Understanding Research Types: Fundamental, Applied, And Action Research

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Abstract

Research is a systematic process of inquiry that contributes to the advancement of knowledge, understanding of phenomena, and resolution of real-world problems. This chapter explores three major types of research: Fundamental Research, Applied Research, and Action Research, highlighting their distinctive characteristics, objectives, applications, strengths, and limitations. Fundamental research focuses on expanding theoretical knowledge and developing new concepts, whereas applied research emphasizes the practical application of scientific knowledge to address specific societal, technological, educational, and industrial challenges. Action research, on the other hand, adopts a participatory and cyclical approach involving problem identification, planning, implementation, observation, evaluation, and reflection to improve practices within specific contexts. The chapter also examines the interrelationship among these research approaches and explains how they complement one another in generating knowledge and promoting practical innovations. Furthermore, it discusses the significance of selecting an appropriate research approach according to research objectives, available resources, and the nature of the problem. The discussion highlights that the integration of fundamental, applied, and action research can strengthen

scientific inquiry, encourage innovation, and facilitate sustainable improvements in different fields of human activity.

Keywords: Research Methodology, Fundamental Research, Basic Research, Applied Research, Action Research, Scientific Inquiry, Problem-Solving, Research Approaches, Knowledge Development, Practical Application.

1. INTRODUCTION

Research constitutes a structured and methodical process of inquiry aimed at discovering, interpreting, and applying knowledge. Fundamentally, research embodies humanity's organized approach to addressing questions, solving problems and enhancing our comprehension of the world. Whether conducted in laboratories, field settings, or through data analysis, all research endeavours share the common objective of generating reliable information through systematic investigation. Various types of research fulfill distinct yet complementary roles in advancing knowledge and practice. Certain forms of research prioritize theoretical understanding, striving to uncover fundamental truths about the operations of the universe, society, or the human mind. These investigations often serve as the foundational elements of scientific progress, even when their immediate applications are not readily apparent.

Conversely, other research approaches are more directly focused on practical problem-solving, applying existing knowledge to address specific challenges in fields such as medicine, education, or technology development. Understanding these diverse research approaches is essential for several reasons. Firstly, it assists scholars and practitioners in selecting the most appropriate methodology for their specific objectives. Secondly, it enables the proper evaluation of research

findings based on their intended purpose. Thirdly, it facilitates more effective communication among researchers operating within different paradigms. Ultimately, this understanding enhances our collective capacity to generate knowledge that can both expand human understanding and improve real-world conditions. Therefore, the choice of research approach depends on multiple factors including the nature of the question being asked, the current state of knowledge in the field, available resources, and the intended application of the findings. By carefully considering these variables, researchers can design studies that maximize both scientific rigor and practical relevance.

This chapter explains three main types of research:

- Fundamental Research (also called basic or pure research) - seeks to increase knowledge without immediate practical use.
- Applied Research - focuses on solving specific problems in fields like medicine, business, or technology.
- Action Research - involves direct problem-solving in real-life settings, often through collaboration with practitioners.

Table-1: Key research types

Research	Primary Goal	Key Focus	Example
Fundamental Research	Expand theoretical knowledge	"Why" or "How" phenomena occur	Studying black holes in astrophysics
Applied Research	Solve practical problems	Direct real-world applications	Developing a new vaccine
Action Research	Improve specific practices	Collaborative problem-solving	Enhancing teaching methods in a school

II. FUNDAMENTAL RESEARCH (BASIC/PURE RESEARCH)

Basic Elements of Research Methods

Definition: Fundamental research is conducted to gain a deeper understanding of a subject, without necessarily solving a specific problem. Its main goal is to expand knowledge and develop theories.

Key Features:

- Theoretical Focus – It explores "why" and "how" things happen rather than finding direct solutions.
- Long-Term Impact – Findings may not have immediate practical use but often lead to major scientific breakthroughs.
- Curiosity-Driven – Researchers investigate topics purely to discover new information.

Table-2: Examples in Different Disciplines

Field	Examples of Study	Potential Long-Term Impact
Physics	Quantum mechanics research	Leads to advanced computing (quantum computers)
Biology	Human genome mapping	Enables personalized medicine
Sociology	Social media	Ways to improve the affected human relationships
Psychology	Working of human brain	Psychological changes in different stages of a man
	Cognitive processes in decision-making	Improves AI and behavioral economics

Strengths and Limitations of Fundamental Research

Fundamental research plays a critical role in building the foundation for future scientific and technological advancements. By exploring theoretical concepts and

uncovering new knowledge, it provides the groundwork upon which applied research can develop practical solutions. Additionally, fundamental research often leads to unexpected discoveries that revolutionize entire fields–breakthroughs like the discovery of penicillin or the structure of DNA originated from curiosity-driven studies. This type of research also fosters innovation by encouraging scientists to explore uncharted territories, pushing the boundaries of human understanding without the constraints of immediate practical applications.

Key notes:

- Builds the foundation for future applied research.
- Leads to unexpected discoveries that can revolutionize science.
- Encourages innovation by exploring unknown areas.

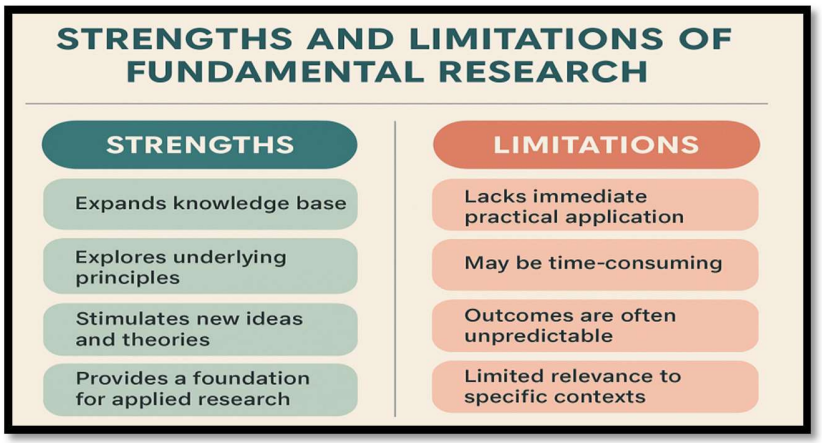


Figure- 1: Strengths and Limitations of Fundamental Research

Despite its long-term benefits, fundamental research has some notable drawbacks. It is often expensive and time-consuming, requiring substantial investments in equipment, personnel, and resources without guaranteed short-term results. Since its primary goal is knowledge expansion rather than problem-solving, findings may not always have direct real-world applications, making it difficult to justify funding, particularly in budget-constrained environments. Governments and institutions may

hesitate to allocate significant resources to projects without clear, immediate benefits, even though their contributions may prove invaluable decades later. Thus, while fundamental research is essential for scientific progress, its high costs and delayed returns present ongoing challenges.

Key notes:

- Often expensive and time-consuming.
- Results may not have direct real-world applications.
- Requires significant funding, which can be hard to justify without immediate benefits.

Why It Matters

Even though fundamental research doesn't always produce quick solutions, it is essential for scientific progress. Many modern technologies (like the internet and medical imaging) started as basic research before becoming practical tools.

III. APPLIED RESEARCH

Applied research is a type of scientific investigation that focuses on solving practical, real-world problems rather than purely expanding theoretical knowledge. Unlike fundamental research, which seeks to answer broad questions about how the world works, applied research aims to develop solutions that can be directly implemented in industries, healthcare, technology, and other fields.

Key characteristics of applied research include:

- Problem-Solving Focus: It addresses specific challenges faced by businesses, governments, or communities.
- Practical Outcomes: The results are intended for immediate use, such as improving products, policies, or processes.

Basic Elements of Research Methods

- Interdisciplinary Approach: Often combines knowledge from multiple fields (e.g., engineering + medicine for medical devices).
- Industry or Policy-Driven: Frequently funded by corporations, governments, or NGOs seeking actionable solutions.

Focus on Solving Practical Problems and Real-World Applications

Applied research bridges the gap between scientific theory and practical implementation. For example:

1) **Medicine**: Developing new drugs or medical devices to treat diseases.
2) **Engineering**: Designing more efficient renewable energy systems.
3) **Business**: Studying consumer behaviour to improve marketing strategies.
4) **Agriculture**: Creating drought-resistant crops to combat food shortages.

This research type is essential because it translates abstract scientific concepts into innovations that improve daily life.

Table-3: Examples from Fields like Medicine, Engineering and Business

Field	**Eample of Applied Research**	**Real Wor;d Impact**
Medicine	Clinical trials for a new cancer drug	Leads to FDA-approved treatments that save lives
Engeeneering	Developing self-driving car algorithms	Improves road safety and transportation efficiency
Buisness	Market research on consumer preferences	Helps companies design better products

Agriculture	Testing pest-resistant genetically modified crops	Increases crop yields and reduces pesticide use

Relationship between Fundamental and Applied Research

Fundamental and applied researches are interconnected:

- Fundamental research provides the foundational knowledge (e.g., discovering DNA structure).
- Applied research uses that knowledge to develop solutions (e.g., gene therapy for diseases).
- Many major innovations (like the internet) began as fundamental research before evolving into applied technologies.

Strengths and Limitations

Applied research presents considerable advantages by directly addressing real-world challenges that affect society. In contrast to theoretical studies, it generates practical solutions that can be swiftly implemented to enhance healthcare, technology, business practices, and public policy. For example, medical researchers developing new vaccines or engineers creating sustainable energy technologies contribute to immediate societal benefits. This practical orientation also renders applied research appealing to funding sources, including private industries, government agencies, and non-profit organizations, which are often inclined to invest in projects with measurable outcomes. Furthermore, because applied research builds on existing scientific knowledge rather than exploring entirely new concepts, it typically yields faster results than fundamental research, facilitating timely solutions to pressing problems.

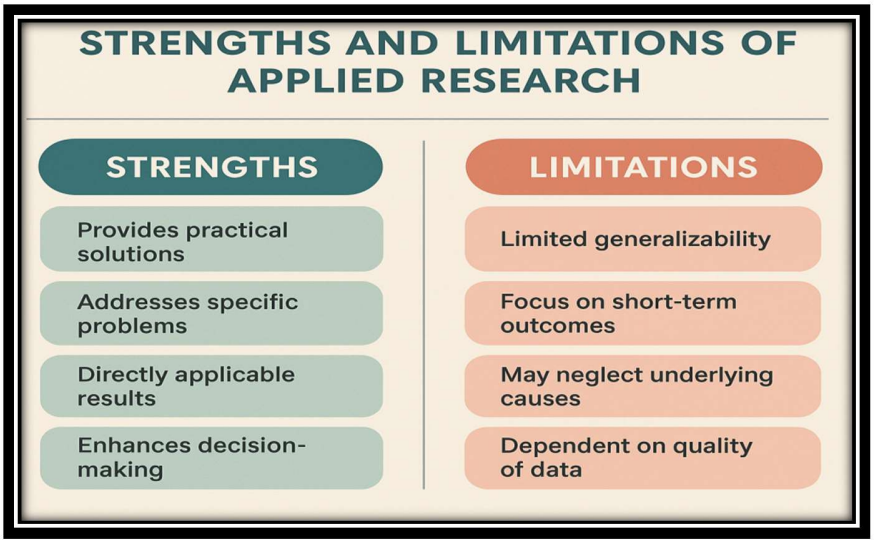


Figure- 2: Strengths and Limitations of Applied Research

Despite its practical benefits, applied research has several limitations. A primary drawback is that its focus on immediate applications may come at the expense of long-term scientific depth. While addressing specific problems, researchers might overlook broader theoretical questions that could lead to more groundbreaking discoveries in the future. Moreover, applied research heavily relies on fundamental research—without a robust foundation of theoretical knowledge, practical innovations would be unattainable. For instance, advancements in artificial intelligence depend on decades of basic research in computer science and mathematics. Another challenge is the potential for bias, as corporate or political interests funding applied studies may influence research priorities or outcomes. This could result in skewed findings that favor commercial or ideological agendas rather than objective scientific truth. While applied research is invaluable for addressing urgent problems, these limitations underscore the necessity for a balance between practical and theoretical scientific inquiry.

IV. ACTION RESEARCH

Definition:

Basic Elements of Research Methods

Action research is a hands-on, participatory approach where researchers work directly with communities or organizations to solve specific problems. Unlike traditional research, which often observes from a distance, action research involves collaboration with the people affected by the issue.

Key characteristics include:

- **Participatory**: Teachers, employees, or community members help design and implement the study.
- **Iterative Process**: Cycles of planning, acting, observing, and refining solutions.
- **Context-Specific**: Solutions are tailored to a particular school, company, or neighborhood.
- **Immediate Application**: Findings are used right away to improve practices.

Emphasis on Problem-Solving Within Specific Contexts

Action research is commonly used in:

- ✓ Education: Teachers test new teaching methods in their classrooms.
- ✓ Healthcare: Nurses improve patient care protocols in a hospital.
- ✓ Business: Managers refine workplace policies based on employee feedback.
- ✓ Community Development: Local leaders address poverty or environmental issues.

Participatory and Iterative Nature

Unlike traditional research, action research follows a cyclical process:

i. Identify a Problem (e.g., low student engagement in a school).
ii. Plan an Intervention (e.g., try interactive learning techniques).
iii. Implement & Observe (apply the method and collect data).
iv. Reflect & Adjust (analyze results and improve the approach).
v. Repeat the Cycle until the problem is resolved.

The Action Research Process: A Systematic Guide

Action research is distinguished by its structured, cyclical methodology, which empowers organizations and communities to pinpoint challenges and devise effective solutions. This participatory approach prioritizes ongoing enhancement through successive cycles of planning, action, and reflection.

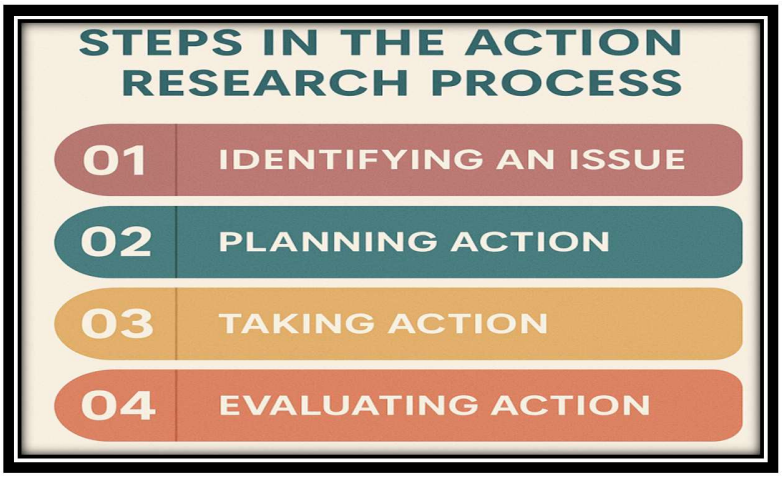


Figure- 3: Strengths and Limitations of Applied Research

1. Problem Identification

The process initiates with the identification of a specific, actionable issue within a defined context. For instance, a corporation may detect troubling trends in employee turnover, whereas an educational institution might observe a decline in students' mathematics performance. This phase demands meticulous observation and initial data collection to delineate the problem's scope and impact. Stakeholders collaborate to ensure the issue is pertinent and significant to those affected.

2. Data Collection

Following problem definition, researchers utilize both qualitative and quantitative methods to gather comprehensive insights. This typically includes:

- Surveys of employees or stakeholders
- In-depth interviews with key participants
- Systematic observations of work processes or behaviors
- Analysis of existing organizational data

The gathered data aids in identifying root causes and establishes a baseline for assessing future improvements.

3. Action Planning

Upon completing data analysis, researchers and stakeholders collaboratively formulate potential solutions. In the context of employee retention, this might involve:

- Designing flexible work arrangements
- Developing professional development programs
- Enhancing communication channels
- Revising compensation structures

The planning phase underscores collaborative decision-making to ensure solutions are feasible and acceptable to all involved parties.

4. Implementation

The proposed interventions are executed in a real-world setting. This phase necessitates:

- Clear communication of changes
- Training or support for affected individuals
- Establishment of monitoring systems
- Allocation of necessary resources

Implementation is initially conducted on a small scale, allowing for adjustments prior to broader application.

5. Evaluation

Researchers evaluate the intervention's effectiveness using predetermined metrics. Evaluation methods may include:

- Follow-up surveys and interviews
- Analysis of performance metrics
- Comparative studies between pre- and post-implementation periods
- Cost-benefit assessments

This stage ascertains whether the solution effectively addressed the identified problem.

6. Refinement

Based on evaluation outcomes, the team makes necessary adjustments to enhance results. The refinement process may involve:

- Modifying implementation strategies
- Addressing unforeseen challenges
- Scaling successful elements
- Discontinuing ineffective components

The cycle then recommences, with each iteration building on previous insights to achieve optimal outcomes. This iterative approach ensures continuous organizational learning and improvement. Unlike traditional research methods that conclude with recommendations, action research integrates the solution-development process within the organization, fostering sustainable change through ongoing adaptation and stakeholder engagement. The cyclical nature allows for

responsiveness to evolving circumstances and the gradual refinement of interventions over time.

Table-4: Steps in the Action Research Process

Step Problem	Description
Identification	A specific issue is recognized (e.g., high employee turnover in a company).
Data Collection	Surveys, interviews, or observations gather insights from stakeholders.
Action Planning	Researchers and participants design a solution (e.g., flexible work policies).
Implementation	The solution is tested in the real-world setting.
Evaluation	Results are analyzed to see if the intervention worked.
Refinement	Adjustments are made, and the cycle repeats for continuous improvement.

Examples and Case Studies

- **Education:** A school uses action research to improve reading skills by testing different literacy programs and adjusting based on student performance.
- **Business:** A company reduces workplace stress by introducing mindfulness sessions and tracking employee feedback over time.
- **Healthcare:** A hospital reduces patient wait times by reorganizing staff schedules and measuring the impact.

Strengths of Action Research

Action research presents several significant advantages that render it particularly effective for addressing practical issues within organizations and communities. A primary strength of this methodology is its capacity to empower participants—be they educators, employees, or community members—by actively involving them in

the research and problem-solving processes. This participatory approach not only yields more pertinent solutions but also enhances engagement and commitment to change. The methodology is adept at generating practical, customized solutions tailored to specific contexts, as interventions are developed and refined in direct response to the unique needs of the setting. Moreover, the cyclical nature of action research promotes continuous improvement, enabling organizations to test, evaluate, and refine their strategies through multiple iterations until optimal results are achieved. This iterative process ensures that solutions evolve organically and remain responsive to changing circumstances.

Limitations of Action Research

Despite its numerous benefits, action research does present certain challenges. A notable limitation is that its highly contextualized nature may impede the generalizability of findings to other settings—solutions effective in one school or company may not be applicable elsewhere. The approach also necessitates strong collaboration among all stakeholders, and resistance from participants can significantly impede progress if not effectively managed. Additionally, the very characteristic that renders action research so comprehensive—its iterative, cyclical process—can also be time-intensive, requiring sustained effort and resources over an extended period. Organizations must carefully consider these limitations in relation to the method's strengths when determining whether action research is the most suitable approach for their specific needs and constraints.

Applied research and action research both focus on solving real-world problems but differ in scale and approach. Applied research develops broad solutions (like new technologies), while action research works within specific communities or organizations for immediate improvements. Understanding these methods helps researchers choose the best approach for their goals—whether advancing industry innovation or refining local practices.

V. COMPARING FUNDAMENTAL, APPLIED AND ACTION RESEARCH

These three research approaches differ significantly in their core purposes and execution:

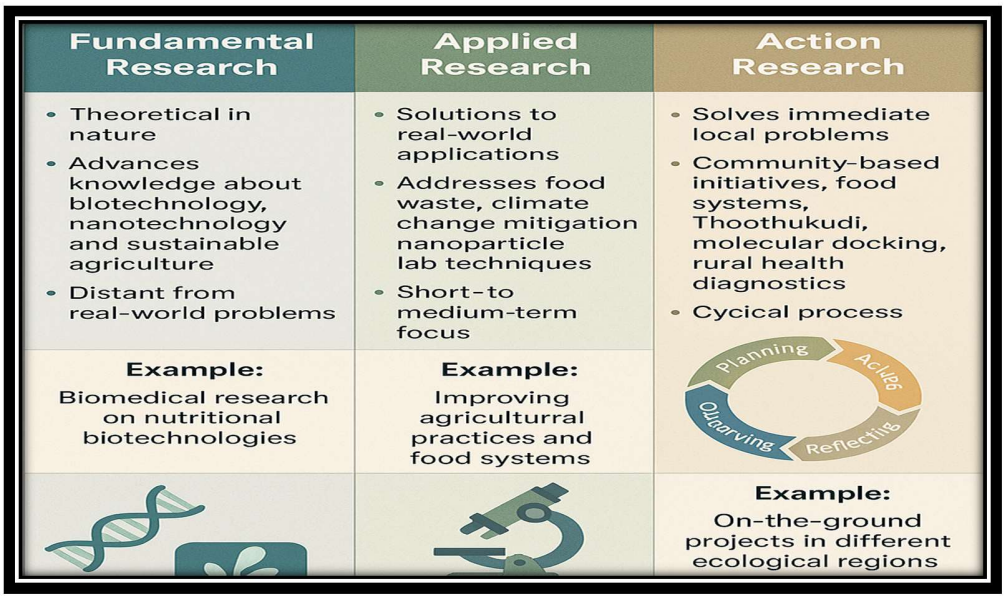


Figure- 4: Comparing Fundamental, Applied and Action Research

When to Use Each Type of Research

Selection depends on research objectives as their main priority.

- ✓ Fundamental research should be your selection if you want to advance basic scientific understanding
- ✓ Choose applied research when planning the development of technological or social challenge solutions.
- ✓ Action research becomes the appropriate research strategy for enhancing specific organizational practices.

Complementary Roles in Advancing Knowledge and Practice

The three research methods create a knowledge ecosystem which supports both creation and practical implementation of ideas.

Basic Elements of Research Methods

i. Research at its foundation establishes theoretical principles as the base for new knowledge development.
ii. The process of turning theoretical concepts into functional solutions through applied research occurs.
iii. Research actions take laboratory-developed solutions to test and perfect them within real operational environments.

VI. CONCLUSION

The advancement of human knowledge together with societal enhancement constitutes the major functions of research activities. All three research types fundamental and applied and action work together to achieve scientific development alongside practical implementation. Research developers gain clarity about their studies through knowledge of distinct features between these three methodologies.

- For their goals researchers need to pick the most suitable methodology
- Researchers should understand the connections between different research methodologies.
- Their investigation team can achieve maximum effectiveness from their research activities.

Research programs which achieve the most significant impact incorporate multiple research approaches to show how exploring theories works with practical implementations and context to create meaningful progress. The understanding of unique research attributes and suitable application examples enables researchers to generate better outcomes in knowledge exploration and real-world challenge resolution.

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