gather data according to the research design, using systematic methods.

### 6. Data analysis:

- Employ statistical or qualitative analysis to interpret the collected data.

### 7. Results interpretation:

- Interpret the findings in the context of the research question.

### 8. Discussion and conclusion:

- Draw conclusions based on the analysis and discuss the implications of the results.

### 9. Publication:

- Communicate the research process and outcomes through publication in journals or presentations.

# Characteristics of scientific research

## 1. Empirical:

- Relies on direct observation and measurement of phenomena.

## 2. Systematic:

- Follows a structured and organized methodology.

## 3. Logical:

- Utilizes logical reasoning and analysis in the interpretation of results.

## 4. Replicable:

- Results should be replicable under similar condition.

## 5. Predictive:

- The research should contribute to the development of theories that can predict future occurrences.

## 6. Critical:

- Encourages critical thinking and evaluation of methods and findings.

## 7. Objective:

- Strives for objectivity, minimizing bias and personal influence.

# Application of scientific research in IT research

## Introduction to Scientific Research in IT:

- Scientific research in IT involves the systematic investigation, experimentation, and analysis of various phenomena related to information technology.
- It encompasses a wide range of areas including computer science, software engineering, data science, artificial intelligence, and more.
- The application of scientific research in IT aims to advance knowledge, solve practical problems, and innovate in the field of technology.

# Application of scientific research in IT research

## Principles of Scientific Research in IT:

- **Empirical Evidence:** Scientific research in IT relies on empirical evidence gathered through observation, experimentation, and measurement. This evidence serves as the basis for making informed decisions and drawing conclusions.
- **Objectivity:** Researchers strive to maintain objectivity by minimizing biases and ensuring that their findings are not influenced by personal beliefs or preferences.
- **Replicability:** The ability to replicate research findings is crucial in scientific research. IT research should be replicable to validate the reliability and accuracy of the results.
- **Validity and Reliability:** Validity refers to the extent to which a study accurately measures what it intends to measure, while reliability pertains to the consistency and stability of the results over time and across different conditions.



# Application of scientific research in IT research

## Applications of Scientific Research in IT Research:

- **1. Software Development and Engineering:**
- Scientific research in IT plays a pivotal role in software development and engineering by providing methodologies, tools and techniques for designing, implementing, and maintaining software systems.
- Research in areas such as software architecture, programming languages, and software testing contributes to the improvement of software quality, reliability, and performance.
- Agile and DevOps methodologies are examples of research-driven approaches that have revolutionized software development practices.

# Application of scientific research in IT research

## Applications of Scientific Research in IT Research:

- **1. Software Development and Engineering:**
- Agile methodology is a project management approach that involves breaking the project into phases and emphasizes continuous collaboration and improvement.
- DevOps is a combination of software development (dev) and operations (ops). It is defined as a software engineering methodology which aims to integrate the works of development teams and operations teams by facilitating a culture of collaboration and shared responsibility.



# Application of scientific research in IT research

## Applications of Scientific Research in IT Research:

- **2. Data Science and Analytics:**
- Data science relies heavily on scientific research methodologies to analyze large volumes of data and extract meaningful insights.
- Research in data mining, machine learning, and statistical analysis enables organizations to discover patterns, trends, and correlations in data, leading to informed decision-making and predictive modeling.
- Applications include personalized recommendations, fraud detection, predictive maintenance, and sentiment analysis.

# Application of scientific research in IT research

## Applications of Scientific Research in IT Research:

- **3. Artificial Intelligence and Machine Learning:**
- Scientific research forms the foundation of artificial intelligence (AI) and machine learning (ML) by exploring algorithms, neural networks, and computational models inspired by human intelligence.
- Research advancements in deep learning, reinforcement learning, and natural language processing have led to breakthrough in various AI applications such as image recognition, language translation, autonomous vehicles, and virtual assistants.

# Application of scientific research in IT research

## Applications of Scientific Research in IT Research:

- **4. Cybersecurity:**
- IT research in cybersecurity focuses on developing strategies, technologies, and protocols to protect digital assets and mitigate cyber threats.
- Research areas include cryptography, network security, intrusion detection, and security analytics, aiming to enhance the resilience and integrity of IT systems and infrastructure.
- Advancements in cybersecurity research are essential for safeguarding sensitive information, ensuring privacy, and maintaining the trustworthiness of digital ecosystems.

# Application of scientific research in IT research

## Challenges and Future Directions:

- Despite the significant contributions of scientific research to IT, several challenges remain, including ethical considerations, data privacy concerns, and the rapid pace of technological change.
- Future directions in IT research may involve interdisciplinary collaboration, ethical AI development, quantum computing, blockchain technology, and the Internet of Things (IoT), among others.

## Conclusion:

- The application of scientific research in IT research is essential for driving innovation, solving complex problems, and advancing the capabilities of information technology. By adhering to scientific principles and embracing emerging technologies, researchers can continue to push the boundaries of what is possible in the digital age.

# Research paradigms and contemporary issues

## Research paradigms

### 1. Paradigm defined:

- A paradigm in research refers to a set of shared assumptions, beliefs, and practices that guide the research community's understanding and approach to studying phenomena.

### 2. Main research paradigms

#### A. Positivism:

- Key tenet: Reality is objective, and knowledge can be discovered through empirical observation and measurement.
- Research emphasis: Quantitative methods, structured experiments, and statistical analysis.
- Example: Experimental studies testing hypotheses.

# Research paradigms and contemporary issues

## Research paradigms

### 2. Main research paradigms

#### B. Interpretivism:

- Key tenet: Reality is subjective and shaped by individual experiences and interpretations.
- Research emphasis: Qualitative methods, in-depth interviews, participant observation.
- Example: Ethnographic studies exploring cultural practices.

#### C. Critical theory:

- Key tenet: Emphasizes social critique and seeks to uncover and challenge power structures and inequalities.
- Research emphasis: Social justice, empowerment, and qualitative methods.
- Example: Research on the impact of social policies on marginalized groups.



# Research paradigms and contemporary issues

## Research paradigms

### 3. Contemporary issues in research

#### A. Ethical considerations:

- Addressing ethical challenges, ensuring participant well-being, and obtaining informed consent.

#### B. Cultural sensitivity:

- Acknowledging and respecting diverse cultural perspectives in research.

#### C. Digital transformation:

- Incorporating technology in research methods, data collection, and analysis.

#### D. Globalization:

- Considering the global context and collaborating across borders in research endeavors.

#### E. Interdisciplinary research:

- Collaborative research that integrates insights and methods from multiple disciplines.

# Research approaches

## 1. Deductive approach:

- **Process:**
- Starts with a theory or hypothesis.
- Develops specific predictions.
- Tests predictions through empirical observation.
- **Example:**
- Testing a hypothesis that predicts a relationship between two variables.

## 2. Inductive approach:

- **Process:**
- Starts with specific observations or data.
- Identifies patterns and trends.
- Develops generalizations or theories based on observations.
- **Example:**
- Analyzing qualitative data to derive themes and patterns.

# Research approaches

## 3. Mixed-methods approach:

- **Process:**
- Integrates both qualitative and quantitative methods in a single study.
- Provides a comprehensive understanding of the research problem.
- **Example:**
- Combining survey data with in-depth interviews to explore a phenomenon.

## 4. Action research:

- **Process:**
- Involves collaboration between researchers and practitioners to address real-world issues.
- Emphasizes cycles of planning, action, observation, and reflection.
- **Example:**
- Implementing changes in an educational setting and studying their impact.

# Research approaches

## 5. Grounded theory:

- **Process:**
- Focuses on building theory from the ground up based on collected data.
- Involves constant comparison and iterative analysis.
- **Example:**
- Studying interviews or observations to develop a theory about a specific phenomenon.

## 6. Case study approach:

- **Process:**
- In-depth exploration of a specific case or a small number of cases.
- Utilizes multiple sources of data for a comprehensive understanding.
- **Example:**
- Investigating the impact of a specific management strategy on the performance of a company.

# Significance of research

- **1. Knowledge Expansion:**

- Research expands the boundaries of knowledge by uncovering new facts, theories, and insights about the natural world, human behavior, and societal phenomena.
- It builds on existing knowledge and contributes to the development of theories, models, and frameworks that explain and predict phenomena.

- **2. Problem solving:**

- Research addresses practical problems and challenges faced by individuals, organizations, and societies.
- It provides evidence-based solutions and recommendations to address issues related to healthcare, education, environment, technology, economics, and more.

# Significance of research

- **3. Innovation and Technological Advancement:**

- Research drives innovation by fostering the development of new technologies, products, and processes.
- It leads to inventions, discoveries, and breakthroughs that improve the quality of life, enhance productivity, and stimulate economic growth.

- **4. Policy Development and Decision Making:**

- Research informs policy development and decision making at various levels, including government, industry, and academia.
- Policymakers rely on research findings to formulate effective policies, regulations, and interventions that address societal needs and promote public welfare.

# Significance of research

- **5. Personal and Professional Growth:**

- Engaging in research enhances critical thinking, problem-solving, and analytical skills.
- It fosters intellectual curiosity, creativity, and lifelong learning among researchers, contributing to their personal and professional growth.

- **6. Academic and Career Advancement:**

- Research is essential for academic advancement, as it is a fundamental component of higher education and scholarly inquiry.
- It enables students, scholars, and professionals to contribute original work, earn academic degrees, publish research papers, and establish credibility in their fields.

# Significance of research

- **7. Social and Cultural Impact:**
- Research influences social attitudes, beliefs, and behaviors by challenging assumptions, raising awareness, and promoting social change.
- It preserves cultural heritage, documents historical events, and explores diverse perspectives, contributing to cultural enrichment and understanding.

## Challenges in Research:

- Despite its significance, research faces several challenges, including funding constraints, ethical considerations, methodological limitations, and dissemination barriers.
- Researchers must navigate these challenges while upholding ethical standards, rigorously conducting research, and effectively communicating their findings to diverse audiences.



# Research methods versus methodology

## Research methods

- Research methods refer to the specific techniques, procedures, and tools used by researchers to collect, analyze, and interpret data.
- These methods are the practical steps undertaken to answer research questions or achieve research objectives.
- Research methods are applied during specific stages of the research process.

## Research methodology

- Research methodology refers to the overarching framework or theoretical perspective guiding the research process.
- It encompasses the philosophical assumptions, principles, and concepts that shape the researcher's approach to inquiry.
- Research methodology influences the entire research journey from conceptualization to dissemination.

# Importance of knowing how research is done

- Understanding how research is conducted is essential for individuals across various disciplines and professions. Whether you are a student, a practitioner, or a decision-maker, knowledge of research methodologies and processes offers several important benefits.

## 1. Critical Thinking and Analytical Skills:

- Learning how research is done cultivates critical thinking skills by encouraging individuals to evaluate evidence, analyze data, and assess the validity of research findings.
- It enhances analytical abilities, enabling individuals to identify strengths and weaknesses in research designs, methodologies, and interpretations.

# Importance of knowing how research is done

## 2. Informed Decision Making:

- Familiarity with research methods empowers individuals to make informed decisions based on evidence rather than intuition or anecdotal evidence.
- It enables professionals to critically evaluate research studies, assess the relevance and applicability of findings to their context, and make evidence based decisions in their respective fields.

## 3. Research Literacy:

- Knowing how research is conducted enhances research literacy, allowing individuals to navigate academic literature, understand research articles, and extract relevant information.
- It enables individuals to distinguish between reliable and questionable research, identify key concepts and methodologies, and synthesize information from multiple sources.

# Importance of knowing how research is done

## 4. Professional Development:

- Knowledge of research methodologies is beneficial for professional development, particularly in fields where research skills are highly valued.
- It enhances employability by demonstrating competency in research design, data analysis, and evidence-based decision making, which are desirable qualities in many professions.

## 5. Contribution to Knowledge:

- Understanding how research is done enables individuals to contribute to the advancement of knowledge within their respective fields.
- It provides the foundation for conducting original research, generating new insights, and contributing to academic discourse through publications, presentations, and collaborations.

# Importance of knowing how research is done

## 6. Ethical Considerations:

- Awareness of research methods includes understanding ethical principles and guidelines governing research conduct.
- It promotes ethical research practices, ensuring the protection of human subjects, the responsible use of data, and the integrity of research findings.

## 7. Lifelong Learning:

- Research methodology is a fundamental aspect of lifelong learning, as it fosters a curiosity-driven mindset and a commitment to continuous self-improvement.
- It encourages individuals to stay updated with the latest research development, engage in ongoing professional development, and contribute to the generation of new knowledge throughout their careers.

# Management research: Concept, types, and value

## Concept of management research

### Definition:

- **Management research** involves the systematic and organized study of management-related issues, problems, and phenomena. It aims to generate knowledge that can be applied to improve managerial practices, decision-making, and organizational performance.
- **Objectives:**
  1. **Understanding issues:** To comprehend complex managerial issues.
  2. **Problem solving:** To find solutions to organizational challenges.
  3. **Decision support:** To provide insights for informed decision-making.
  4. **Continuous improvement:** To contribute to the ongoing development of management practices.

# Management research: Concept, types, and value

## Types of management research

### 1. Applied research:

- Focus: Addresses specific, practical problems in the organizational context.
- Purpose: Seeks solutions and improvements in current practices.
- Example: Research on optimizing supply chain logistics.

### 2. Basic research:

- Focus: Explores fundamental theoretical concepts in management.
- Purpose: Aims to enhance the theoretical understanding of management phenomena.
- Example: Studying underlying principles of organizational behavior.

# Management research: Concept, types, and value

## Types of management research

### 3. Quantitative research:

- Methodology: Involves the collection and analysis of numerical data.
- Purpose: Seeks to establish relationships and patterns through statistical analysis.
- Example: Survey on employee satisfaction using quantitative scales.

### 4. Qualitative research:

- Methodology: Emphasizes non-numerical data collection methods (e.g., interviews, observations).
- Purpose: Aims for in-depth understanding and insights into complex organizational issues.
- Example: Qualitative study on the impact of organization culture on employee management.



# **Management research: Concept, types, and value**

## **Value of management research in decision-making processes**

### **1. Informed decision-making:**

- Role: Provides managers with accurate and relevant information for decision-making.
- Example: Market research to inform product launch strategies.

### **2. Risk mitigation:**

- Role: Helps identify potential risks and uncertainties in decision options.
- Example: Risk analysis before entering a new market.

### **3. Performance improvement:**

- Role: Helps in identifying areas for improvement within the organization.
- Example: Research on efficiency in production processes.

# **Management research: Concept, types, and value**

## **Value of management research in decision-making processes**

### **4. Strategic planning:**

- Role: Contributes to the formulation and refinement of organizational strategies.
- Example: Research on industry trends to inform strategic planning.

### **5. Innovation and creativity:**

- Role: Encourages innovative thinking by providing insights into new possibilities.
- Example: Research on emerging technologies in the industry.

### **6. Employee engagement and satisfaction:**

- Role: Helps in understanding and addressing employee needs and concerns.
- Example: Surveys to gauge employee satisfaction and engagement.

# Management research: Concept, types, and value

## Value of management research in decision-making processes

### 7. Competitive advantage:

- Role: Provides an edge by informing decisions based on a deeper understanding of the market and industry.
- Example: Research on competitors and market trends.

### Conclusion:

- **Management research** is a powerful tool for organizations, offering valuable insights for decision-making processes.
- It plays a crucial role in addressing complex managerial challenges, improving organizational performance, and staying competitive in dynamic business environments.

# Ethical issues in IT research

## Introduction

- Ethical issues in IT research encompasses a wide range of considerations due to the unique nature of information technology. These include concerns related to privacy, data protection, consent, security, intellectual property, and the societal impacts of technological advancements. Understanding and addressing these ethical issues is crucial for researchers to maintain public trust, ensure compliance with laws and regulations, and promote the responsible use of technology.

## Key ethical principle in IT research

1. **Respect for persons:** Ensuring the autonomy and dignity of participants by obtaining informed consent and respecting their privacy.
2. **Legal compliance:** Minimizing harm and maximizing benefits for participants and society.
3. **Justice:** Ensuring the equitable distribution of the benefits and burdens of research.
4. **Respect for law and public interest:** Complying with all applicable laws and regulations and considering the broader societal implications of research.

# Ethical issues in IT research

## Privacy and confidentiality

- **Data privacy:** Researchers must protect the privacy of individuals by ensuring that personal data is collected, stored, and processed in a secure manner.
- **Confidentiality:** Maintaining the confidentiality of participant data is essential. This involves anonymizing data, using encryption, and implementing access controls to prevent unauthorized access.

- **Key issues**

### 1. Informed consent:

- Participants should be fully informed about the nature, purpose, and potential risks of the research.
- Consent should be obtained freely without coercion.
- Special considerations are required for vulnerable populations.

### 2. Data anonymization and de-identification:

- Techniques to anonymize data to protect participant identities.
- Challenges include the risk of re-identification through data linkage or advanced analytics.

# Ethical issues in IT research

## Data security

- **Protecting data integrity:** Ensuring that data is accurate, complete, and protected from unauthorized alterations.
- **Access control:** Implementing measures to restrict access to sensitive data to authorized personnel only.
- **Data breaches:** Developing and following protocols to handle data breaches, including notification procedures and mitigation strategies.

- **Key issues**

### 1. Cybersecurity threats:

- Researchers must be aware of and address potential cybersecurity threats that could compromise data security.
- Implementing robust security measures and staying updated on best practices.

### 2. Data storage and transmission:

- Ensuring secure storage and transmission of data, particularly when dealing with sensitive information.
- Utilizing encryption and secure communication channels.

# Ethical issues in IT research

## Ethical use of artificial intelligence and machine learning

- **Bias and fairness:** Addressing biases in AI algorithms and ensuring fairness in their application.
- **Transparency:** Making AI models and their decision-making processes transparent and explainable.
- **Accountability:** Establishing accountability for AI systems and their outcomes.

- **Key issues**

### 1. Algorithmic bias:

- Identifying and mitigating biases in data and algorithms that could lead to unfair or discriminatory outcomes.

### 2. Transparency and explainability:

- Providing clear explanations of how AI systems make decisions.
- Ensuring that users and stakeholders understand the limitations and potential impacts of AI technologies.

# Ethical issues in IT research

## Intellectual property and open access

- **Intellectual property rights:** Respecting the intellectual property rights of others and properly attributing sources and contributions.
- **Open access:** Balancing the benefits of open access to research findings with the need to protect proprietary information and intellectual property.

- **Key issues**

### 1. Plagiarism:

- Avoiding plagiarism by properly citing and acknowledging the work of others.
- Using plagiarism detection tools to ensure originality.

### 2. Data sharing and collaboration:

- Encouraging data sharing and collaboration while respecting intellectual property rights.
- Developing agreements that outline the terms of data sharing and collaboration.



# Ethical issues in IT research

## Societal impacts and responsibilities

- **Digital divide:** Addressing the disparities in access to technology and its benefits across different populations.
- **Environmental impact:** Considering the environmental impact of IT research and promoting sustainable practices.
- **Social responsibility:** Ensuring that IT research contributes positively to society and does not exacerbate existing inequalities or create new ethical dilemmas.

- **Key issues**

### 1. Accessibility:

- Promoting accessibility in technology design to ensure that all individuals, including those with disabilities, can benefit from technological advancements.
- Adhering to standards and guidelines for accessible design.

### 2. Sustainability:

- Evaluating the environmental impact of IT research activities and technologies.
- Implementing practices to reduce energy consumption, electronic waste, and the overall carbon footprint.

# Ethical issues in IT research

## Ethical review and governance

- **Ethics committees and institutional review boards (IRBs):** Ensuring that research proposals undergo ethical review to assess potential risks and benefits.
- **Codes of conduct and professional standards:** Adhering to codes of conduct and professional standards set by relevant organizations and institutions.

- **Key issues**

- 1. Ethical review process:**

- Submitting research proposals to IRBs or ethics committees for review.
- Addressing feedback and concerns raised by these bodies to ensure ethical compliance.

- 2. Ongoing monitoring and compliance:**

- Regularly monitoring research activities to ensure ongoing compliance with ethical standards.
- Implementing corrective actions when ethical breaches or concerns are identified.

# Ethical issues in IT research

## Conclusion

- Ethical issues in IT research are complex and multifaceted, requiring researchers to be vigilant and proactive in addressing potential concerns.
- By adhering to ethical principles, implementing robust data protection measures, and considering the broader societal impacts of their work, researchers can conduct IT research that is both responsible and beneficial to society.
- Continuous engagement with ethical guidelines, ongoing education, and collaboration with ethics committees are essential to maintaining high ethical standards in IT research.

# Status of IT research in Nepal

## Introduction

- Nepal has been progressively integrating information technology (IT) into various sectors. The landscape of IT research in Nepal is evolving, marked by both opportunities and challenges.

## Key areas of focus in IT research

### 1. E-Governance:

- Research on the implementation of e-governance systems to enhance transparency, efficiency, and public service delivery.
- Studies on the challenges and opportunities in digitizing government services.

### 2. Telecommunication and networking:

- Advancements in telecommunications infrastructure, particularly in expanding internet connectivity to rural areas.
- Research on improving network reliability, bandwidth, and reducing costs.

# Status of IT research in Nepal

## Key areas of focus in IT research

### **3. Software development and engineering:**

- Development of localized software solutions tailored to Nepalese needs.
- Focus on agile methodologies, software quality assurance, and user-centered design.

### **4. Data science and analytics:**

- Increasing interest in big data, machine learning, and artificial intelligence applications.
- Research on data-driven decision making in sectors like agriculture, health, and education.

### **5. Cybersecurity:**

- Studies on the cybersecurity landscape in Nepal, addressing threats, vulnerabilities, and mitigation strategies.
- Development of frameworks and policies for protecting digital assets and privacy.

### **6. Renewable energy technology:**

- Research on IT applications in renewable energy management and smart grids.
- Innovations in using IT for optimizing energy production and consumption.

# Status of IT research in Nepal

## Institutional Support and Initiatives

### 1. Government Initiatives:

- Ministry of Communication and Information Technology (MoCIT): Leading body for IT policy formulation and implementation.
- Nepal Telecommunications Authority (NTA): Regulating and promoting telecommunications and internet services.

### 2. Academic Institutions:

- Tribhuvan University: Leading university with several programs in computer science and IT.
- Kathmandu University: Known for its engineering programs and research in IT.
- Pokhara University, Purbanchal University and Gandaki University: Also contributing to IT education and research.

### 3. Research Centers and Labs:

- Nepal Research and Education Network (NREN): Promoting research and education in networking technologies.
- Nepal Academy of Science and Technology (NAST): Supporting scientific research and innovation, including IT.

### 4. Industry Collaboration:

- Growing partnerships between academia and the IT industry to promote applied research and innovation.
- IT companies and startups in Nepal actively engaging in research projects and product development.

# Status of IT research in Nepal

## Challenges in IT Research

### 1. Limited funding:

- Scarcity of financial resources for research projects and innovation.
- Dependence on international grants and collaborations.

### 2. Infrastructure constraints:

- Insufficient infrastructure, particularly in rural areas, to support advanced IT research.
- Challenges in maintaining reliable electricity and internet connectivity.

### 3. Brain drain:

- Migration of skilled IT professional and researchers to other countries for better opportunities.
- Difficulty in retaining talent within the country.

# Status of IT research in Nepal

## Challenges in IT Research

### **4. Regulatory and policy issues:**

- Need for more comprehensive and supportive IT policies and regulations.
- Bureaucratic hurdles and slow implementation of existing policies.

### **5. Skill gaps:**

- Mismatch between the skills taught in academic institutions and the needs of the industry.
- Need for continuous professional development and training programs.



# Status of IT research in Nepal

## Future Prospects

### 1. Expansion of IT education:

- Increasing the number of IT programs and courses in universities.
- Emphasis on practical skills, internships, and industry collaboration.

### 2. Enhanced government support:

- More investment in IT infrastructure and research from the government.
- Policies to attract and retain skilled professionals in the country.

### 3. International collaboration:

- Strengthening ties with international universities, research institutions, and IT companies.
- Participation in global research projects and conferences.

# Status of IT research in Nepal

## Future Prospects

### 4. Innovation and startups:

- Encouraging entrepreneurship and the growth of tech startups.
- Providing incubators, accelerators, and funding opportunities for new ventures.

### 5. Focus on local solutions:

- Developing IT solutions that address the specific needs and challenges in Nepal.
- Leveraging IT for social impact in areas like healthcare, education, and agriculture.

## Conclusion

- The status of IT research in Nepal is one of cautious optimism. While there are significant challenges to overcome, there is also a strong foundation of institutional support, growing interest in IT education, and a dynamic industry ready to innovate. By addressing funding issues, improving infrastructure, and fostering an environment that retains talent, Nepal can further its progress in IT research and leverage technology for national development.



# Unit II

## Literature Review

# Concept of Literature Review

- **Definition:**

- A literature review is a critical and systematic analysis of existing research and scholarly articles, books, reports, and other sources on a particular topic.

- **Purpose:**

- 1. Identification of Gaps:**

- To identify existing gaps, controversies, or unanswered questions in the current body of knowledge.

- 2. Contextualization:**

- To provide a context for the research by placing it within the existing literature and theoretical framework.

# Concept of Literature Review

- **Purpose:**

## **3. Understanding Trends:**

- To understand the historical development and evolution of research in the chosen field.

## **4. Methodological insights:**

- To gain insights into research methodologies, approaches, and tools used in previous studies.

## **5. Conceptual Framework:**

- To develop a conceptual framework that guides the current research.

## **6. Theoretical Foundations:**

- To explore and understand the theoretical foundations that inform the research topic.

# Importance of Literature Review

## 1. Contextualizing Research:

- A literature review provides a context for the research, helping readers understand its relevance and significance.

## 2. Identification of Gaps:

- A literature review helps identify gaps in existing research, guiding researchers on where their study fits within the current state of knowledge.

## 3. Avoiding Redundancy:

- Researchers can avoid duplicating previous work by understanding what has already been done in their area of interest.

## 4. Theoretical Framework:

- A literature review assists in the development of a theoretical framework by synthesizing and integrating existing theories and concepts.

# Importance of Literature Review

## **5. Methodological Guidance:**

- Researchers gain insights into various research methodologies, data collection techniques, and analytical tools employed in previous studies.

## **6. Quality Enhancement:**

- A literature review contributes to the overall quality and credibility of research by providing a strong foundation of relevant and reliable sources.

## **7. Informed Decision-Making:**

- Researchers can make informed decisions about the scope, direction, and methods of their study based on a comprehensive understanding of existing literature.

# Function of Literature Review

## 1. Surveying Literature:

- The literature review serves as a comprehensive survey of existing literature related to the research topic.

## 2. Synthesizing Information:

- The literature review involves synthesizing information from diverse sources to create a coherent narrative that informs the research.

## 3. Critical Analysis:

- The review critically evaluates the strengths and weaknesses of previous research, identifying gaps or areas requiring further investigation.

## 4. Organizing Themes:

- It helps organize literature into themes or categories, aiding in the presentation and discussion of findings.



# Function of Literature Review

## **5. Providing Historical Context:**

- The literature review places the research within a historical context, highlighting the evolution of ideas and theories over time.

## **6. Building a Conceptual Framework:**

- The literature review contributes to the construction of a conceptual framework, offering a theoretical basis for the research.

## **7. Informing Hypotheses and Research Questions:**

- Literature review guides the formulation of the hypotheses or research questions by addressing existing gaps or controversies.

# Conclusion

- A literature review is a fundamental component of scholarly research, playing a crucial role in shaping the direction, scope, and quality of a study.
- It not only provides a comprehensive overview of existing knowledge but also guides researchers in the formulation of hypotheses, development of theoretical frameworks, and identification of gaps that contribute to the advancement of knowledge in a particular field.

# Steps in Literature Review

## **1. Define the Scope of the Review:**

- Clearly define the research question or objective of the literature review.
- Determine the scope and boundaries of the review in terms of time, geography, and specific themes.

## **2. Conduct Preliminary Searches:**

- Begin with preliminary searches to identify key terms and concepts related to the research question.
- Explore databases, academic journals, and other relevant sources to get an initial understanding of the literature landscape.

## **3. Select Search Keywords and Phrases:**

- Identify and refine keywords and phrases that are directly related to the research topic.
- Consider synonyms, alternative terms, and variation to capture a comprehensive range of literature.

# Steps in Literature Review

## 4. Choose Relevant Databases and Sources:

- Select appropriate databases, libraries, and repositories for conducting a systematic search.

## 5. Conduct a Systematic Search:

- Perform a systematic search using the selected keywords and phrases.
- Use Boolean operators (AND, OR, NOT) to combine or exclude terms for a focused search.

## 6. Screen and Select Literature:

- Review the search results and screen the literature based on relevance to the research question.
- Exclude irrelevant or outdated sources and focus on high-quality, peer-reviewed publications.

# Steps in Literature Review

## **7. Organize and Catalog Articles:**

- Develop a systematic approach to organize and catalog selected articles.
- Use reference management tools to store, categorize, and annotate articles for efficient retrieval.

## **8. Evaluate and Critically Appraise Sources:**

- Critically evaluate the quality and reliability of selected sources.
- Consider factors such as the author's credentials, research methodology, and publication venue.

## **9. Synthesize and Categorize Information:**

- Synthesize information from selected sources to identify patterns, themes, and trends.
- Categorize literature based on commonalities and distinctions to create an organized structure.

# Steps in Literature Review

## **10. Identify Gaps and Controversies:**

- Evaluate the literature to identify gaps, controversies, or unresolved questions.
- Highlight areas where further research is needed or where differing perspectives exist.

## **11. Write the Literature Review:**

- Draft the literature review using a coherent structure that includes an introduction, main body, and conclusion.
- Ensure a logical flow that presents key themes, debates, and findings.

## **12. Revise and Refine:**

- Review and revise the literature review to enhance clarity, coherence, and conciseness.
- Seek feedback from peers, mentors, or colleagues to refine the review.

# Steps in Literature Review

## 13. Include Proper Citations:

- Properly cite all sources used in the literature review using a consistent citation style.
- Follow the guidelines of the selected citation style (APA, MLA, Chicago, etc.).

## 14. Update and Maintain the Review:

- Periodically update the literature review to include the latest research.
- Maintain an organized record of references and continue to monitor developments in the field.

# Conclusion

- Conducting a literature review is a systematic and iterative process that involves defining the scope, searching for relevant literature, critically evaluating sources, and synthesizing information.
- Following these steps ensures a comprehensive and well-organized literature review that contributes to the overall quality of the research.



# **Selection of Appropriate Literature**

## **Introduction:**

- The selection of literature is a crucial step in the literature review process.
- Choosing appropriate literature involves identifying and including sources that are relevant, credible, and contribute significantly to the understanding of the research topic.

## **1. Define Inclusion and Exclusion Criteria:**

- Establish clear criteria for selecting literature based on the research question or objective.
- Define parameters such as publication date, type of source (e.g., peer-reviewed journals, books), and relevance to the research topic.

# **Selection of Appropriate Literature**

## **2. Relevance to Research Question:**

- Prioritize literature directly related to the research question or objective.
- Assess how each source contributes to the overall understanding of the topic.

## **3. Peer-Reviewed Publications:**

- Give preference to peer-reviewed journals and scholarly publications.
- These sources undergo rigorous review processes, ensuring higher quality and reliability.

## **4. Authoritativeness of Authors:**

- Consider the credentials and expertise of the authors.
- Select literature authored by recognized experts or scholars in the field.

# **Selection of Appropriate Literature**

## **5. Research Methodology:**

- Evaluate the research methodology employed in the literature.
- Choose sources that utilize sound research methods, ensuring the validity and reliability of findings.

## **6. Publication Venue:**

- Assess the reputation and impact factor of the publication venue.
- High-impact journals or reputable publishers often indicate quality research.

## **7. Diversity of Sources:**

- Include a diverse range of sources to provide a comprehensive view.
- Consider literature from different geographic locations, cultural perspectives, and academic disciplines.

# **Selection of Appropriate Literature**

## **8. Timeliness and Currency:**

- Prioritize recent literature to ensure the information is current.
- For rapidly evolving fields, consider the relevance of older literature in providing historical context.

## **9. Avoiding Bias:**

- Be aware of potential bias in selected literature.
- Aim for a balanced representation of perspectives and avoid over-reliance on a single viewpoint.

## **10. Check Citations and References:**

- Examine the citations and references within the literature.
- Check if the sources are cited appropriately and if they lead to other reputable works.

# Selection of Appropriate Literature

## **11. Consideration of Literature Type:**

- Evaluate the type of literature (e.g., primary research articles, reviews, theoretical papers).
- Choose a mix of literature types to capture different aspects of the research topic.

## **12. Cross-Verification:**

- Cross-verify information across multiple sources.
- Ensure consistency and reliability by consulting different perspectives.

## **13. Audience and Purpose:**

- Consider the intended audience and purpose of the literature.
- Align the selected sources with the goals and objectives of the research.

# Selection of Appropriate Literature

## 14. Feedback and Peer Review:

- Seek feedback from peers, mentors, or colleagues on the appropriateness of selected literature.
- Peer review ensures a more comprehensive and rigorous selection process.

## Conclusion:

- The selection of appropriate literature is a strategic process that involves defining criteria, prioritizing relevance, considering authoritativeness, and ensuring diversity.
- By carefully curating a collection of relevant and credible sources, researchers can build a strong foundation for a high-quality literature review that contributes meaningfully to the research field.

# Searching Literature Through the Internet

## Introduction:

- The internet has become a crucial tool for accessing a vast array of academic and IT-related literature.
- Efficient literature search is essential for obtaining relevant information, understanding current trends, and identifying IT issues.

## 1. Selecting Search Engines and Databases:

- Choose reputable search engines and databases for academic and IT literature.
- Examples include Google Scholar, PubMed, JSTOR, EBSCOhost, and IT-specific databases.

# Searching Literature Through the Internet

## 2. Defining Search Terms:

- Clearly define search terms related to the research topic or IT issues.
- Utilize synonyms, alternative terms, and specific keywords to broaden or narrow the search

## 3. Boolean Operators:

- Understand and use Boolean operators (AND, OR, NOT) to enhance search precision.
- Combine terms to create complex search queries that better reflect the research focus.

## 4. Filters and Advanced Search Options:

- Utilize filters and advanced search options provided by search engines and databases.
- Filter by publication date, document type, author, and other criteria to refine search results.



# Searching Literature Through the Internet

## 5. Alerts and Notifications:

- Set up alerts or notifications for new publications in the chosen field.
- Stay updated on the latest research and IT developments.

## 6. Citation Tracking:

- Use citation tracking tools to identify highly cited and influential articles.
- Explore the works that have cited a particular article to discover related literature.

## 7. Access to Full Text:

- Check for access to the full text of articles and publications.
- Utilize institutional subscriptions, open-access resources, or interlibrary loan services.

# Searching Literature Through the Internet

## **8. Keeping an Organized Record:**

- Maintain an organized record of search results.
- Use reference management tools like EndNote, Zotero, or Mendeley to organize, annotate, and cite resources.

## **9. Evaluating Website Credibility:**

- Assess the credibility of websites hosting IT-related literature.
- Prefer academic institutions, established publishers, and reputable organizations for reliable information.

## **10. Utilizing Academic and IT Journals:**

- Explore academic journals and IT magazines for in-depth analysis and insights.
- Academic journals provide rigorous research, while IT magazines offer practical perspectives.

# Identifying IT Issues

## **1. Analyzing Research Articles:**

- Examine research articles for discussions on IT challenges and issues.
- Identify key findings and conclusions related to IT problems or opportunities.

## **2. Reviewing Industry Reports:**

- Access industry reports and market analyses.
- Identify trends, challenges, and emerging issues within specific industries.

## **3. Exploring Case Studies:**

- Explore IT case studies to understand real-world challenges.
- Case studies offer insights into how IT navigate and address issues.

# Identifying IT Issues

## **4. Surveying IT News and Reports:**

- Monitor IT news sources and reports for current issues.
- News articles and reports provide timely information on evolving IT scenarios.

## **5. Examining Academic Reviews and Discussions:**

- Read academic reviews, discussions, and literature critiques.
- Scholars often analyze and discuss critical IT issues within the academic context.

## **6. Networking and Professional Organizations:**

- Engage with professional organizations and networks.
- Attend conferences, webinars, and industry events to gain firsthand knowledge of IT challenges.

# Identifying IT Issues

## 7. Consulting Industry Experts:

- Reach out to industry experts and professionals for insights.
- Interviews and expert opinions provide valuable perspectives on current IT issues.

## Conclusion:

- Effective literature searching through the internet is a vital skill for researchers and IT professionals.
- By mastering search techniques, critically evaluating sources, and staying informed, individuals can identify and analyze IT issues, contributing to informed decision-making and strategic planning within the IT landscape.

# Practices of Writing Literature Review

## Introduction:

- Writing a literature review is a systematic process that involves critical evaluation, synthesis, and organization of existing research on a specific topic.
- Effective practices in writing a literature review ensure clarity, coherence, and a strong foundation for further research.

## 1. Understand the Purpose:

- **Objective clarity:**
  - Clearly understand the purpose of the literature review – whether it is to identify gaps, synthesize knowledge, or provide historical context.
- **Align with Research Goals:**
  - Ensure that the literature review aligns with the research goals and contributes meaningfully to the overall study.

# Practices of Writing Literature Review

## 2. Conduct Thorough Literature Search:

- **Comprehensive Search:**
- Conduct a thorough literature search using reputable databases, journals, and academic sources.
- **Utilize Keywords:**
- Employ relevant keywords, synonyms, and alternative terms to capture a comprehensive range of literature.

## 3. Organize Literature Effectively:

- **Create Categories:**
- Organize literature into categories or themes based on commonalities and distinctions.
- **Logical Flow:**
- Ensure a logical flow within the literature review, with each section contributing to the overall narrative.

# Practices of Writing Literature Review

## 4. Critical Evaluation of Sources:

- **Assess Source Credibility:**
  - Critically evaluate the credibility and reliability of each source.
  - Consider the author's credentials, research methodology, and publication venue.
- **Identify Bias:**
  - Be aware of potential bias in selected sources and strive for a balanced representation of perspectives.

## 5. Synthesize Information:

- **Highlight Key Findings:**
  - Synthesize information from various sources to identify key findings, themes, and trends.
- **Integration of Perspectives:**
  - Integrate diverse perspectives to present a holistic view of the research topic.



# Practices of Writing Literature Review

## 6. Provide Context and Historical Overview:

- **Contextualization:**
- Provide a context for the research by placing it within the historical and theoretical framework.
- **Chronological Organization:**
- Consider organizing the literature chronologically to showcase the historical development of ideas.

## 7. Highlight Gaps and Controversies:

- **Identify Research Gaps:**
- Clearly highlight gaps, controversies, or areas where further research is needed.
- **Critical Discussion:**
- Engage in a critical discussion of existing literature, emphasizing the unresolved aspects.

# Practices of Writing Literature Review

## 8. Writing Style and Language:

- **Clarity and Conciseness:**
  - Write with clarity and conciseness, avoiding unnecessary jargon or overly complex language.
- **Professional Tone:**
  - Maintain a professional and scholarly tone throughout the literature review.

## 9. Use of Citations:

- **Consistent Citation Style:**
  - Use a consistent citation style (APA, MLA, Chicago, etc.) throughout the literature review.
- **Proper Attribution:**
  - Properly attribute ideas, concepts, and findings to the original authors.

# Practices of Writing Literature Review

## 10. Revise and Seek Feedback:

- **Revision Process:**
- Review and revise the literature review for coherence, clarity, and accuracy.
- **Peer Review:**
- Seek feedback from peers, mentors, or colleagues to refine the review.

## 11. Avoid Plagiarism:

- **Proper Attribution:**
- Ensure proper attribution of ideas to avoid plagiarism.
- Use quotation marks for direct quotes and provide citations for paraphrased content.

# Practices of Writing Literature Review

## Conclusion:

- Writing a literature review is a multifaceted process that involves strategic planning, thorough research, critical evaluation, and effective communication.
- By adhering to these practices, researchers can create a literature review that not only contributes to the existing body of knowledge but also serves as a foundation for further scholarly inquiry.



## Unit III

# Research Problem, Research Question, Theoretical and Conceptual Framework

# Concepts of Research Problem:

- **Introduction to Research Problem:**
- **Definition:**
  - A research problem is a specific issue, concern, or difficulty that requires investigation and resolution through a systematic research process.
- **Foundation of Research:**
  - The research problem is the cornerstone of the entire research endeavor. It dictates the direction, scope, and significance of the study.

# Concepts of Research Problem:

- **Characteristics of a Good Research Problem:**

- 1. Clarity and Precision:**

- The problem statement should be clear, concise, and specific.
- Ambiguity can lead to vague research outcomes

- 2. Feasibility:**

- The research problem should be feasible within the available resources, time constraints, and ethical considerations.

- 3. Relevance:**

- The problem must be relevant to the field of study, contributing to the existing knowledge and addressing a gap or issue.

# Concepts of Research Problem:

- **Characteristics of a Good Research Problem:**

## **4. Novelty:**

- Ideally, the research problem should offer a novel perspective, introducing new insights or approaches to the subject matter.

## **5. Measurability:**

- The variables within the research problem should be measurable and observable, ensuring the collection of reliable data.

## **6. Interest and Significance:**

- The problem should be of interest to the researcher and the academic community, demonstrating significance in addressing broader issues.



# Concepts of Research Problem:

- **Sources of Research Problems:**

- 1. Personal Experience:**

- Issues encountered in daily life or professional experiences can spark research ideas.

- 2. Literature Review:**

- Gaps and unanswered questions identified during a literature review can evolve into research problems.

- 3. Current Events:**

- Real-world events, societal changes, or emerging trends may prompt research questions.

- 4. Collaboration and Discussion:**

- Interactions with colleagues, experts, or mentors can lead to the identification of research problems.

# Concepts of Research Problem:

- **Types of Research Problems:**

- 1. Descriptive Problems:**

- Involve describing the characteristics of a phenomenon without manipulating variables. Common in exploratory research.

- 2. Relational Problems:**

- Investigate the relationships between two or more variables. Aim to establish connections or correlations.

- 3. Comparative Problems:**

- Focus on comparing two or more groups or conditions to identify similarities, differences, or patterns.

- 4. Explanatory Problems:**

- Seek to explain the underlying reasons or causal relationships between variables.

# Concepts of Research Problem:

- **Conclusion:**
- Understanding the concepts of research problems is foundational for any research endeavor.
- A well-defined and carefully chosen research problem sets the stage for a meaningful and impactful study, driving the entire research process.

# Guiding Principles of Formulating Research Problem:

- **Introduction:**

- 1. Foundation of Research:**

- The formulation of a research problem is a critical step in the research process. It sets the direction, scope, and purpose of the study.

- 2. Significance:**

- A well-formulated research problem is essential for conducting meaningful and valuable research.

# Guiding Principles of Formulating Research Problem:

- **Guiding Principles:**

- 1. Clarity and Precision:**

- **Definition:** The research problem statement should be clear, precise, and unambiguous.
- **Importance:** Clarity ensures that the research question is easily understood, reducing the likelihood of misinterpretation.

- 2. Feasibility:**

- **Definition:** The research problem should be feasible in terms of resources, time, and ethical considerations.
- **Importance:** Ensures that the study is practical and can be conducted within the available constraints.

# Guiding Principles of Formulating Research Problem:

- **Guiding Principles:**

## **3. Relevance:**

- **Definition:** The research problem should be relevant to the field of study, addressing a gap or contributing to existing knowledge.
- **Importance:** Enhances the significance of the research, making it valuable to the academic community and beyond.

## **4. Novelty:**

- **Definition:** The research problem should offer a novel perspective or contribute new insights to the subject matter.
- **Importance:** Fosters innovation and ensures that the research adds something new to the body of knowledge.

# Guiding Principles of Formulating Research Problem:

- **Guiding Principles:**

## **5. Measurability:**

- **Definition:** Variables within the research problem should be measurable and observable.
- **Importance:** Facilitates the collection of reliable and valid data, ensuring the study's credibility.

## **6. Interest and Significance:**

- **Definition:** The research problem should be of interest to the researcher and demonstrate significance in addressing broader issues.
- **Importance:** Motivates the researcher and increases the impact of the research within the academic community.

# Guiding Principles of Formulating Research Problem:

- **Conclusion:**
- Understanding and applying the guiding principles in formulating a research problem is crucial for the success of any research endeavor. A well-crafted research problem aligns with these principles, ensuring clarity, feasibility, relevance, novelty, measurability, and significance, ultimately contributing to the quality and impact of the research.



# **Formulation of Research Questions and Objectives:**

- **Steps in Formulating a Research Problem:**

- 1. Selecting a Broad Area:**

- Identify a general field of interest based on academic background, passion, or societal relevance.

- 2. Reviewing the Literature:**

- Conduct a thorough literature review to understand existing research, identify gaps, and refine the research problem.

- 3. Defining the Problem:**

- Clearly articulate the research problem, specifying the variables, scope, and context.

# **Formulation of Research Questions and Objectives:**

- **Steps in Formulating a Research Problem:**

## **4. Narrowing the Scope:**

- Refine the problem to a manageable size, considering the available resources and time constraints.

## **5. Formulating Research Questions or Hypotheses:**

- Pose specific research questions or hypotheses that guide the study and address the research problem.

## **6. Seeking Feedback:**

- Share the formulated research problem with peers, mentors, or experts to receive constructive feedback.

# Formulation of Research Questions and Objectives:

- **Formulation of Research Objectives:**

- 1. Definition of Objectives:**

- Research objectives are specific, measurable, and achievable goals that the researcher aims to accomplish in the study.

- 2. Characteristics of Good Research Objectives:**

- Specific: Clearly define what the researcher intends to achieve.
- Measurable: Objectives should be quantifiable or observable.
- Achievable: Ensure that objectives are realistic and feasible within the study's scope.
- Relevant: Ensure that objectives are relevant to the study's scope.
- Time-bound: Set a timeframe for achieving each objective.

- 3. Example:**

- Research Objective: "To assess the impact of social media usage on the academic performance of university students over a one-year period."

# Formulation of Research Questions and Objectives:

- **Linkage between Research Questions and Objectives:**

## **1. Alignment:**

- Ensure a direct alignment between research questions and objectives.
- Questions guide the study, and objectives operationalize the achievement of research goals.

## **2. Example:**

- Research Question: “What are the factors influencing employee job satisfaction in the IT industry?”
- Research Objective: “To identify and analyze the key factors influencing employee job satisfaction in the IT industry through a comprehensive literature review and empirical investigation.”

# Formulation of Research Questions and Objectives:

- **Conclusion:**
- Formulating clear and focused research questions and objectives is foundational to the research design process.
- These elements provide a roadmap for the study, guiding researchers toward meaningful and achievable goals.
- The careful alignment between questions and objectives ensures a coherent and purposeful research endeavor.

# Theory: Theoretical framework, Conceptual framework, Role of theory in research

- **Introduction:**

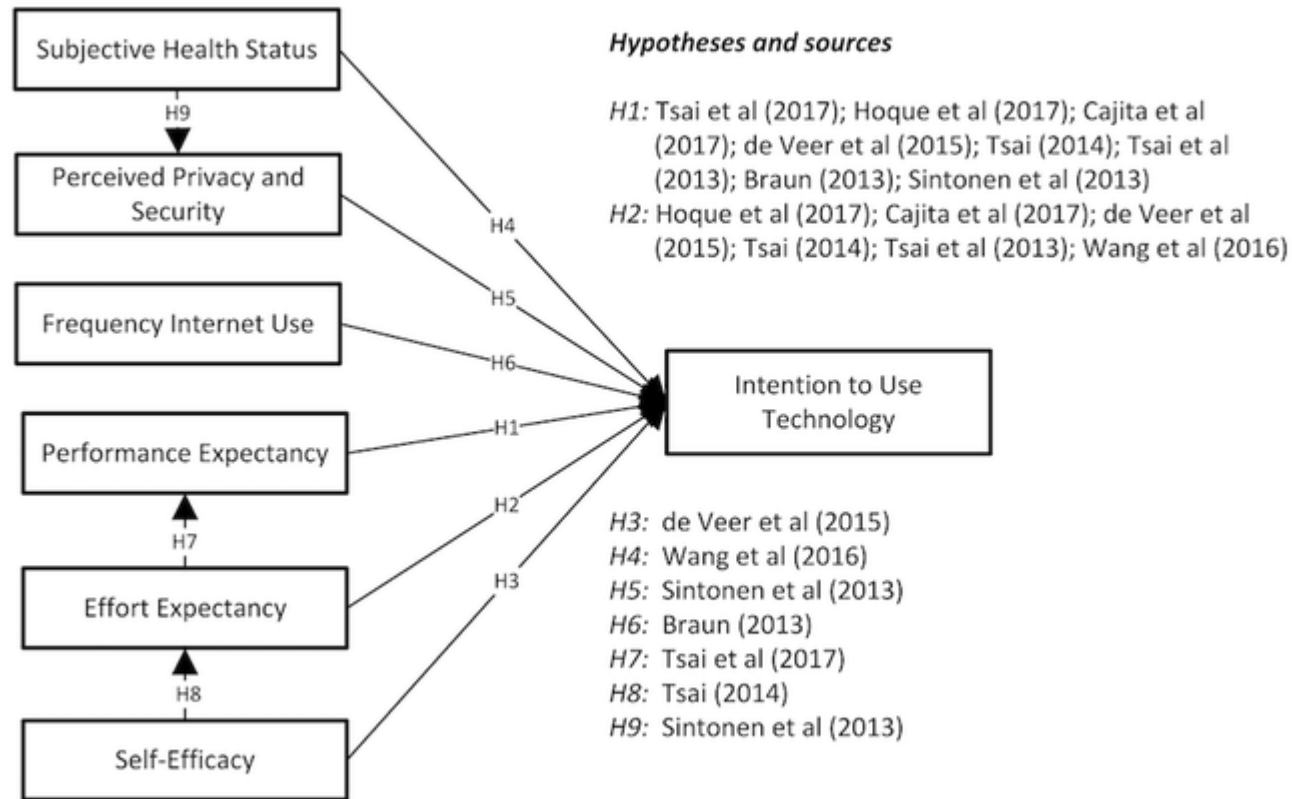
- In research, theory plays a crucial role in providing a framework for understanding, interpreting, and explaining phenomena.
- Theoretical and conceptual frameworks are essential components that guide the research process and shape its structure.

- **1. Theoretical Framework:**

- Definition: A theoretical framework is a structure of concepts, definitions, and propositions that presents a systematic view of relationships among variables, forming a basis for understanding and analyzing a phenomenon.
- Purpose:
  - To provide a foundation for hypothesis development.
  - To guide the collection and analysis of data.
  - To offer a coherent and logical explanation for observed patterns.

# Theory: Theoretical framework, Conceptual framework, Role of theory in research

- 1. Theoretical Framework:



- This framework displays the factors associated with older people's intention to use technology. Each hypothesis is based on prior research, as shown. H = hypothesis

(Reference: [https://www.researchgate.net/figure/Theoretical-framework-This-framework-displays-the-factors-associated-with-older-peoples\\_fig1\\_324262649](https://www.researchgate.net/figure/Theoretical-framework-This-framework-displays-the-factors-associated-with-older-peoples_fig1_324262649))

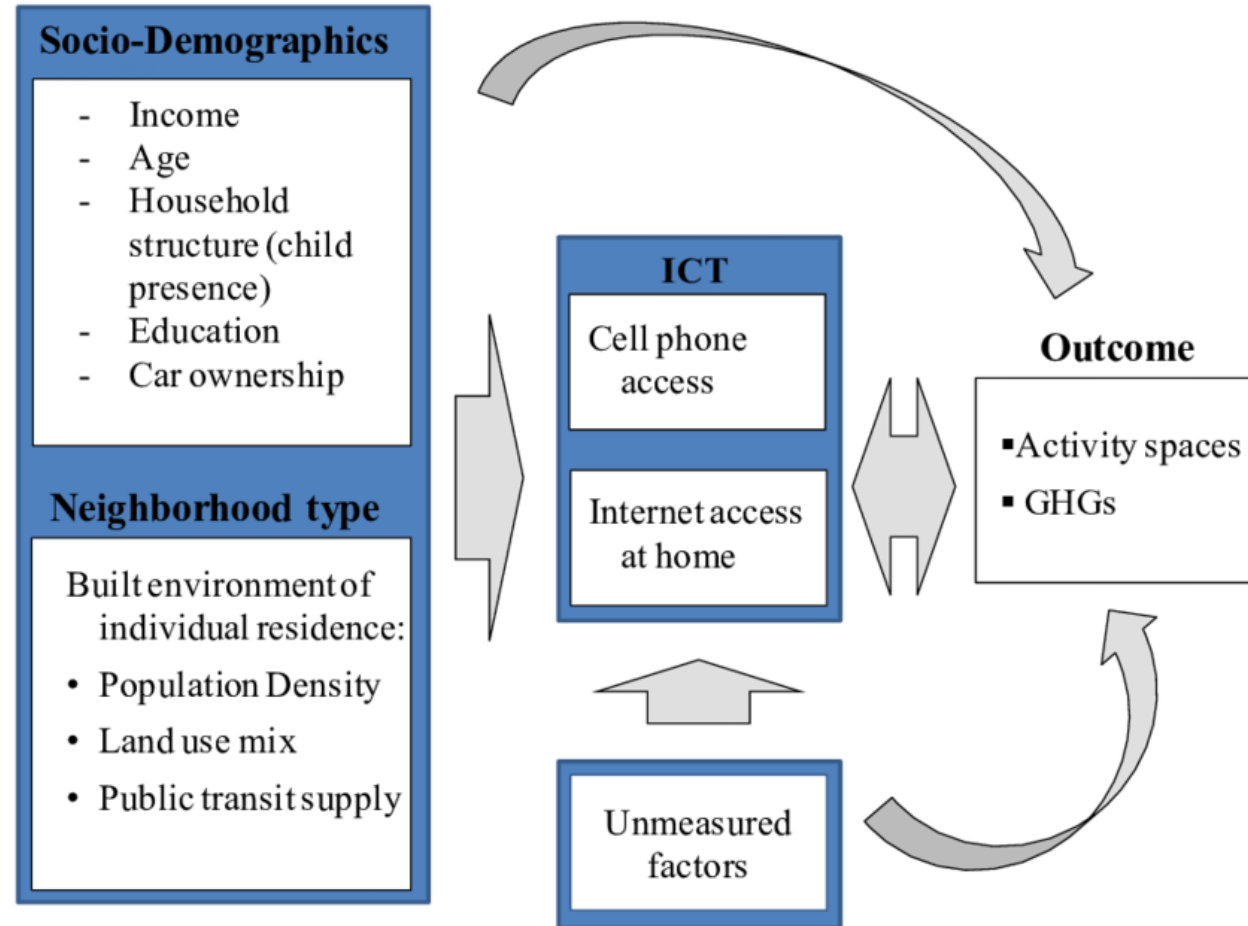
# Theory: Theoretical framework, Conceptual framework, Role of theory in research

- **2. Conceptual Framework:**
- Definition: A conceptual framework is an analytical tool used to visualize the relationships between concepts, variables, or ideas within the study.
- Components:
  - *Concepts*: Abstract ideas representing class or category.
  - *Variables*: Measurable traits or characteristics.
- Function:
  - Clarifies the study's focus.
  - Guides the selection of variables.
  - Offers a roadmap for data analysis.



# Theory: Theoretical framework, Conceptual framework, Role of theory in research

- 2. Conceptual Framework:



- Conceptual framework-link between ICT and travel outcomes

(Reference: [https://www.researchgate.net/figure/Conceptual-framework-link-between-ICT-and-travel-outcomes\\_fig3\\_254426937](https://www.researchgate.net/figure/Conceptual-framework-link-between-ICT-and-travel-outcomes_fig3_254426937))

# Theory: Theoretical framework, Conceptual framework, Role of theory in research

- **3. Role of Theory in Research:**

- Guiding Research Design:

- Theory shapes the overall design of a study, influencing the selection of methods and data collection techniques.

- Providing a Rationale:

- Theoretical frameworks justify the study by explaining why the chosen variables are important and how they relate to one another.

- Hypothesis Formulation:

- Theoretical perspectives contribute to the development of hypotheses, predicting relationships between variables.

# Theory: Theoretical framework, Conceptual framework, Role of theory in research

- **3. Role of Theory in Research:**

- Interpretation of Findings:
- Theory aids in interpreting research findings, allowing researchers to draw meaningful conclusions.
- Generalizability:
- A well-founded theoretical framework enhances the generalizability of research findings.

- **Conclusion:**

- In summary, theory, whether theoretical or conceptual, serves as a roadmap for researchers, guiding their study design, hypothesis formulation, and interpretation of results. A strong theoretical foundation contributes to the robustness and credibility of research endeavors.

# Deduction and Induction

- **Introduction:**
- Deduction and induction are two fundamental methods of reasoning in research and philosophy.
- They represent distinct approaches to drawing conclusions from evidence.
- **1. Deduction:**
- Definition: Deduction involves deriving specific conclusions from general principles, theories, or premises.
- Process:
- Starts with a general statement or hypothesis.
- Applies this general principle to specific cases to reach a more detailed and specific conclusion.
- Example:
- All humans are mortal (general premise).
- Socrates is a human (specific case).
- Therefore, Socrates is mortal (specific conclusion).

# Deduction and Induction

- **2. Induction:**
- Definition: Induction involves deriving general principles or theories from specific observations or cases.
- Process:
- Begins with specific instances or examples.
- Draws general conclusion that is likely but not certain.
- Example:
- The sun has risen every morning in the past (specific observations).
- Therefore, the sun will likely rise tomorrow morning (general conclusion).

# Deduction and Induction

- **3. Comparison:**
- Nature of Reasoning:
  - Deduction is a top-down reasoning process, moving from general to specific.
  - Induction is a bottom-up reasoning process, moving from specific to general.
- Certainty:
  - Deductive reasoning aims for certainty; if the premises are true, the conclusion is certain.
  - Inductive reasoning provides probable, but not absolute, conclusions.

# Deduction and Induction

- **4. Strengths and Limitations:**

- Deduction:

- Strengths: Offers certainty, logical structure.
- Limitations: Relies heavily on the accuracy of premises, may not be applicable in all situations.

- Induction:

- Strengths: Reflects real-world uncertainty, allows for flexibility.
- Limitations: Conclusions are not guaranteed, vulnerable to counterexamples.

# Deduction and Induction

- **5. Research Applications:**

- Deductive Research:
  - Often used in quantitative research.
  - Testing hypotheses derived from established theories.
- Inductive Research:
  - Common in qualitative research.
  - Generating theories or concepts based on observed patterns.

- **Conclusion:**

- Deduction and induction represent complementary approaches in research, each with its strengths and applications. Researchers often use a combination of these methods depending on the nature of their study and the questions they seek to answer. Understanding these reasoning processes is fundamental for sound research design and analysis.



# Concept of Hypothesis

- **Introduction**
- A hypothesis is a fundamental element in the scientific method, serving as a testable statement that predicts the outcome of a research study.
- It provides a logical structure for investigation, guiding the research process from design to analysis.
- **1. Definition of Hypothesis:**
- Definition: A hypothesis is a clear, specific, and testable statement that predicts the relationship between variables or the outcome of an experiment.
- Purpose:
- Provides a basis for empirical investigation.
- Guides the researcher in formulating research questions.

# Concept of Hypothesis

- **2. Types of Hypothesis:**
- Null Hypothesis ( $H_0$ ): Assumes no effect or relationship; any observed difference is due to random chance.
- Alternative Hypothesis ( $H_1$ ): Assumes a specific effect or relationship; what the researcher aims to support.
- Directional vs. Non-Directional Hypotheses:
- Directional: Predicts the direction of the effect (e.g., positive or negative)
- Non-Directional: Predicts the existence of an effect without specifying its direction.

# Concept of Hypothesis

- **3. Hypothesis Formulation:**
- Observation: Begins with observation of a phenomenon or pattern.
- Research Question: Develops into a research question that guides hypothesis formulation.
- Variables: Identifies the independent and dependent variables.
- Testable Statement: Converts the research question into a clear, testable statement.
- Null and Alternative Hypotheses: Formulates the null hypothesis ( $H_0$ ) and alternative hypothesis ( $H_1$ ).

# Concept of Hypothesis

- **4. Good Criteria for Hypothesis Formulation:**

- **Clarity and Specificity:** Clearly states the expected relationship or effect.
- **Testability:** Allows for empirical testing through data collection and analysis.
- **Falsifiability:** The hypothesis should be capable of being proven false.
- **Relevance:** Addresses the research question and aligns with study objectives.
- **Logical Consistency:** The hypothesis should be logically consistent with existing knowledge.
- **Scope:** Defines the scope and boundaries of the study.

# Concept of Hypothesis

- **5. Examples:**

- Null Hypothesis ( $H_0$ ): There is no significant difference in test scores between Group A and Group B.
- Alternative Hypothesis ( $H_1$ ): Group A will perform significantly better than Group B in test scores.

- **6. Research Applications:**

- Experimental Research: Hypotheses guide the experimental design and the manipulation of variables.
- Observational Research: Hypotheses guide the collection and analysis of observational data.

# Concept of Hypothesis

- **Conclusion:**
- The concept of a hypothesis is central to the scientific method, providing a structured and testable foundation for empirical research.
- Proper formulation, guided by good criteria, enhances the reliability and validity of research findings.
- Researchers use hypotheses to make predictions, test theories, and contribute to the cumulative knowledge in their respective fields.



# Unit IV

## Research Design

# Research Design – Concept, Importance, and Components

- **Introduction:**
  - Research design is a crucial aspect of the research process, providing a systematic plan for conducting a study.
  - It serves as a blueprint that outlines the structure and strategy for collecting, analyzing, and interpreting data.
- **1. Concept of Research Design:**
  - *Definition:* Research design refers to the overall strategy or plan that integrates various components of a research study, ensuring the fulfillment of research objectives.
  - *Function:* Guides the researcher in making decision about the study's design, data collection, and analysis.



# Research Design – Concept, Importance, and Components

- **2. Importance of Research Design:**

- *Structural Framework*: Provides a structured framework for organizing the study.
- *Minimizes Bias*: Helps in minimizing bias and ensuring the reliability and validity of the study.
- *Resource Optimization*: Maximizes the efficient use of time, money, and resources.
- *Study Replication*: Allows for the replication of the study by other researchers.

- **3. Components of Research Design:**

- **a. Research Type:**

- *Descriptive Research*: Focuses on describing the characteristics of a population or phenomenon.
- *Exploratory Research*: Aims to explore new ideas or gain insights into a topic.
- *Explanatory Research*: Seeks to explain the relationship between variables.

# Research Design – Concept, Importance, and Components

- **3. Components of Research Design:**

- **b. Research Strategy:**

- *Quantitative Research*: Involves the collection and analysis of numerical data.
- *Qualitative Research*: Focuses on understanding social phenomena through non-numeric data.
- *Mixed-Methods Research*: Combines both quantitative and qualitative approaches.

- **c. Data Collection Methods:**

- *Surveys*: Collects data through questionnaires or interviews.
- *Experiments*: Manipulates variables to observe their effects.
- *Observational Studies*: Involves the systematic observation of behavior.
- *Case Studies*: In-depth examination of a single instance or phenomenon.

# Research Design – Concept, Importance, and Components

- **3. Components of Research Design:**
- **d. Sampling Strategy:**
  - *Random Sampling*: Every member of the population has an equal chance of being included.
  - *Stratified Sampling*: Divides the population into subgroups and samples from each.
  - *Convenience Sampling*: Selects participants based on their availability or accessibility.
- **e. Time Horizon:**
  - *Cross-Sectional Study*: Collects data at a single point in time.
  - *Longitudinal Study*: Collects data over an extended period to observe changes.

# Research Design – Concept, Importance, and Components

- **3. Components of Research Design:**
- **f. Data Analysis Plan:**
- *Statistical Analysis:* Involves the use of statistical tools for quantitative data.
- *Thematic Analysis:* Identifies themes and patterns in qualitative data.
- **4. Practical Considerations:**
- *Ethical Considerations:* Research design should adhere to ethical principles and protect participants.
- *Feasibility:* The design should be realistic, considering available resources and time constraints.
- **Conclusion:**
- Research design is the backbone of a research study, providing a roadmap for conducting research systematically. It influences the study's validity, reliability, and generalizability. Researchers must carefully consider and articulate each component of the research design to ensure the success and integrity of their studies.

# Research Question and Research Design

- **Introduction:**
- A well-formulated research question is the foundation of any research study, guiding the subsequent development of the research design.
- Research design, in turn, serves as the roadmap that outlines the overall strategy for conducting the study.
- **1. Research Question:**
- *Definition:* A research question is a clear, concise, and specific inquiry that a researcher aims to answer through systematic investigation.
- *Characteristics:*
- Should be focused and directly related to the research problem.
- Clear enough to guide the study's design and analysis.
- Open-ended to allow for exploration and discovery.
- Examples:
- “What is the impact of social media on adolescents’ mental health?”
- “How does employee satisfaction affect organizational productivity?”

# Research Question and Research Design

- **2. Importance of a Well-Formulated Research Question:**

- *Guides the Research Process:* Directs the selection of research design, methods, and data analysis techniques.
- *Defines the Scope:* Sets the boundaries and scope of the study.
- *Facilitates Focus:* Helps maintain focus on the specific issue being investigated.
- *Promotes Clarity:* Assists in clearly communicating the purpose of the study to others.

- **3. Developing a Research Question:**

- *Start with a Broad Topic:* Identify an area of interest and then narrow it down.
- *Review Existing Literature:* Understand what is already known and identify gaps.
- *Formulate the Question:* Develop a clear and concise research question based on the identified gap.

# Research Question and Research Design

- **4. Research Design:**
- *Definition:* Research design is the overall plan or structure that guides the systematic collection, analysis, and interpretation of data.
- *Components:*
- Research type (descriptive, exploratory, explanatory).
- Research strategy (quantitative, qualitative, mixed-methods).
- Data collection methods (surveys, experiments, interviews, etc.).
- Sampling design.
- Time horizon (cross-sectional, longitudinal).
- Data analysis plan.
- *Example:*
- A researcher interested in understanding the impact of a new teaching method on student performance may use an experimental research design, collecting quantitative data through pre and post-tests.

# Research Question and Research Design

- **5. Relationship Between Research Question and Research Design:**

- *Reciprocal Influence:*
- A well-defined research question informs the choice of research design.
- The chosen research design helps to answer the research question effectively.

- **6. Practical Considerations:**

- *Feasibility:* Consider the resources, time, and ethical implications when formulating a research question and designing the study.
- *Adaptability:* Be open to refining the research question or adjusting the design based on practical constraints and emerging insights.

- *Conclusion:*

- The relationship between a research question and research design is symbiotic, with each influencing and shaping the other. A clear and focused research question lays the groundwork for designing a study that is methodologically sound and capable of producing meaningful results. Researchers must pay careful attention to both elements to ensure the success and rigor of their research endeavors.



# Types of Research Design

- *Introduction:*
- Research design is a crucial aspect of the research process, determining the overall structure and strategy employed in a study.
- Different types of research designs serve distinct purposes and are selected based on the research question and objectives.
- **1. Exploratory Research Design:**
- *Purpose:*
- To gain insights into a poorly understood problem.
- To identify variables and formulate hypotheses for further research.
- *Methods:*
- Literature reviews, focus groups, interviews, case studies.
- *Example:*
- Exploring consumer preferences for a new product before formalizing a hypothesis.

# Types of Research Design

- **2. Descriptive Research Design:**

- *Purpose:*
  - To provide an accurate and detailed portrayal of a phenomenon.
  - To answer questions about who, what, when, where, and how.
- *Methods:*
  - Surveys, observational studies, content analysis.
- *Example:*
  - Investigating the demographic profile of customers in a specific market.

- **3. Case Study Research Design:**

- *Purpose:*
  - To delve deeply into a particular case or instance.
  - To understand complex phenomena in their natural context.
- *Methods:*
  - In-depth interviews, observations, document analysis.
- *Example:*
  - Studying the impact of a specific educational intervention in a particular school.

# Types of Research Design

- **4. Comparative Research Design:**

- *Purpose:*
  - To compare two or more groups, settings, or conditions.
  - To identify similarities and differences.
- *Methods:*
  - Surveys, experiments, case studies.
- *Example:*
  - Comparing the performance of students in urban and rural schools.

- **5. Experimental Research Design:**

- *Purpose:*
  - To establish cause-and-effect relationships.
  - To test hypotheses by manipulating independent variables.
- *Methods:*
  - Randomized controlled trials, field experiments.
- *Example:*
  - Investigating the impact of a new drug on patient outcomes through a controlled experiment.

# Types of Research Design

- **6. Cross-Sectional Research Design:**

- *Purpose:*
- To collect data at a single point in time.
- To capture a snapshot of a phenomenon.
- *Methods:*
- Surveys, observations, experiments.
- *Example:*
- Analyzing public opinion through a survey conducted in a specific month.

- **7. Longitudinal Research Design:**

- *Purpose:*
- To collect data from the same subjects over an extended period.
- To observe changes or trends.
- *Methods:*
- Cohort studies, panel studies.
- *Example:*
- Tracking the career trajectories of a group of professionals over a decade.

# Types of Research Design

- **8. Practical Considerations:**

- *Selection Criteria:*

- Choose a research design based on the nature of the research question and objectives.
- *Flexibility:*
- Researchers may adapt or combine designs based on emerging insights and practical constraints.

- **Conclusion:**

- Each type of research design serves a unique purpose, and the selection of the appropriate design depends on the specific goals of the research. Understanding the characteristics and applications of each design type is essential for researchers to make informed decisions and conduct methodologically rigorous studies.

# Research Designs Commonly Used in IT Research

- **1. Experimental Research Design:**

- **Definition:** Involves the manipulation of variables to establish cause-and-effect relationships.

- **Features:**

- **Control Group:** A group that does not receive the experimental treatment.

- **Randomization:** Random assignment of participants to different groups to ensure each participant has an equal chance of being placed in any group.

- **Independent Variable:** The variable that is manipulated.

- **Dependent Variable:** The variable that is measured.

- **Examples in IT:**

- Testing the effectiveness of a new software tool.

- Comparing user performance with different user interfaces.

# Research Designs Commonly Used in IT Research

- **2. Quasi-Experimental Research Design:**

- **Definition:** Similar to experimental design but lacks random assignment.

- **Features:**

- **Non-randomized Groups:** Participants are not randomly assigned to groups.

- **Comparison Groups:** Groups are compared to assess the impact of the intervention.

- **Examples in IT:**

- Evaluating the impact of a cybersecurity training program in different organizations without random assignment

# Research Designs Commonly Used in IT Research

- **3. Survey Research Design:**

- **Definition:** Involves collecting data from a large number of respondents through questionnaires or interviews.

- **Features:**

- **Questionnaires/Interviews:** Tools for collecting data.

- **Large Sample Size:** Typically involves a large number of participants to ensure representativeness.

- **Examples in IT:**

- Assessing user satisfaction with a software application.

- Understanding the adoption of new technologies in organizations.



# Research Designs Commonly Used in IT Research

- **4. Case Study Research Design:**

- **Definition:** An in-depth study of a single case or a small number of cases.
- **Features:**
  - **Detailed Analysis:** Provides a comprehensive understanding of the case(s).
  - **Contextual Factors:** Considers the context in which the case is situated.
- **Examples in IT:**
  - Studying the development process of a successful open-source project.

# Research Designs Commonly Used in IT Research

- **5. Longitudinal Research Design:**

- **Definition:** Involves collecting data from the same subjects over a period of time.

- **Features:**

- **Time Series Data:** Data collected at multiple points in time.

- **Changes Over Time:** Tracks changes and developments over time.

- **Examples in IT:**

- Studying the long-term effects of using a particular technology on productivity.

- Tracking the evolution of software development practices in an organization.

# Research Designs Commonly Used in IT Research

- **6. Cross-Sectional Research Design:**

- **Definition:** Involves collecting data at a single point in time from different subjects.

- **Features:**

- **Snapshot:** Provides a snapshot of the phenomenon at a specific point in time.

- **Comparative Analysis:** Allows for comparison between different groups.

- **Examples in IT:**

- Comparing the adoption rates of different technologies across industries.

- Assessing the cybersecurity practices of various organizations at a particular time.

# Research Designs Commonly Used in IT Research

- **7. Ethnographic Research Design:**

- **Definition:** Involves the study of people and cultures in their natural setting.

- **Features:**

- **Participant Observation:** The researcher immerses themselves in the environment being studied.

- **Cultural Context:** Focuses on understanding the cultural context.

- **Examples in IT:**

- Studying the work culture of a software development team.

- Understanding user interactions in an online community.

## **Unit V: Measurement, Scaling and Sampling**

### **Data Measurement Scale**

Measurement may be defined as the assignment of numbers to objects or events according to certain rules. There are generally four types of measurement scales, which are as follows.

#### **a) Nominal scale**

Nominal scale is used for measuring variables which are qualitative in nature. It is the first level of measurement where labels are assigned to the attributes of the variables in the form of number. Numbers are used as mere identifiers and do not hold any numerical value & no arithmetic operations can be drawn upon them. It only satisfies the 'Identity' property of scale of measurement. Nominal scale is the simplest scale & is also called as the 'Categorical scale' because it represents only the names or categories. It is also called as least powerful level of measurement. The only statistical analysis that can be performed on a nominal scale is frequency count. Mode is used as a measure of central tendency.

For example: -

- jersey number of players in cricket team, types of hair color, PAN number, Telephone number etc.
- Another example, what is your gender? – Male (1) or Female (2)

#### **b) Ordinal scale**

Ordinal scale is used for measuring variable which are qualitative in nature. It is the second level of measurement where labels are assigned to the variable in the form of numbers & they are arranged in a proper order. Not only the numbers but also the order of the variables is important. That's why it is called as ordinal scale. It satisfies the 'Identity' & 'Magnitude/Order' property.

\*Ordinal scales measure non-numeric concepts like satisfaction, happiness, discomfort, beauty etc. By giving ranks. Median or mode are used as the measures of central tendency & spearman's rank correlation.

For example,

### **Order- How much happy are you with our services?**

Very happy-1

Happy-2

Neutral-3

Unhappy-4

Very unhappy-5

- Another example, Ranks of students in an academic test, health status (excellent, average, poor)

Here, the order is represented but the difference between the variable is not indicated.

### **c) Interval scale**

Interval scale is used for measuring variables which are quantitative in nature. It is the third level of measurement where labels are assigned to the variables in the form of numbers & they are arranged in a proper order with equal differences between the values. Along with the numbers & order, the difference between the values is also known. That's why it is called an Interval scale. It is an extension of ordinal scale. (i. e., it possesses the property of identity, order & equal intervals). Arithmetic operations like addition & subtraction can be performed on the variables but not multiplication & division and hence, ratios can't be calculated. Interval scales don't have a true zero meaning negative values also exist. Like -10-degree Celsius temperature. Mean, median, mode is used as the measure of central tendency. And standard deviation and range are used as the measures of dispersion. For example, a temperature scale where difference between 60 & 70 degree Celsius is same as that of the difference between 20 & 30 degree Celsius

### **d) Ratio scale**

Ratio scale is used for measuring variables which are quantitative in nature. It is the fourth level of measurement which possesses all the attributes of an interval scale along with the property of

absolute zero. Arithmetic operations like addition & subtraction can be performed on the variables along with multiplication & division. Here, the ratios can be calculated. That's why it is called a ratio scale. Like, weight of ram is double of that of Shyam. Ratio scales have a true zero meaning negative values don't exist. Like there cannot be a negative weight or negative length. It is the most powerful level of measurement. Mean, median, mode, harmonic mean, geometric mean are used as the measures of central tendency. And standard deviation and coefficient of variation are used as the measures of dispersion. For example, height, weight, length, distance etc.

### **Summary**

<b>Feature</b>	<b>Nominal</b>	<b>Ordinal</b>	<b>Interval</b>	<b>Ratio</b>
Level of measurements	First	Second	Third	Fourth
Type of variable	Qualitative	Qualitative	Quantitative	Quantitative
Identity	Yes	Yes	Yes	Yes
Magnitude/order	No	Yes	Yes	Yes
Equal interval	No	No	Yes	Yes
Absolute zero	No	No	No	Yes
Central tendency	Mode	Median & mode	Mean, median & mode	Mean, median, mode, geometric & harmonic mean
Source of dispersion	.....	.....	Standard deviation & range	Standard deviation & coefficient of variation
Arithmetic operation	.....	.....	Only addition & subtraction	Add, subtract, multiply & divide
Statistical tests	Non-parametric	Non-parametric	Parametric	Parametric

## **Characteristics of Good Measurement**

Generally, measurement should be able to measure the things which a researcher intends. The tools, which are used, should be simple and able to increase the efficiency of a researcher. The main criteria for testing the goodness of measures are validity, reliability and practicability. These features of measurement are described below:

### **1. Reliability**

Reliability refers to how consistently a method measures something. If the same result can be consistently achieved by using the same methods under the same circumstances, the measurement is considered reliable.

For example: you measure the temperature of a liquid sample several times under identical conditions. The thermometer displays the same temperature every time, so the results are reliable.

### **Test of reliability**

#### **a) Test-retest method**

According to this method, the same scale is applied twice to the same population & the results obtained are compared by computing correlation between the first and second set of scores. If the correlation is high, it can be assumed that the measuring instrument used in the research is highly reliable but if there is low correlation then the instrument is less reliable so the modification in instrument is essential.

#### **b) Alternative or parallel form method**

According to this method, two forms of a scale are constructed & applied to the same population. If the results obtained by two methods show high degree of similarity, then the scale is considered reliable. In this method, both forms have similar items and the same response format with only the wording and ordering of the question are changed. These two forms are administered in the same time to the same sample; so, there is less chance of having errors due to [pace of time.

#### **c) Split half method**

The test is first divided into two equivalent halves and the correlations thus computed from two components and the test is divided into two components as odd and even numbers of sets. The reliability coefficient is called stepped up reliability coefficient and mathematically it is given by

$$R_s = \frac{nr_p}{1+(n-1)r_p}$$

where  $r_p$  is the correlation coefficient of two parts and  $n$  is the number of parts.

#### **d) Rational- equivalence method**

When the proportion of the group doing correctly & the proportion doing incorrectly are given, the reliability is calculated by using formula,



$$R_r = \frac{n}{n-1} \frac{(\sigma^2 - \sum pq)}{\sigma^2}$$

Where p is the proportion of test items correctly and q is the incorrect.  $\sigma$  is the standard deviation of the test score and n is the number of items in the test.

When mean of test score is given,

$$R_r = \frac{n\sigma^2 - \bar{X}(n - \bar{X})}{(n-1)\sigma^2}$$

Where  $\bar{X}$  mean of the test score.

### Numerical problem

1. A test is divided into two parts where the correlations coefficient between two parts is 0.72. Find the stepped-up reliability coefficient of the test.
2. The stepped-up reliability coefficient is found to be 0.75. What will be the effect of the test reliability if the length of the test is tripled.
3. A test of 75 items is administered and the standard deviation of the test is 5.9, the sum of the product of the proportion of the test items correctly and incorrectly is 14.37. Find the reliability coefficient of the test.
4. A test of 50 structural multiple-choice tests is administered to the 100 college students where correct answer indicating 1 and incorrect answer indicating 0 of the tests. Mean score of the test is 27.75 and their standard deviation is 5.80. Find the reliability coefficient of the test.

## 2. Validity

Validity refers to how accurately a method measures what it is intend to measure. If research has high validity, that means it produces results that correspond to real properties, characteristics & variations in the physical or social world. High reliability is one indicator that a measurement is valid. If a method is not reliable, it probably isn't valid. There are three types of validity.

- **Content validity**

It is also known as face validity. It refers to the adequate coverage of the concept. In other words, content validity ensures that the measuring tools include an adequate and representative set of items that would tap the concept. The more scale item represents the concept of the research topic; the instrument has the higher validity. If the instrument contains a representative sample of the universe, then the content validity is high. Its determination is judgmental and intuitive but it can also be determined by using a panel of person who shall judge how well the measuring instrument meets the standards, but there is no numerical way to express it.

Content validity ratio (CVR) is measured as:

$$CVR = \frac{ne - \frac{N}{2}}{\frac{N}{2}}$$

Where ne is the number of expert panelists indicating "essential" and N is the total number of expert panelists. -This formula yields values of CVR range from +1 to -1; positive values indicate that at least half the experts rated the item as essential.

- **Criterion-Related validity**

Criterion validity measures how well one measure predicts an outcome for another measure. A test has this type of validity if it is useful for predicting performance or behavior in another situation. Criterion validity evidence involves the correlation between the test and a criterion variable (or variables) taken as representative of the construct. For example, employee selection tests are often validated against measures of job performance (the criterion), and IQ tests are often validated against measures of academic performance (the criterion).

- a) If the test data and criterion data are collected at the same time, this is referred to as concurrent validity evidence.
- b) If the test data are collected first in order to predict and criterion data collected at a later point in time, then this is referred to as predictive validity evidence.

It relates to our ability to predict some outcomes or estimated the existence of some current situation.

- **Construct validity**

Construct validity is "the degree to which a test measures what it claims to be measuring". If a measure confirms the predicted correlation with other theoretical preposition, then such measure possesses construct validity. It wants the agreement between a theoretical concept and a specified measuring instrument. Construct validity is the appropriateness of inferences made on the basis of observations or measurements (often test scores), specifically whether a test measures the intended construct. Constructs are abstractions that are deliberately created by researchers in order to conceptualize the latent variable, which is correlated with scores on a given measure (although it is not directly observable). Construct validity examines the question: Does the measure behave like the theory says a measure of that construct should behave?

## **Relationship between Reliability and Validity**

The relationship between reliability and validity can be assessed in various ways. For a measurement to be valid, it has to be reliable. While validity is associated with accuracy, reliability is all about consistency. Therefore, an unreliable measurement cannot be valid. However, a measurement can be reliable without being valid. It is often required for measurements to be both valid and reliable. The process of assessing psychological traits is called psychological measurement. In psychological measurements, reliability is used to determine the consistency of measurements and results. For example, when using test-retest reliability, an intelligent individual by certain metrics is expected to exhibit intelligence at all times. Validity measures the agreement

of test results with that which the test is intended to measure. For instance, somebody can decide to use the height of individuals as a measurement for confidence. The test may have several consistent results making it reliable, but that doesn't mean it is valid. Confidence has nothing to do with an individual's height. A psychological test's high validity and high reliability indicate that the test is effective and efficient. Therefore, the test can be used for research studies, evaluating job applicants, etc. In terms of coefficients, the expected values for reliability and validity should be 0.6 or greater.

## Scaling

Scaling is the assignment of numerals to the object items or variables. In scaling, individuals are sorted according to some known and specified characteristics or attributes which helps in comparative study of individuals. Good scaling must hold some of the special characteristics.

Characteristics of scaling

- Simple
- Reliable
- Valid
- Economic
- Exact
- Comprehensive
- Practical

Scaling consists of psychophysical and Attitudinal scaling.

- Psychological scaling**- like honesty, aggressiveness, pleasantness, quality of beauty, sense of human behavior, etc.
- Attitudinal scaling**- feeling, perception and behaviors towards other things -people, places, times, etc. are called attributes.

## Techniques for developing attitude scale

There are four techniques for developing attitude scales. They are given below,

- Choice:** Respondents were given number of alternatives and ask to choose the preferred alternative. If a respondent chooses one alternative, then it is assumed that respondent prefers that alternative than other alternatives.
- Ranking:** Various alternatives are provided to the respondents and asked to give rank as per their priority. Respondent provides rank to the given alternatives that helps to know their attitude.
- Rating:** Researcher asks the respondent to estimate the magnitude of quality or a characteristic that a product or event possess. The position is found/seen on the basis of their rating.

- d) **Sorting:** Several concepts are provided to the respondents and asked to arrange them in order on the basis of their priority/ value. Such arrangement reflects the attitude of the respondents.

## **Attitude Measurement**

Every person is unique in their experiences, behaviors, and culture. Human attitudes are shaped by their experiences, behavior, and culture. An attitude is a person's response to any situation, item, or other object. Research in social science examines how individuals and societies behave and think. In order to investigate these aspects, a researcher has to gauge participants' attitudes. The primary goal of studying human attitudes is to identify the factors that influence human behavior. Researchers in social science have created a number of scales to evaluate people's attitudes. We refer to this type of measurement as attitude measurement.

### **Issues in attitude measurement**

Measurement refers to the process of gathering data that may be examined. The technique of determining a person's attitude toward an object is known as attitude measurement. Prior to measuring attitudes or any other parameter, one has to clearly sort out the following:

- "what" has to be measured?
- "who" is to be measured?
- the accuracy desired in the measurement
- the costs permissible
- the choices available in the measurement/data collection techniques.

When measuring attitudes, the researcher's main focus is on determining the respondent's "state of mind". It might involve elements such as decision-making, attitudes, and awareness. The challenge of verifying these measures is an interesting feature. The "truth" about a respondent's level of liking for a new product, like ice cream mix, cannot be determined. Unless the researcher is a "telepathist," he is unable to analyze mental states like preferences, likes, dislikes, and so on. These things can only be assumed.

### **Scale construction for Attitude measurement**

Attitude is a qualitative subject. Thus, numbers or symbols are offered for measuring such qualitative subjects. People's attitudes vary from one another. Thus, a variety of scales can be employed to quantify human attitudes. Some of the important method of attitude scale are given below:

#### **a) Arbitrary scale**

Sometimes, a researcher develops a new sensible and appropriate method. If he or she believes that the subject of research is completely novel and that a new approach or methodology is required for measuring attitude, he or she creates a new scale known as an arbitrary scale. A researcher must be able to demonstrate the reliability and validity of such a scale. Because the nature of social events varies, the researcher creates alternative scales from time to time and uses them as needed.

## **b) Summated rating scale or Likert scale**

An assessment tool where respondents rate their level of agreement or disagreement with a sequence of statements assessing the same construct or variable. For every question, there are usually five to seven response alternatives (strongly agree to strongly disagree, for example). A person's overall attitude toward the construct of interest can be inferred by adding the response values for each question to get an average score. Summated rating scales that are most frequently employed are Likert scales. Summated scale is another name for the summated rating system.

### **Construction of Likert scale**

- Write a significant number of statements on the particular attitudinal item under investigation. For example, one might consider the role of volunteer organizations in providing health services in rural areas. The majority of these statements should be either somewhat positive or negative. Neutral objects are usually avoided on these scales. The elements should be evenly distributed between positive and negative remarks.
- Administer the pool of statements to a sample of respondents who are similar to the demographic for which the scale will be utilized. For example, if we wish to research housewives' attitudes, we should administer the pool to a group of housewives from a comparable background to our final sample.
- Assign scale values to the degrees of agreement or disagreement with each item. The particular values may differ from one researcher to another. Sometimes one may adopt the values 1, 2, 3, 4, 5 and sometimes +2, +1, 0, -1, -2. For negative items the directions should be reversed.
- Calculate a total attitude score for each respondent using the same scaling procedure. The distribution of total scores is then used to refine the list of items. This step is called item analysis.
- The next stage is to identify the statements with the highest discriminatory power. A few extreme groups are viewed as representing the most and least positive attitudes.
- Only statements that correlate with the overall test should be included in the final instrument, with the rest being discarded/removed.

### **Scales used in Business Research / Social Science Research**

Experts create several scales to assess an individual's or group's attitudes. The researcher uses various scales to measure the attitude of people or groups dependent on the nature of the event or the objectives of the study effort. Business research has its own unique nature and goals. As a result, when doing business research, multiple scales are used. Some of the most frequent scales used in business research are listed below:

#### **1) Likert scale**

It is the most extensively used scale in business research for assessing individual or group attitudes, norms, values, and behavior. In this scale, respondents are asked to express their opinions using the given scales, and they indicate whether they agree or disagree with the statement provided in

the questionnaire. It displays not just agreement and disagreement, but also the level of agreement or disagreement.

Example: employees are committed towards the organization.

1- Strongly disagree

2- Disagree

3- Undecided

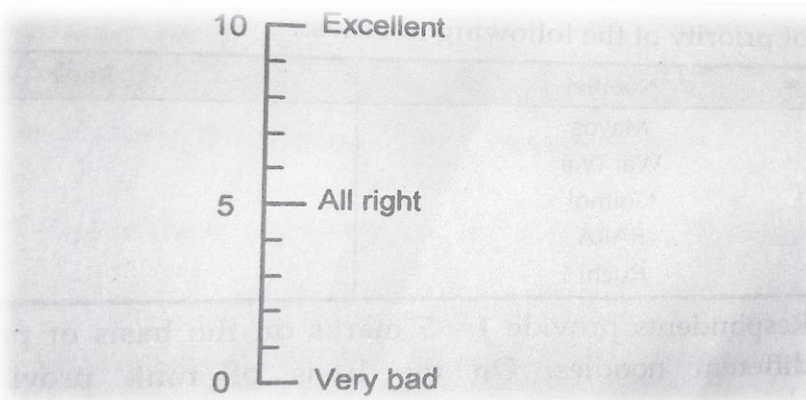
4- Agree

5- Strongly agree

## 2. Graphic rating scale:

In this scale, participants are asked to mark the relevant spot on the chart to indicate how they feel about a certain issue. This type of labeling aids in comprehending respondents' opinions.

Example: On scale of 0 to 10 how do you rate your departmental head?



Request a single marking from the respondent on a scale of 0 to 10. This choice expresses the respondent's viewpoint. A researcher determines whether an employee views his or her department head favorably or unfavorably based on employee opinions.

## 3. Itemized rating scale:

Utilizing this scale, the researcher offers a range of possible answers from which the participant chooses the most pertinent response to address the research questions. Since it may be adjusted to many different scenarios where variables need to be monitored, it is well-liked in business research. For example:

a) How do you rate your interest in changing organizational policies?

*Extremely poor*

*Not at all*

*Some what well*

*Very well*

b) How well is the new distribution channel working?

*Not at all*

*somewhat good*

*very much good*

#### 4. Rank order rating scale:

Respondents are requested to rank the provided products or things according to their priority using this scale. They rank them in order of highest priority to lowest. The methodology is comparative. It serves as a gauge for the organization's priority with regard to any topic. According to priority, it forces the responders to divide the product or problems into subsequent groups. Only ordinal data is developed by it.

Example: a researcher asked to the customers to identify the rank on the basis of priority of the following noodles:

Noodles	Rank
Wai Wai	-
Golmol	-
Rara	-
Ramba	-
Rumpum	-

Respondent provide 1-5 marks on the basis of priority to the different noodles. On the basis of rank provided by the respondents, a researcher finds out the priority of the customers.



# **Unit VI**

## **Data Collection and Analysis**



# Nature and Sources of Data

- **Introduction:**
- **1. Data in Research:**
- Data is the raw material of research, providing the basis for analysis, interpretation, and drawing conclusions.
- **2. Nature of Data:**
- Data can be qualitative or quantitative, primary or secondary, and it plays a crucial role in shaping the research process.
- **Types of Data:**
- **1. Qualitative Data:**
- **Nature:**
- Non-numeric information that describes qualities, characteristics, or attributes.
- **Examples:**
- Text, images, interviews, observations.

# Nature and Sources of Data

- **Types of Data:**
- **2. Quantitative Data:**
- **Nature:**
  - Numeric information that can be measured and subjected to statistical analysis.
- **Examples:**
  - Measurements, counts, survey responses.
- **Sources of Data:**
- **1. Primary Data:**
- **Definition:**
  - Data collected firsthand by the researcher for a specific research purpose.
- **Methods:**
  - Surveys, interviews, observations, experiments.

# Nature and Sources of Data

- **Sources of Data:**
- **1. Primary Data:**
- **Advantages:**
- Direct relevance to the research problem, control over data collection process.
- **Challenges:**
- Time-consuming, resource-intensive.
- **2. Secondary Data:**
- **Definition:**
- Data obtained from existing sources that were collected for a different purpose.
- **Sources:**
- Books, articles, government reports, databases.

# Nature and Sources of Data

- **2. Secondary Data:**

- **Advantages:**

- Time-efficient, cost-effective.

- **Challenges:**

- Lack of control over data quality, relevance.

- **Nature of Data Collection:**

- **1. Exploratory Data:**

- **Purpose:**

- Gather preliminary information, generate insights, and define the problem.

- **Methods:**

- Interviews, focus groups, open-ended surveys.

# Nature and Sources of Data

- **Nature of Data Collection:**
- **2. Descriptive Data:**
- **Purpose:**
- Describe the characteristics of a phenomenon.
- **Methods:**
- Surveys, observational studies, content analysis.
- **3. Explanatory Data:**
- **Purpose:**
- Understand the relationships between variables and explain causality.
- **Methods:**
- Experiments, longitudinal studies, statistical analyses.

# Methods of obtaining primary and secondary data

- **1. Surveys:**
- **Definition:**
- Systematic collection of data through questionnaires or interviews.
- **Advantages:**
- Efficient for large samples, standardized data collection.
- **Considerations:**
- Designing unbiased questions, ensuring representative samples.
  
- **2. Observations:**
- **Definition:**
- Systematic recording of behaviors, events, or occurrences.
- **Advantages:**
- Naturalistic data, minimal intrusion.
- **Considerations:**
- Observer bias, ensuring consistency.

# Methods of obtaining primary and secondary data

- **3. Experiments:**

- **Definition:**

- Controlled manipulation of variables to observe their effects.

- **Advantages:**

- Establishing causality, control over variables.

- **Considerations:**

- Ethical concerns, external validity.

- **Data Quality and Reliability:**

- **1. Validity**

- **Definition:**

- The extent to which data measures what it claims to measure.

- **Types:**

- Content validity, construct validity.

# Methods of obtaining primary and secondary data

- **Data Quality and Reliability:**
- **2. Reliability:**
- **Definition:**
- Consistency and stability of data over time or across different conditions.
- **Types:**
- Internal reliability, test-retest reliability.
- **Conclusion:**
- Understanding the nature and sources of data is fundamental in research. Researchers must carefully select data types, collection methods, and sources based on the research objectives, ensuring the quality, relevance, and reliability of the data collected. The choice between primary and secondary data, as well as qualitative and quantitative data, depends on the research design and goals.



# Preparation of Research Instruments and Questionnaire Design

- **Introduction:**
- **1. Research Instruments:**
- Tools or devices used to collect data in a research study.
- **2. Questionnaire:**
- A structured set of questions to gather information from respondents.
  
- **Principles of Questionnaire Design:**
- **1. Clarity:**
- **Principle:**
- Questions should be clear, concise, and easily understandable.
- **Importance:**
- Minimizes ambiguity, ensuring accurate respondent interpretation.

# Preparation of Research Instruments and Questionnaire Design

- **Principles of Questionnaire Design:**
- **2. Relevance:**
- **Principle:**
- Questions should directly relate to the research objectives and address the research problem.
- **Importance:**
- Ensures that collected data is pertinent and contributes to the study's goals.
- **3. Unbiased Language:**
- **Principle:**
- Avoid leading or biased language that may influence respondents' answers.
- **Importance:**
- Preserves the integrity of responses, leading to unbiased and reliable data.

# Preparation of Research Instruments and Questionnaire Design

- Principles of Questionnaire Design:
- **4. Avoiding Double-Barreled Questions:**
- **Principle:**
- Each question should address a single concept or issue, avoiding multiple inquiries in one.
- **Importance:**
- Facilitates precise responses and reduces confusion.
- **5. Consistency:**
- **Principle:**
- Maintain a consistent format and language throughout the questionnaire.
- **Importance:**
- Enhances respondent understanding and aids in data analysis.

# Preparation of Research Instruments and Questionnaire Design

- **Principles of Questionnaire Design:**
- **6. Logical Flow:**
- **Principle:**
- Arrange questions in a logical sequence, starting with general and progressing to specific.
- **Importance:**
- Improves respondent engagement and understanding.

# Preparation of Research Instruments and Questionnaire Design

- **Components of Questionnaire Design:**
- **1. Introduction:**
- **Purpose:**
- Provides context and introduces the study to respondents.
- **Components:**
- Research objectives, confidentiality assurances, consent statement.
- **2. Demographic information:**
- **Purpose:**
- Gathers background information about respondents.
- **Components:**
- Age, gender, education, occupation.

# Preparation of Research Instruments and Questionnaire Design

- **Components of Questionnaire Design:**
- **3. Main Questions:**
- **Purpose:**
- Core questions related to the research objectives.
- **Components:**
- Varied based on study focus, using open-ended or close-ended formats.
- **4. Instructions:**
- **Purpose:**
- Guides respondents on how to complete the questionnaire.
- **Components:**
- Clear directions on response formats, skipping patterns, or any specific instructions.

# Preparation of Research Instruments and Questionnaire Design

- **Components of Questionnaire Design:**
- **5. Closing and Thank You:**
- **Purpose:**
- Expresses gratitude, provides contact information for queries.
- **Components:**
- Appreciation for participation, researcher contact details.

# Preparation of Research Instruments and Questionnaire Design

- **Types of Questions:**
- **1. Open-Ended Questions:**
- **Characteristics:**
- Allows free-form responses.
- **Use:**
- Elicits detailed, qualitative information.
- **2. Close-Ended Questions:**
- **Characteristics:**
- Provides fixed response options.
- **Use:**
- Facilitates qualitative data analysis, offers structured choices.



# Preparation of Research Instruments and Questionnaire Design

- **Types of Questions:**
- **3. Likert Scale Questions:**
- **Characteristics:**
- Measures agreement or disagreement on a scale.
- **Use:**
- Quantifies attitudes or opinions.
- **4. Multiple-Choice Questions:**
- **Characteristics:**
- Presents several response options.
- **Use:**
- Provides a range of choices for a specific question.

# Preparation of Research Instruments and Questionnaire Design

- **Steps in Preparation:**
- **1. Define Objectives:**
  - Clearly outline research objectives to guide question development.
- **2. Literature Review:**
  - Review existing literature to ensure questions align with prior research.
- **3. Select Question Types:**
  - Choose appropriate question types based on research goals.
- **4. Draft Questions:**
  - Develop a preliminary set of questions, ensuring adherence to design principles.
- **5. Pilot Testing:**
  - Test the questionnaire on a small sample to identify and rectify issues.
- **6. Finalization:**
  - Make necessary adjustments based on pilot test feedback, finalizing the questionnaire.

# Preparation of Research Instruments and Questionnaire Design

- **Conclusion:**
- The preparation of research instruments, particularly the questionnaire, is a critical aspect of the research process.
- Adhering to the principles of clarity, relevance, and unbiased language, and incorporating appropriate components and question types, ensures the effectiveness of the instrument in gathering valuable data.
- The meticulous design and testing process contribute to the reliability and validity of the research findings.

# Sources and Method of Obtaining Qualitative Data

- **Introduction:**
- **1. Qualitative Data:**
- Information that is non-numeric and descriptive, focusing on the quality, context, and depth of experiences.
- **2. Purpose:**
- To explore, understand, and interpret social phenomena in their natural settings.
  
- **Sources of Qualitative Data:**
- **1. Interviews:**
- **Definition:**
- Conversations between the researcher and participants to gather in-depth information.
- **Types:**
- Structured, semi-structured, unstructured.
- **Advantages:**
- Rich, detailed insights; flexibility in questioning.

# Sources and Method of Obtaining Qualitative Data

- **Sources of Qualitative Data:**
- **2. Focus Groups:**
- **Definition:**
- Group discussions among participants led by a facilitator to explore shared perspectives.
- **Advantages:**
- Stimulates group dynamics, captures diverse viewpoints.
- **3. Observations:**
- **Definition:**
- Systematic watching and recording of behaviors, events, or interactions.
- **Types:**
- Participant observation, non-participant observation.
- **Advantages:**
- Captures real-time behaviors, provides context.

# Sources and Method of Obtaining Qualitative Data

- **Sources of Qualitative Data:**
- **4. Documents and Texts:**
- **Definition:**
- Analysis of written, visual, or audio materials relevant to the research.
- **Examples:**
- Letters, diaries, official documents, media content.
- **Advantages:**
- Historical context, authentic expressions.
- **5. Surveys with Open-Ended Questions:**
- **Definition:**
- Surveys that include qualitative, open-ended questions for detailed responses.
- **Advantages:**
- Combines quantitative and qualitative insights.

# Sources and Method of Obtaining Qualitative Data

- **Methods of Obtaining Qualitative Data:**
- **1. In-Depth Interviews:**
- **Process:**
- One-on-one discussions with participants, allowing exploration of individual perspectives.
- **Advantages:**
- Deep insights, rapport building.
- **2. Focus Group Discussions:**
- **Process:**
- Small group interactions facilitated by a moderator, encouraging discussion.
- **Advantages:**
- Collective insights, group dynamics.

# Sources and Method of Obtaining Qualitative Data

- **Methods of Obtaining Qualitative Data:**
- **3. Participant Observation:**
- **Process:**
- Researchers actively engage in setting their study, observing and sometimes participating.
- **Advantages:**
- Rich contextual understanding, firsthand experiences.
- **4. Content Analysis:**
- **Process:**
- Systematic analysis of text, audio, or visual content to identify patterns and themes.
- **Advantages:**
- Objective examination, identifies recurring elements.



# Sources and Method of Obtaining Qualitative Data

- **Methods of Obtaining Qualitative Data:**
- **5. Case Studies:**
- **Process:**
- In-depth exploration of a single case or a small number of cases.
- **Advantages:**
- Holistic understanding, in-depth analysis.

# Sources and Method of Obtaining Qualitative Data

- **Challenges in Qualitative Data Collection:**
- **1. Subjectivity:**
- **Challenge:**
- Interpretation and analysis may be influenced by the researcher's subjectivity.
- **Mitigation:**
- Use reflexivity, acknowledge biases.
- **2. Time-Consuming:**
- **Challenge:**
- Qualitative data collection can be time-intensive.
- **Mitigation:**
- Careful planning, realistic timelines.

# Sources and Method of Obtaining Qualitative Data

- **Challenges in Qualitative Data Collection:**
- **3. Limited Generalizability:**
- **Challenge:**
- Findings may not be easily generalizable to broader populations.
- **Mitigation:**
- Emphasize in-depth understanding over generalizability.
  
- **4. Data Analysis Complexity:**
- **Challenge:**
- Analyzing qualitative data can be intricate.
- **Mitigation:**
- Use systematic coding, employ qualitative analysis software.

# Sources and Method of Obtaining Qualitative Data

- **Ethical Considerations:**
- **1. Informed Consent:**
- **Principle:**
- Participants should be fully informed and consent to participate.
- **Application:**
- Clearly explain the study, risks, and benefits.
- **2. Confidentiality:**
- **Principle:**
- Protect participants' identities and sensitive information.
- **Application:**
- Anonymize data, secure storage.

# Sources and Method of Obtaining Qualitative Data

- **Ethical Considerations:**
- **3. Respect for Participants:**
- **Principle:**
- Treat participants with dignity and respect their autonomy.
- **Application:**
- Allow participants to withdraw, prioritize their well-being.
  
- **Conclusion:**
- Qualitative data collection involves engaging with participants to uncover rich, context-specific insights.
- Utilizing various sources and methods, researchers can delve into the complexity of human experiences and social phenomena.
- Effective qualitative research requires careful planning, ethical considerations, and a commitment to capturing the depth and nuance of the studied subject.



# **Unit VII**

## **Research Proposal and Scientific Writing**

# Selection of research title

- **Introduction:**
- **1. Significance of Research Title:**
- The research title serves as the first impression and a crucial component of a research study. It encapsulates the essence of the research and sparks interest.
- **2. Purpose:**
- The title not only identifies the study but also conveys the research focus, scope, and relevance.
- **Key Considerations in Selecting a Research Title:**
- **1. Clarity and Precision:**
- **Principle:**
- The title should be clear, concise, and accurately reflect the research content.
- **Importance:**
- Ensures that readers immediately understand the research focus.

# Selection of research title

- **Key Considerations in Selecting a Research Title:**
- **2. Relevance to the Research Problem:**
- **Principle:**
- The title should directly connect to the research problem or question.
- **Importance:**
- Aligns the title with the core objective of the study.
- **3. Reflective of Research Design:**
- **Principle:**
- The title should provide insights into the research design or methodology.
- **Importance:**
- Helps potential readers understand the approach used in the study.



# Selection of research title

- **Key Considerations in Selecting a Research Title:**
- **4. Inclusion of Key Variables or Concepts:**
- **Principle:**
  - If applicable, include key variables, concepts, or factors in the title.
- **Importance:**
  - Enhances specificity and helps readers identify the main components of the study.
- **5. Avoidance of Jargon:**
- **Principle:**
  - Use language that is accessible to a broad audience, avoiding unnecessary technical jargon.
- **Importance:**
  - Promotes understanding among diverse readers.

# Selection of research title

- **Key Considerations in Selecting a Research Title:**
- **6. Engaging and Intriguing:**
- **Principle:**
- Craft a title that captures attention and generates curiosity.
- **Importance:**
- Encourages readers to explore the research further.
- **7. Consideration of Keywords:**
- **Principle:**
- Include relevant keywords that potential readers might use in searches.
- **Importance:**
- Enhances the discoverability of the research in academic databases.

# Steps in Selecting a Research Title:

- **1. Understand the Research Problem:**
- **Process:**
- Clearly comprehend the core issue or question the research aims to address.
- **Outcome:**
- Informed decision-making regarding the title's focus.
  
- **2. Review Existing Literature:**
- **Process:**
- Conduct a literature review to identify key themes, concepts, and terminology.
- **Outcome:**
- Insights into relevant language and concepts for the title.

# Steps in Selecting a Research Title:

- **Key Considerations in Selecting a Research Title:**
- **3. Identify Key Variables or Factors:**
- **Process:**
- Determine the main variables, concepts, or factors under investigation.
- **Outcome:**
- Foundation for inclusion in the title for specificity.
- **4. Consider the Research Design:**
- **Process:**
- Reflect on the research methodology and design used in the study.
- **Outcome:**
- Insights into how the design can be integrated into the title.

# Steps in Selecting a Research Title:

- **Key Considerations in Selecting a Research Title:**
- **5. Brainstorming:**
- **Process:**
- Engage in creative brainstorming sessions to generate title ideas.
- **Outcome:**
- A pool of potential titles to evaluate.
- **6. Evaluate and Refine:**
- **Process:**
- Assess each potential title against the principles and refine as needed.
- **Outcome:**
- A finalized, polished research title.

# Steps in Selecting a Research Title:

- **Examples of Well-Selected Research Titles:**
- 1. “Exploring the impact of social media usage on academic performance: A longitudinal study of university students”
  - Rationale: Clear focus on the research problem and key variables.
- 2. “Unveiling urban transformation: A qualitative analysis of gentrification in downtown metropolis”
  - Rationale: Engaging language, specific to the research focus.
- 3. “A comparative analysis of leadership styles in high-performing and low-performing organizations”
  - Rationale: Clearly states the variables under investigation and hints at the research design.

# Steps in Selecting a Research Title:

- **Conclusion:**
- Selecting a research title is a critical step that requires careful consideration of key principles and factors.
- A well-crafted title enhances the visibility, relevance, and accessibility of the research study.
- Researchers should approach the title selection process with a clear understanding of the research problem, an awareness of key concepts, and a commitment to engaging, precise language.

# Research Proposal: Goal, Types, Structure, and Components

- **Introduction:**
- **1. Research Proposal**
- A comprehensive document outlining the plan for a research study, including its objectives, methodology, and anticipated outcomes.
- **Goals of a Research Proposal:**
- **1. Clearly define research objectives:**
- **Objective:**
- To articulate the purpose, aims, and goals of the research.
- **Importance:**
- Provides a roadmap for the study, guiding the researcher and ensuring clarity.



# Research Proposal: Goal, Types, Structure, and Components

- **Goals of a Research Proposal:**
- **2. Secure approval and funding:**
- **Objective:**
- To seek approval from relevant authorities and secure necessary funding.
- **Importance:**
- Validates the research idea and facilitates the allocation of resources.
- **3. Set expectations and guidelines:**
- **Objective:**
- To establish expectations and guidelines for the research team.
- **Importance:**
- Ensures everyone involved is on the same page regarding the study's scope and objectives.

# Research Proposal: Goal, Types, Structure, and Components

- **Types of Research Proposals:**
- **1. Solicited proposals:**
- **Definition:**
- Invited proposals in response to a specific call or request.
- **Use:**
- Common in grant applications and specific research initiatives.
- **2. Unsolicited proposals:**
- **Definition:**
- Proposals submitted without a specific invitation.
- **Use:**
- Often utilized for independent research initiatives.

# Research Proposal: Goal, Types, Structure, and Components

- **Types of Research Proposals:**
- **3. Continuation or renewal proposals:**
- **Definition:**
- Proposals seeking to extend or renew existing research projects.
- **Use:**
- Ensures continuity and ongoing support for successful projects.

# Research Proposal: Goal, Types, Structure, and Components

- **Structure of a Research Proposal:**

- **1. Title:**

- **Purpose:**

- Captures the essence of the research and sparks interest.

- **Components:**

- Clear, concise, and engaging title.

- **2. Introduction:**

- **Purpose:**

- Provides context, background, and justification for the research.

- **Components:**

- Problem statement, research questions, significance, and rationale.

# Research Proposal: Goal, Types, Structure, and Components

- **Structure of a Research Proposal:**
- **3. Literature review:**
- **Purpose:**
- Reviews existing literature relevant to the research topic.
- **Components:**
- Summarizes key findings, identifies gaps, and justifies the need for the study.
- **4. Research objectives and hypotheses:**
- **Purpose:**
- Clearly states the research objectives and hypotheses (if applicable).
- **Components:**
- Clearly defined objectives and testable hypotheses.

# Research Proposal: Goal, Types, Structure, and Components

- **Structure of a Research Proposal:**
- **5. Research methodology:**
- **Purpose:**
- Describes the approach, methods, and techniques used in the study.
- **Components:**
- Research design, sampling strategy, data collection, and analysis methods.
- **6. Timeline:**
- **Purpose:**
- Provides a schedule for the completion of different phases of the research.
- **Components:**
- Gantt chart or detailed timeline.

# Research Proposal: Goal, Types, Structure, and Components

- **Structure of a Research Proposal:**
- **7. Budget:**
- **Purpose:**
- Outlines the financial requirements for the research.
- **Components:**
- Itemized list of expenses, justification for each cost.
- **8. Expected results and implications:**
- **Purpose:**
- Anticipates the outcomes and potential impact of the research.
- **Components:**
- Expected findings, potential contributions to the field.

# Research Proposal: Goal, Types, Structure, and Components

- **Structure of a Research Proposal:**
- **9. Ethical considerations:**
- **Purpose:**
- Addresses ethical aspects of the research, ensuring participant welfare.
- **Components:**
- Informed consent, confidentiality, and measures to protect participants.
- **10. References:**
- **Purpose:**
- Cites all sources referenced in the proposal.
- **Components:**
- Follows a specific citation style (APA, MLA, etc.).



# Research Proposal: Goal, Types, Structure, and Components

- **Components of a Research Proposal:**
- **1. Cover page:**
  - Includes the title, researcher's name, institutional affiliation, and date.
- **2. Abstract:**
  - Concise summary of the entire proposal, typically 150-250 words.
- **3. Table of contents:**
  - Provides a roadmap for easy navigation.
- **4. List of figures and tables:**
  - If applicable, includes a list of figures and tables used in the proposal.
- **5. Appendix:**
  - Contains additional supporting documents, such as questionnaires or interview scripts.

# Research Proposal: Goal, Types, Structure, and Components

- **Conclusion:**
- A well-structured research proposal is essential for guiding the research process and securing support.
- By clearly defining goals, selecting an appropriate type, and organizing the proposal's components effectively, researchers increase their chances of approval and successful project execution.
- Understanding the purpose and structure of a research proposal is crucial for aspiring researchers to convey the significance and feasibility of their study.

# Characteristics of a Good Research Proposal

- **1. Clear and concise:**
- **Characteristics:**
- The proposal should present ideas and intentions in a clear and concise manner.
- **Importance:**
- Ensures easy comprehension and understanding by reviewers.
- **2. Focused and specific:**
- **Characteristics:**
- Clearly defines the research problem and objectives without ambiguity.
- **Importance:**
- Demonstrates a well-defined scope and purpose.

# Characteristics of a Good Research Proposal

- **3. Relevance to the field:**
  - **Characteristics:**
    - The proposal addresses a relevant and significant issue in the field.
  - **Importance:**
    - Contributes to existing knowledge and fills gaps in the literature.
- **4. Feasible and realistic:**
  - **Characteristics:**
    - The research plan is practical, achievable, and considers available resources.
  - **Importance:**
    - Enhances the likelihood of successful completion and implementation.

# Characteristics of a Good Research Proposal

- **5. Grounded in literature:**
  - **Characteristics:**
    - The proposal demonstrates a thorough review of relevant literature.
  - **Importance:**
    - Establishes a strong theoretical foundation and justifies the research need.
- **6. Methodologically sound:**
  - **Characteristics:**
    - The research design and methods are appropriate for addressing the research questions.
  - **Importance:**
    - Ensures the validity and reliability of the study's outcomes.

# Characteristics of a Good Research Proposal

- **7. Ethically sound:**
- **Characteristics:**
- Adheres to ethical principles in research involving human subjects or sensitive data.
- **Importance:**
- Protects the rights and well-being of participants and upholds research integrity.
  
- **8. Well-organized structure:**
- **Characteristics:**
- The proposal follows a logical and well-organized structure.
- **Importance:**
- Facilitates easy navigation and understanding for reviewers.

# Characteristics of a Good Research Proposal

- **9. Clear objectives and hypotheses:**
  - **Characteristics:**
    - Clearly states research objectives and, if applicable, formulates testable hypotheses.
  - **Importance:**
    - Guides the research process and sets expectations for outcomes.
- **10. Practical timeline:**
  - **Characteristics:**
    - The proposal includes a realistic timeline for the completion of various research phases.
  - **Importance:**
    - Helps in effective project management and resource allocation.

# Characteristics of a Good Research Proposal

- **11. Budget transparency:**
  - **Characteristics:**
    - The budget section is transparent, itemized, and justified.
  - **Importance:**
    - Facilitates understanding of resource requirements and allocation.
- **12. Potential for contribution:**
  - **Characteristics:**
    - The proposal outlines the potential contributions of the research to the field.
  - **Importance:**
    - Demonstrates the study's significance and relevance.



# Characteristics of a Good Research Proposal

- **Conclusion:**
- A good research proposal is characterized by its clarity, focus, relevance, feasibility, ethical considerations, and well-organized structure.
- Researchers should aim to create proposals that address significant research problems, contribute to existing knowledge, and adhere to ethical standards.
- Understanding the key characteristics of a good research proposal is essential for researchers to effectively communicate their intentions and secure support for their studies.

# Research Reports: Methods of Writing Research Reports

- **Introduction:**
- **1. Research Report:**
  - A detailed and structured document that communicates the findings, methods, and outcomes of a research study.
- **Methods of writing research reports:**
- **1. Title page:**
- **Components:**
  - Title of the research, author(s) name, institutional affiliation, date.
- **Purpose:**
  - Identifies the study and provides basic information.

# Research Reports: Methods of Writing Research Reports

- **Methods of writing research reports:**
- **2. Abstract:**
- **Components:**
- Concise summary of the research, including objectives, methods, results, and conclusions.
- **Purpose:**
- Offers a quick overview for readers and facilitates decision-making on whether to read the full report.
- **3. Table of contents:**
- **Components:**
- Lists all major sections and subsections with page numbers.
- **Purpose:**
- Facilitates navigation and helps readers locate specific information.

# Research Reports: Methods of Writing Research Reports

- **Methods of writing research reports:**
- **4. List of figures and tables:**
- **Components:**
- Enumerates all figures and tables along with corresponding page numbers.
- **Purpose:**
- Provides quick access to visual aids used in the report.
- **5. Introduction:**
- **Components:**
- Background, problem statement, objectives, and significance of the study.
- **Purpose:**
- Sets the context, defines the research problem, and outlines the study's purpose.

# Research Reports: Methods of Writing Research Reports

- **Methods of writing research reports:**
- **6. Literature review:**
- **Components:**
- Critical review of relevant literature, identifying gaps, and justifying the study.
- **Purpose:**
- Establishes the theoretical foundation and contextualizes the research.
- **7. Research design and methodology:**
- **Components:**
- Describes the research design, sampling strategy, data collection methods, and analysis.
- **Purpose:**
- Details the plan for conducting the study, ensuring transparency and replicability.

# Research Reports: Methods of Writing Research Reports

- **Methods of writing research reports:**
- **8. Findings/results:**
- **Components:**
- Presents the results of data analysis using tables, figures, and descriptive text.
- **Purpose:**
- Communicates the empirical findings, allowing readers to interpret the data.
- **9. Discussion:**
- **Components:**
- Interprets the results, compare findings to existing literature, and discusses implications.
- **Purpose:**
- Analyzes the meaning of results, explores patterns, and highlights the study's contributions.

# Research Reports: Methods of Writing Research Reports

- **Methods of writing research reports:**
- **10. Conclusion:**
- **Components:**
- Summarizes key findings, discusses limitations, and suggests avenues for future research.
- **Purpose:**
- Offers a concise overview and wraps up the main points of the study.
- **11. Recommendations:**
- **Components:**
- Provides actionable suggestions based on the study's findings.
- **Purpose:**
- Offers guidance for practitioners, policymakers, or further research.

# Research Reports: Methods of Writing Research Reports

- **Methods of writing research reports:**
- **12. References:**
- **Components:**
- Lists all sources cited in the report using a specific citation style (APA, MLA, etc.).
- **Purpose:**
- Gives credit to previous research and allows readers to locate cited works.
- **13. Appendices:**
- **Components:**
- Includes supplementary materials such as questionnaires, coding schemes, or additional data.
- **Purpose:**
- Provides additional details without cluttering the main body of the report.



# Research Reports: Methods of Writing Research Reports

- **Writing tips for research reports:**
- **1. Clarity and precision:**
  - Express ideas clearly and avoid unnecessary jargon.
- **2. Logical flow:**
  - Organize sections in a logical sequence to enhance readability.
- **3. Consistent style:**
  - Maintain a consistent writing style, including tense, tone, and formatting.
- **4. Objectivity:**
  - Present findings objectively, avoiding personal biases or opinions.
- **5. Conciseness:**
  - Be concise, focusing on key information without unnecessary details.
- **6. Revision and proofreading:**
  - Review and revise the report for clarity, coherence, and correctness.

# Research Reports: Methods of Writing Research Reports

- **Conclusion:**
- Writing a research report involves a systematic presentation of the study's components, from the title page to the appendices.
- Researchers must adhere to a structured format, ensure clarity, and follow a logical flow.
- By effectively communicating the research process and findings, a well-written research report contributes to the dissemination of knowledge and supports informed decision-making in academia and beyond.

# Citations and references: A comprehensive guide

- **Introduction:**
- **1. Purpose of citations**
- Acknowledge and give credit to the original sources of information used in academic work.
- Provide a roadmap for readers to locate the sources referred to in the text.
- **2. Components of citations:**
- **Author(s):** The person or entity responsible for the work.
- **Year of publication:** The year the work was published.
- **Title of the work:** The name of the book, article, or source.
- **Publication information:** Includes details like the publisher or journal name, volume/issue, and page numbers.

# Citations and references: A comprehensive guide

- **Types of citations:**
- **1. In-text citations:**
- **Format:**
- (Author(s) Last Name, Year)
- **Purpose:**
- Immediately connects a specific point in the text to a particular source
- **2. Parenthetical citations:**
- **Format:**
- (Author(s) Last Name, Year, p. Page number)
- **Purpose:**
- Specifies the exact page where the information can be found.

# Citations and references: A comprehensive guide

- **Types of citations:**
- **3. Footnotes/endnotes:**
- **Format:**
- A number in the text corresponds to a note at the bottom of the page (footnote) or at the end of the document (endnote).
- **Purpose:**
- Provides additional information or commentary without cluttering the main text.

# Citations and references: A comprehensive guide

- **Citation styles:**
- **1. APA (American Psychological Association):**
- **Format:**
- Author(s) Last Name, Initials. (Year). Title of the work. Publisher.
- **Usage:**
- Common in the social sciences.
- **2. MLA (Modern Language Association):**
- **Format:**
- Author(s) Last Name, First Name. Title of the work. Publisher, Publication Year.
- **Usage:**
- Common in the humanities.

# Citations and references: A comprehensive guide

- **Citation styles:**
- **3. Chicago/Turabian:**
- **Format:**
- Author(s) Last Name, First Name. Title of the work. Place of publication: Publication, Year.
- **Usage:**
- Chicago is widely used in various disciplines, while Turabian is a simplified version commonly used in history.
- **4. Harvard:**
- **Format:**
- Author(s) Last Name, Initials, Year, Title of the work, Place of publication, Publisher.
- **Usage:**
- Popular in the UK and Australia.

# Citations and references: A comprehensive guide

- **Citation styles:**
- **5. IEEE (Institute of Electrical and Electronics Engineers):**
- **Format:**
- [1] A. Author et al., “Title of the Paper,” Abbrev. Title of the Journal, vol. x, no. x, pp. xxx-xxx, month, year.
- **Usage:**
- Common in technical fields.



# Citations and references: A comprehensive guide

- **References page:**
- **1. Format:**
- Alphabetical order by the author's last name.
- Hanging indentation for each entry.
- **2. Components:**
- Author(s) Last Name, Initials.
- Year of Publication.
- Title of the Work.
- Source Information (Publisher, Journal, Volume, Issue, Page Numbers).

# Citations and references: A comprehensive guide

- **Avoiding Plagiarism:**
- **1. Definition:**
- Presenting someone else's ideas, words, or work as your own without proper acknowledgement is plagiarism.
- **2. Prevention:**
- Use citations for all borrowed information.
- Clearly distinguish your ideas from cited sources.
- Familiarize yourself with the rules of the citation style you are using.
- **Conclusion:**
- Mastering the art of citations and references is essential for academic integrity and effective communication for research. Different citation styles cater to various disciplines, and adherence to specific guidelines is crucial. By understanding the principles of in-text citations, reference page formatting, and avoiding plagiarism, researchers can contribute to the scholarly conversation while giving proper credit to those who paved the way.

## **Analysis of Qualitative Data**

Data, which is expressed in subjective way or in language but not in numbers and collected through observation and interview is known as qualitative data. Generally, qualitative data are collected from open ended questions or observation. Qualitative data are to be systematized to make it understandable. Such data are analyzed using various techniques which are known as analysis of qualitative data. Analysis of qualitative data explains the fact that helps to understand the significance or importance and complexity of subject matter. There is no rigid process of analyzing the qualitative data but some steps that are followed by most of the researchers are given below:

- a) **Data reduction:** Data are collected at first in large numbers. To classify the data into different classes, data is to be reduced. Thus, inter-related data should be integrated and non-related data is to be removed to reduce the data. Data can be reduced through tabulation, categorization, coding, comparison, case analysis and integration.
- b) **Data display:** Data are to be presented in a certain format for the integration of data. It helps to keep data in condensed form so that data reduction and summarizing is possible. Data presentation is made preparing table, figure, diagram and comparative matrix.
- c) **Drawing conclusions:** The researcher should draw conclusions from the presentation and analysis of data. The researcher should check biasness in data that shows the reliability and validity of research. Reliability can also be increased taking feedback from external experts.

## **Method of analyzing qualitative data**

Qualitative data analysis is related to integration and classification of data and watching the trend/behavior of the data. Thus, mainly they are described below:

- Content Analysis
- Narrative Analysis
- Thematic Analysis

## **Content Analysis**

Content analysis is a research technique for the systematic, objective and quantitative descriptions of the content of data collected through interviews, questionnaires, schedules and other expression in written or verbal form. It is used to analyze the data obtained from case study, details from field

and open-ended questions. It synthesizes the scattered information and data so that they can be analyzed and draw some information. For example, radio, T.V. and other seminars, meeting, etc. discuss over the quality of product or services all over the world. Thus, collection of information related to quality of product and services from published and unpublished, written and oral sources and integration of such information purposefully and making them measurable is considered as content analysis.

### ***Features of Content Analysis***

- a) **Systematic:** Content analysis should be logical and systematic. Data collected for content analysis are to be classified on the basis of certain procedures or rules. Facts may be in favor of research issue or against it. Researcher should analyze the data incorporating both types of data i.e. primary and secondary.
- b) **Objectivity:** Analysis of content must be purposive and unbiased. All variables of content analysis must be directed by certain method, rules and procedures. Researcher should, first of all, decide the method, rules and process for the collection and classification of data and then he/she should collect and analyze the data so as to reduce the impact of subjectivity or perception of the people.
- c) **Generalizability:** The findings drawn from the content analysis should be applicable in practice. The findings should fit with a theoretical, empirical or applied context. Non-related facts developed from the content analysis are valueless or they have less value. Findings found from content analysis should be applicable to large mass of the people or organizations.

### ***Guidelines for Content Analysis***

Following factors should be considered while conducting content analysis:

- a) **Clear operational definition of the units of analysis:** The units that a researcher wants to analyze must be first identified and defined clearly. Research questions must focus to such units. Such units should be operationalized. Operationalize refers to the definition of concept in a measurable way.
- b) **Clear definition for the response category:** Responses obtained from the respondents must be classified into different groups and such groups must be able to present research

objectives and they must be independent to each other. Clear and appropriate classification is a pre-requisite for content analysis. Thus, if research is not able to classify properly, it will be difficult to analyze. But all the information must be incorporated while classifying the data.

- c) **Analysis of material:** Every material should be thoroughly observed and analyzed before developing categories of data for content analysis. It will familiarize to the researcher with the data and information and helps to develop categories. It helps to reduce surprise data and encountering with unfit data at the time of analyzing information or data.
- d) **Decision on developing categories:** First of all, researcher should decide about creation of classes of data. Such classes of data must be independent. Researcher should consider to repetition of class, number of class and size of classes. If classification contains repetition, large number and odd size of classes, it does not help to attain the purpose of research. Thus, a researcher should take decision on developing categories.
- e) **Maintaining impartiality:** Persons, who is involved in data collection, should not be involved in content analysis. If the content analyst knows the purpose of study there is chances of biasness. Thus, a neutral person should be used who does not know the purpose of content analysis while analyzing the content for the research work.
- f) **The validity of the content analysis should be assessed:** The validity of the results of content analysis depends on the materials analyzed. Researcher should put maximum effort to collect all the relevant materials. A content analysis of a biased sample produces biased results.

### ***Limitations of Content Analysis***

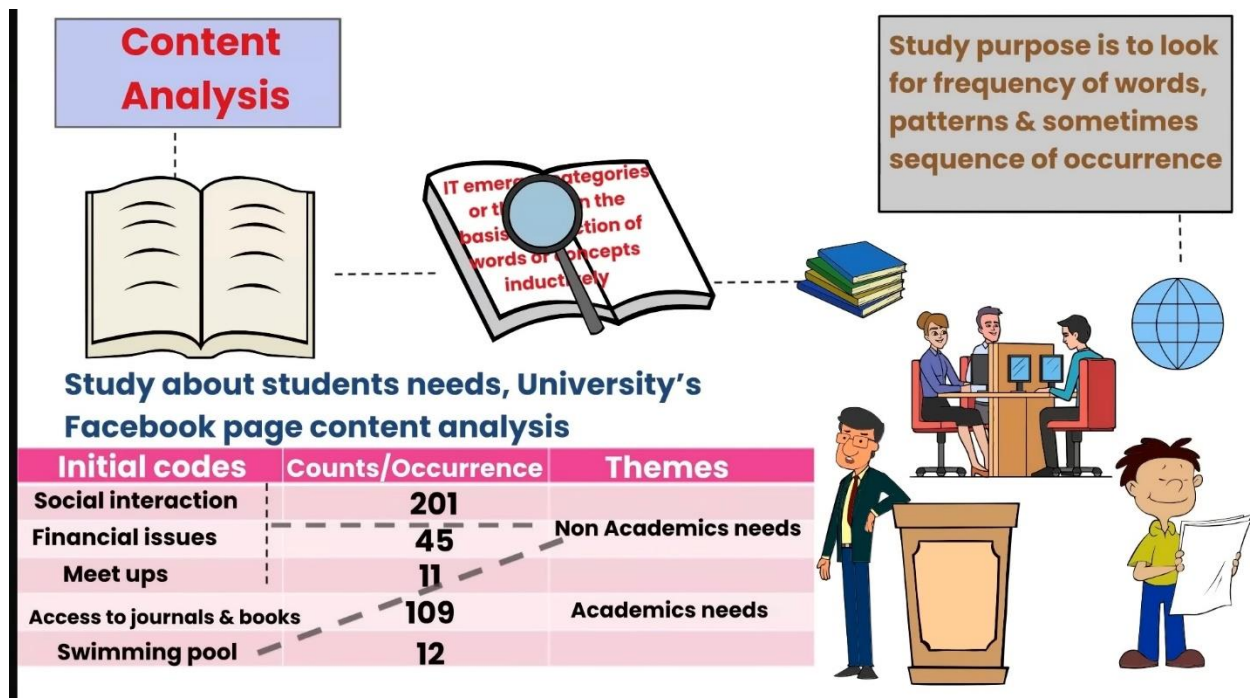
- a) **Non-reliable result:** All the information may not be collected so that such information may not represent to the universe. Thus, the results obtained from content analysis may not be correct and reliable.
- b) **Difficult to categorize data/material:** Main base of content analysis is classification of responses into different categories. But there is no any hard and fast rule for the classification of data. Thus, classification is a very difficult and challenging work. In the

analysis will not be correct. absence of appropriate classification, results obtained from content

- c) **Difficult to get clear and appropriate information:** Clear information is essential for content analysis. Surveyor and various communication channel provide different types of information. Thus, it is very difficult to obtain clear and appropriate information.
- d) **Costly:** Coding and decoding of data requires skilled manpower. Cost of skilled manpower is very high. Thus, it is costly. Because of cost factor, every organization cannot adopt content analysis.
- e) **Difficult to generalize:** It is generally related to case analysis and other behavior of particular group. It is totally based on specific information obtained from specific group of people. So, the results of content analysis cannot be generalized to a large mass or population.

### *Steps for Conducting Content Analysis*

- a. Identify the essential data.
- b. Develop bases for tabulation.
- c. Develop bases for content analysis.
- d. Develop the layout for the construction of design.
- e. Classify various variables into various groups.
- f. Establish procedures for the use of materials.
- g. Prepare outline of analysis and utilizing them.



## Narrative Analysis

A technique of recording and analyzing the information and subject based on the story of the respondents or people related to an event or subject matter is known as narrative analysis. In this process, researcher requests to the respondents to provide detail information related to a subject or events on the basis of observation or experience. There is no pre-determined question and respondents are not asked to give the answers of the questions. Narrative data comes from various sources. Researcher may obtain from response to open-ended question, the feedback from focus group, notes from field observation or the published reports.

Narrative analysis is widely used in the social science research. Information collected for narrative analysis helps to get information about the rational of research and analyses the various dimensions of the society and human behavior that gives information about the society and behavior of the people.

### *Elements of Narrative Analysis*

Narrative analysis contains the following elements.

- Understanding their level:** In narrative analysis, people tell the stories on the basis of their experience in a subject or event. Thus, such stories widen the understanding of the people on such subjects or events.

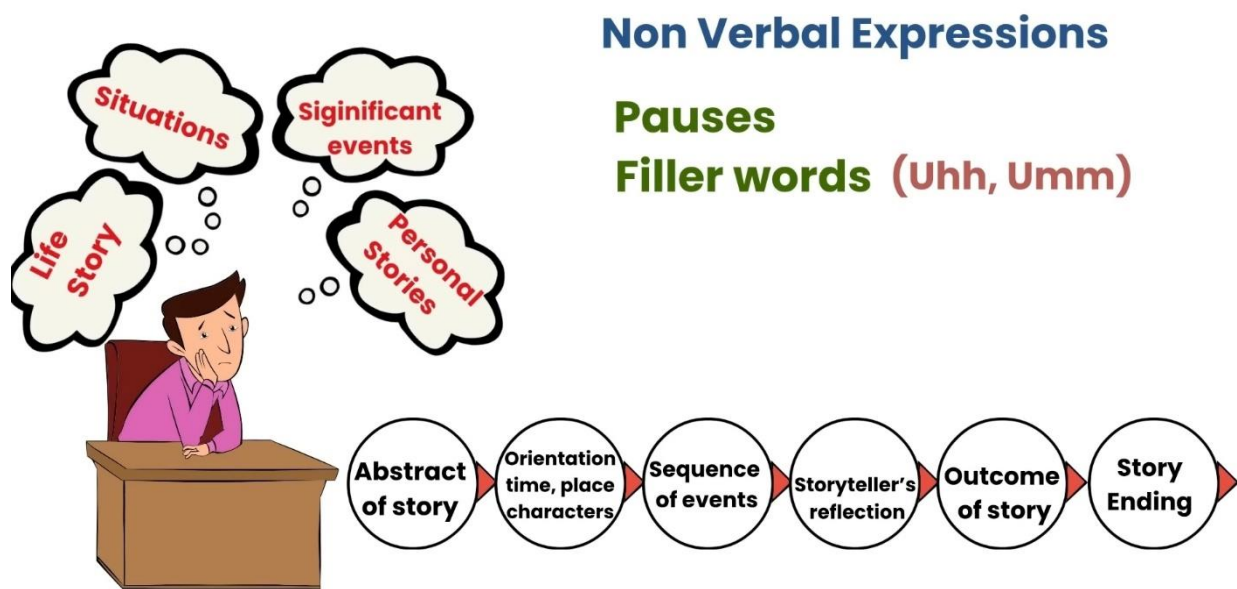
- b) **Data collection:** People exchange their stories in discussion, interview and focus group discussions. Such data can be collected from the autobiography, individual letters and diaries and personal interviews.
- c) **Analysis:** Data is analyzed with the close study of them. It can be analyzed by writing memo or summaries of the stories. Case wise comparison can be made to the narrations of the people.
- d) **People's understanding over events:** The analysis of contents, style, context and telling stories shows the people's understanding over any event or subjects, cultural context and their communities.
- e) **Key actors and events:** There are obviously key events and actors in their life. They include a variety of themes like career, remoteness, relations with other, etc. It helps to know their autobiography and understand their understanding over certain people or event or subject.

#### *Steps for Narrative Analysis*

- Obtaining data
- Focusing on analysis of data obtained from autobiography, interview, focus group discussion, etc.
- Codify data using sign or symbols to the classes of data.
- Identify the relationship among the various classes.



# Narrative Analysis



## Thematic Analysis

Theme refers to the main point or quality of a subject or event. A technique of qualitative data analysis that is used to identify the major points of data, analyze them and prepare report is known as thematic analysis. Thematic analysis is a work of searching theme of the data, event or subjects that is important for the description of the phenomena. The process involves the identification of themes through careful reading and re-reading of data, noting down initial ideas, coding interesting features of the data, relating code into theme, generating thematic map, on-going analysis to refine each of them and producing report through the continuous analysis.

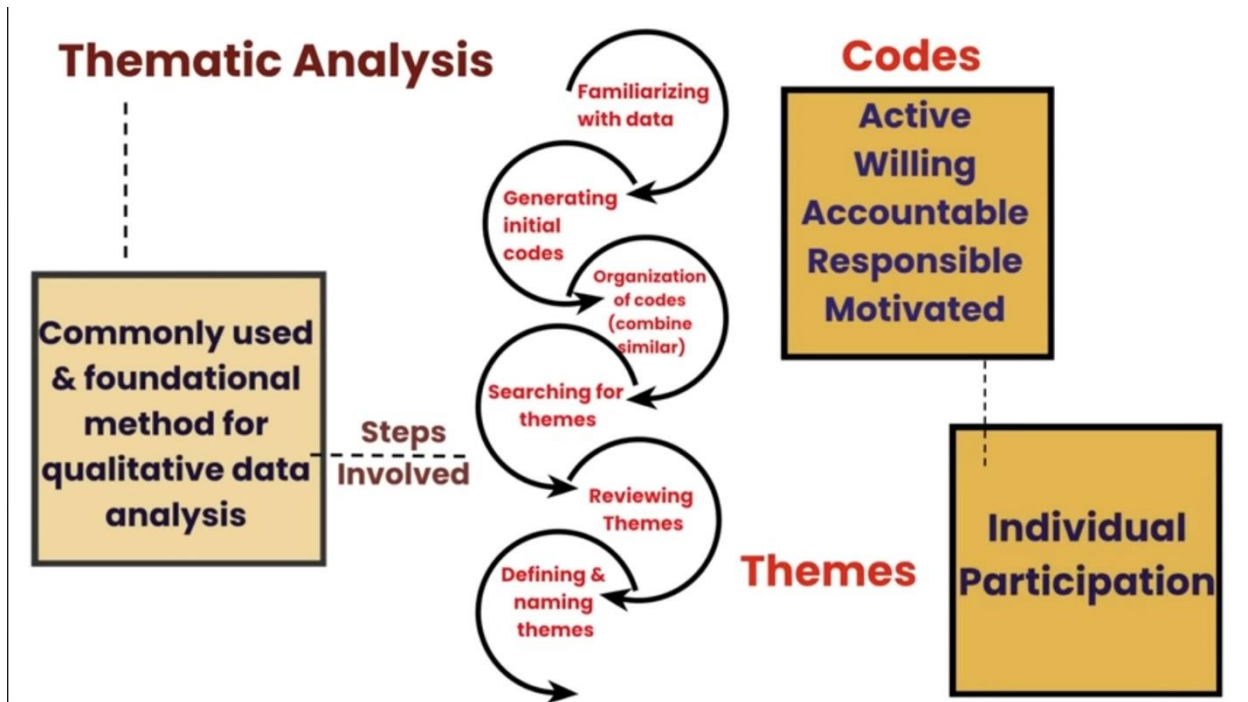
### Steps in Thematic analysis

**1.Reviewing the previous literature:** The researcher should review the previous literatures related to concerned subject or events for the thematic analysis. Such review helps to make familiar with the data. In this step, researcher should translate, read and re-read the data and develop notes for various ideas found in the literature.

**2. Generating initial codes:** Researcher wants to collect the necessary data only. Collection of unnecessary data increases cost and consumes more time while analyzing them. Thus, to collect

the essential data, he/she should highlight the essential information or data found in literature and prepare note of such data.

**3. Searching for themes:** Researcher should identify the probable information. He/ She should collect the codes and essential data based on potential themes.



## Analysis of Variance

ANOVA, or Analysis of Variance, is a statistical method used to compare the means of three or more groups to determine if there is a statistically significant difference among them. Instead of comparing groups one by one (as in a t-test), ANOVA evaluates all groups simultaneously, which reduces the likelihood of making a Type I error (false positive).

### Assumption

- **Independence:** The observations in each group must be independent of each other (e.g., one person's result should not affect another's result).
- **Normality:** The data within each group should follow a normal distribution. Small deviations are acceptable if the sample size is large (Central Limit Theorem applies).
- **Homogeneity of Variances:** The variance (spread) of data in all groups should be roughly equal. This is called homoscedasticity. i.e.,  $\sigma_1^2 = \sigma_2^2 = \sigma_3^2 = \dots = \sigma_k^2 = \sigma^2$  for k populations
- **Dependent Variable is Continuous:** The data being analyzed must be measured on an interval or ratio scale (e.g., height, weight, or test scores).

### ANOVA is used when:

- You want to compare means of multiple groups.
- Your data is continuous (e.g., height, weight, test scores).
- You want to determine if variations in the dependent variable are due to differences in the independent variable.

### Types of ANOVA

1. **One-Way ANOVA:** Compares the means of groups based on one factor (e.g., testing the effect of different fertilizers on plant growth).
2. **Two-Way ANOVA:** Compares means based on two factors (e.g., testing the effect of fertilizers and watering frequency on plant growth).
3. **Repeated Measures ANOVA:** Used when the same subjects are tested under different conditions (e.g., measuring reaction times before, during, and after consuming caffeine).

## One Way ANOVA

One-Way ANOVA (Analysis of Variance) is a statistical method used to determine if there are significant differences between the means of three or more independent groups based on one factor or variable. It helps test whether variations between group means are statistically significant or simply due to random chance.

For example, you might use One-Way ANOVA to compare the effectiveness of three different fertilizers on crop yield.

### Steps

#### 1. Hypothesis Set up

$H_0: \mu_1 = \mu_2 = \mu_3 = \dots = \mu_k$  i.e., there is no significant difference of  $k$  population means.

$H_1: \mu_1 \neq \mu_2 \neq \mu_3 \neq \dots \neq \mu_k$  i.e., there is significant difference of  $k$  population means or at least one of the means of the population is different from the others.

#### 2. Test Statistics

$$F \text{ statistic} = \frac{\text{variance between samples}}{\text{variance within samples}} = \frac{MSB}{MSE}$$

#### One Way ANOVA table

Source of variation	Sum of squares	D.f.	Mean sum of square	F-ratio
Between samples(treatments)	SSB	(k-1)	$MSB = \frac{SSB}{k-1}$	$F = \frac{MSB}{MSE}$
Within samples (error)	SSE	(n-k)	$MSE = \frac{SSE}{n-k}$	
Total	SST	(n-1)		

We calculate the value of SSB, SSE & SST using following formula,

- a) Compute the grand total (T) i.e. sum of all observations in all  $k$  samples. That is,

$$T = \sum X_1 + \sum X_2 + \dots + \sum X_k$$

- b) Compute the correction factor (C.F.) by dividing square of grand total by total number of

observations. i.e.  $C.F. = \frac{T^2}{n}$

- c) Compute the sum of squares of all individual observations of  $k$  sample subgroups and subtract the C.F. from it. This gives the total sum of squares (SST). That is,

$$SST = \sum X_1^2 + \sum X_2^2 + \dots + \sum X_k^2 - C.F.$$

- d) Compute the square of the sum of the values of each sample subgroup and divide each such squared value by the corresponding number of values in sample subgroups and then compute the sum of all the resulting values and subtract the C.F. from this sum values. It gives the sum of squares of deviation between the sample subgroups. That is,

$$SSB = \left[ \frac{(\sum X_1)^2}{n_1} + \frac{(\sum X_2)^2}{n_2} + \dots + \frac{(\sum X_k)^2}{n_k} \right] - C.F$$

- e) Then the SSE can be computed by subtracting SSB from SST. That is,  
 $SSE = SST - SSB$   
 (Since,  $SST = SSB + SSE$ )

### 3. Level of Significance: $\alpha$

4. **Critical Value:** We have to determine the tabulated value of F at  $\alpha\%$  level of significance for  $(v_1, v_2)$  i.e.  $(k-1, n-k)$  degree of freedom.

### 5. Decision:

- If  $F_{cal} \leq F_{tab}$ , we do not reject  $H_0$
- If  $F_{cal} > F_{tab}$ , we reject  $H_0$

## Chi-square test ( $\chi^2$ -test)

The **chi-square test** is a statistical method used to compare observed data with expected data based on a specific hypothesis. It helps determine whether there is a significant difference between the expected and observed frequencies in categorical data.

### Assumptions of the Chi-Square Test

- The data should be in the form of frequencies or counts of categories.
- Observations must be independent.
- The expected frequency in each category should be at least 5 for accurate results.
- The total sample size should be sufficiently large.

### Chi-Square Test for Independence of Attributes:

The Chi-Square Test for Independence is a statistical test used to determine whether two categorical variables are associated or independent of each other. It compares observed frequencies (actual data) in a contingency table to the frequencies expected if the variables were independent.

### Conditions for Using the Test

1. **Two Categorical Variables:** The test is used when your data involves two variables that can be categorized (e.g., gender, preferences, education level). Examples:
  - a) "Does smoking status (smoker/non-smoker) depend on gender (male/female)?"
  - b) "Is product preference (A/B/C) related to age group (child/teen/adult)?"
2. **Data Represented in Counts or Frequencies:** The data must represent counts or frequencies, not percentages, ratios, or continuous data. Example: The number of males and females preferring different products.
3. **Random Sampling:** The sample should be randomly selected from the population.
4. **Independence of Observations:** Each observation should be independent of others (e.g., one person cannot belong to multiple categories).
5. **Sufficient Sample Size:** The expected frequency in each cell of the contingency table should generally be at least 5 for the test to be reliable.

### **Examples of When to Use**

1. **Market Research:** Determining if age group (young, middle-aged, senior) is associated with the choice of a streaming service (Netflix, Hulu, Amazon).
2. **Medical Studies:** Testing whether smoking status (smoker/non-smoker) is related to the presence of a specific disease (yes/no).
3. **Education Studies:** Evaluating if study habits (daily/weekly/monthly) are associated with performance levels (high/medium/low).
4. **Social Science Research:** Investigating if marital status (single/married/divorced) is related to political affiliation (party A/party B/independent).

## Steps for Conducting the Test

### 1. Hypothesis Set up:

$H_0$ : There is no relationship between two attributes or two attributes are independent.

$H_1$ : There is relationship between two attributes or two attributes are dependent.

**2. Test Statistics:** Under  $H_0$ , the  $\chi^2$  -statistic is

$$\chi^2 = \sum \left( \frac{(O-E)^2}{E} \right)$$

where, O = observed frequencies

$$E = \text{expected frequencies} = \frac{RT * CT}{N}$$

N = total sample size = grand total

For example, 2 x 2 contingency table:

	B <sub>1</sub>	B <sub>2</sub>	Row total (RT)
A <sub>1</sub>	a	b	a+b
A <sub>2</sub>	c	d	c+d
Column total (CT)	a+c	b+d	N= a+b+c+d

The expected frequencies for each cell can be obtained as follows:

$$E(a) = \frac{RT * CT}{N} = \frac{(a+b)(a+c)}{N}, \quad E(b) = \frac{(a+b)(b+d)}{N}$$

$$E(c) = \frac{(c+d)(a+c)}{N} \quad \text{and} \quad E(d) = \frac{(c+d)(b+d)}{N}$$

For 2 x 2 contingency table  $\chi^2$  can be computed using following formula:

$$\chi^2 = \frac{N(ad-bc)^2}{(a+b)(c+d)(a+c)(b+d)}$$

### 3. Level of Significance: $\alpha$

### 4. Degree of Freedom = (r-1) (c-1)

**5. Critical Value:** We have to determine the tabulated value of  $\chi^2$  at  $\alpha\%$  level of significance for (r-1) (c-1) degree of freedom from  $\chi^2$  table

### 6. Decision:

- If  $\chi^2_{\text{cal}} \leq \chi^2_{\text{tab}}$ , we do not reject  $H_0$
- If  $\chi^2_{\text{cal}} > \chi^2_{\text{tab}}$ , we reject  $H_0$



### Questions

1. Four hundred employees of a certain factory were classified according to the gender and their level of satisfaction.

Gender	Level of satisfaction		
	Unsatisfied	Satisfied	Highly satisfied
Male	60	80	70
Female	40	60	90

Is there any relationship between gender and level of satisfaction? ( $\chi^2_{\text{cal}} = 8.377$ , reject  $H_0$ )

2. A sample of 300 students of undergraduate and 300 of Post graduate classes of a university were asked to give their opinion towards the autonomous colleges. 190 of the Under-graduate and 210 of the post-graduate students favored the autonomous status.

Present the above fact in the form of frequency table and test, at 5% level, that opinions of Under-graduate and post-graduate student autonomous status of colleges are independent. ( $\chi^2_{\text{cal}} = 3$ , do not reject  $H_0$ )

3. The number of married, unmarried and widow population in the three cities of Kathmandu Valley is obtained as below. Test whether the city and the marital status of the adult female population are associated.

	Married	Unmarried	Widow	Total
X	20	15	15	50
Y	30	20	25	75
Z	50	40	10	100
Total	100	75	50	225

( $\chi^2_{\text{cal}} = 15.994$ , reject  $H_0$ )

4. Explain the importance of inferential statistics in management and business science. A market analyst is reviewing three types of landed property in Singapore (terraces, detached, and semi-detached) that are owned by the three different household income groups (low, middle, and high). She organized the collected data into the following table:

Types of property	Household income range		
	Low	Middle	High
Terraces	15	57	80
Detached	32	84	20
Semi detached	8	13	47

Using 5% level of significant, help the analyst determine whether there is evidence of a significant relationship between type of landed property and the household income. ( $\chi^2_{\text{cal}} = 71.266$ , reject  $H_0$ )