

UNIT - I



Dr. V. MAGENDIRA MANI, M.Sc., M.Phil., Ph.D., SET
Research Coordinator and Research Supervisor
PG and Research Department of Biochemistry
Marudhar Kesari Jain College for Women
Vaniyambadi-635 751,
Contact : +91 9486000227; +91 6381858544
Mail: magendiramani@rediffmail.com
Download Science at: <https://tvuni.academia.edu/mvinayagam>

UNIT I

RESEARCH METHODOLOGY

NATURE AND IMPORTANCE OF RESEARCH

Research is the systematic investigation and analysis of a subject or problem with the aim of acquiring new knowledge, understanding, or finding solutions. It is a critical process that contributes to the advancement of human knowledge, innovation, and problem-solving in various fields. Research plays a vital role in several aspects, including:

Expansion of knowledge: Research helps expand the existing knowledge base by exploring new ideas, concepts, and theories. It allows us to deepen our understanding of the world around us, whether it's in science, technology, social sciences, or humanities.

Development of society: Research is instrumental in driving social, economic, and technological development. It leads to the discovery of new methods, technologies, and solutions that can enhance the quality of life, improve public policies, address societal challenges, and promote progress in various sectors.

Problem-solving and innovation: Research is essential for finding solutions to complex problems and challenges. It enables researchers to identify gaps in knowledge, develop hypotheses, conduct experiments, gather data, and analyze findings to generate new insights and innovative solutions.

Evidence-based decision making: Research provides a foundation for evidence-based decision making in various fields such as healthcare, education, policy-making, and business. It offers reliable and objective information that policymakers, professionals, and stakeholders can use to make informed choices and develop effective strategies.

Continuous improvement: Research helps in identifying areas for improvement, whether in products, services, processes, or systems. It enables organizations to evaluate their performance, gather feedback, and make necessary adjustments to enhance efficiency, effectiveness, and competitiveness.

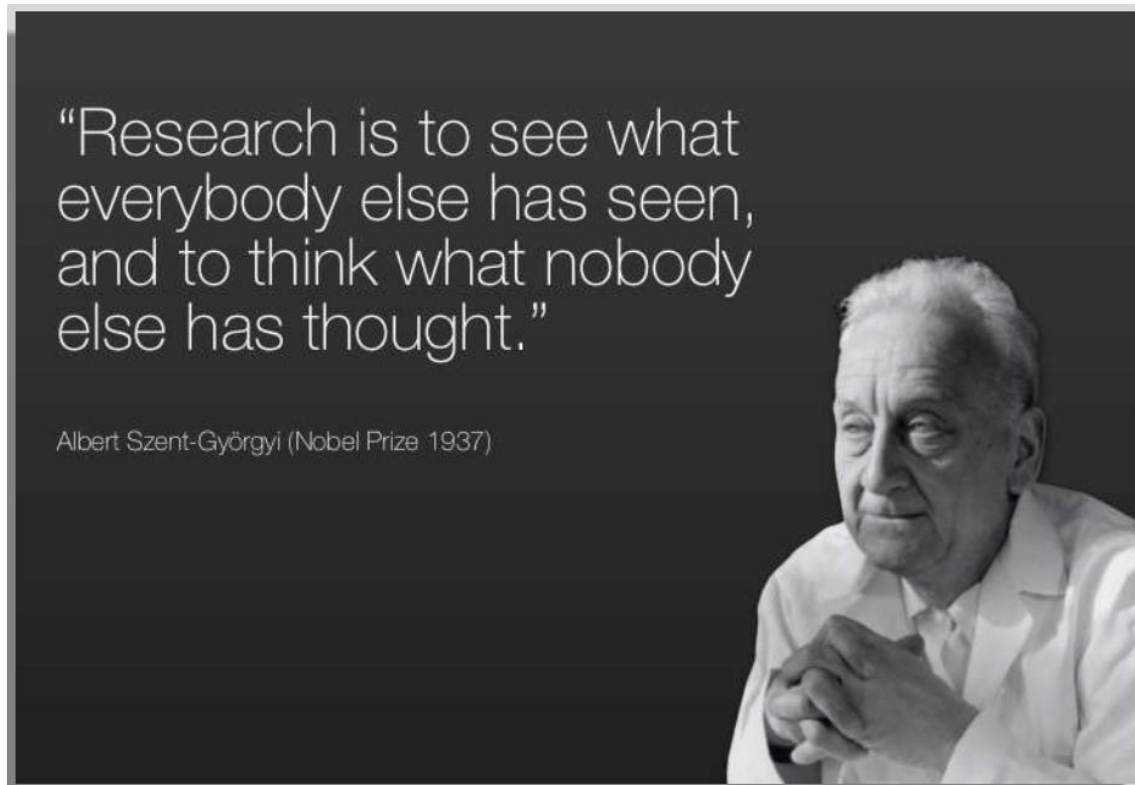
Academic progress: Research is the cornerstone of academic progress and the advancement of knowledge in universities and academic institutions. It supports the training of new scholars, fosters critical thinking, and encourages intellectual growth.

Professional development: Research enhances professional development by promoting the acquisition of new skills, fostering analytical thinking, and encouraging a deep understanding of a subject matter. It allows individuals to contribute to their respective fields and stay up to date with the latest advancements.

Scientific advancement: Research drives scientific progress by uncovering new phenomena, validating existing theories, and challenging conventional wisdom. It fosters the accumulation of knowledge and the refinement of scientific methodologies.

Economic growth: Research plays a crucial role in economic development. It fuels innovation, fosters entrepreneurship, and leads to the development of new industries and job opportunities. Research also helps in identifying market trends, consumer preferences, and emerging needs, enabling businesses to adapt and thrive.

Healthcare and medical advancements: Research in the medical and healthcare fields leads to the development of new treatments, drugs, and therapies. It contributes to the prevention, diagnosis, and treatment of diseases, ultimately improving public health outcomes and extending human life expectancy.



Technological innovation: Research drives technological advancements by exploring new frontiers, pushing the boundaries of knowledge, and developing breakthrough technologies. It underpins the development of new products, services, and processes that revolutionize industries and improve efficiency.

Policy formulation and evaluation: Research provides empirical evidence and analysis that inform policy formulation and evaluation. It helps policymakers understand the impact of existing policies, identify areas requiring attention, and develop evidence-based policies that address societal challenges.

Preservation of cultural heritage: Research plays a crucial role in preserving and documenting cultural heritage. It contributes to the understanding of historical events, traditions, languages, and art forms, ensuring their conservation and transmission to future generations.

Education and learning: Research forms the foundation of education and learning. It generates knowledge that is disseminated through educational institutions, enabling students to gain a deeper understanding of subjects and fostering critical thinking skills.

Environmental sustainability: Research is instrumental in understanding environmental issues, climate change, and sustainable development. It contributes to the development of sustainable practices, renewable energy sources, and conservation strategies to mitigate the impact of human activities on the environment.

Social impact and equity: Research helps address social inequalities and challenges by examining social structures, discrimination, and marginalization. It provides evidence to support policies and interventions aimed at promoting social justice, equality, and inclusivity.

International cooperation and collaboration: Research promotes international cooperation and collaboration among researchers, institutions, and countries. It encourages the exchange of knowledge, expertise, and resources, leading to global progress and collective problem-solving.

Research is a dynamic and iterative process that drives progress and innovation across various domains. It serves as a catalyst for positive change, contributing to the betterment of individuals, communities, and society as a whole.

In summary, research is crucial for expanding knowledge, solving problems, fostering innovation, driving societal development, and making informed decisions. It is a fundamental process that contributes to the progress of individuals, organizations, and society as a whole.

AIM OF RESEARCH

The aim of research is to systematically investigate, explore, and analyze a specific subject or problem in order to generate new knowledge, deepen understanding, and find solutions. The primary objectives of research can vary depending on the field, context, and specific research questions, but some common aims include:

Exploration and discovery: Research aims to explore new ideas, phenomena, or areas of study. It seeks to uncover new knowledge, theories, and concepts, expanding the boundaries of existing knowledge and filling gaps in understanding.

Description and characterization: Research aims to describe and characterize the features, characteristics, or behaviors of a particular subject or phenomenon. This involves collecting and analyzing data to provide an accurate and detailed account of the subject under investigation.

Explanation and understanding: Research aims to explain the underlying mechanisms, processes, or relationships between variables. It seeks to understand the reasons, causes, or factors that contribute to a particular phenomenon or outcome.

Prediction and forecasting: Research aims to develop models, theories, or frameworks that can predict future events or trends. It involves analyzing historical data, identifying patterns, and using them to make informed predictions or projections.

Problem-solving and decision-making: Research aims to find solutions to specific problems or challenges. It investigates potential strategies, interventions, or approaches to address the problem and provides evidence-based recommendations for decision-making.

Evaluation and assessment: Research aims to evaluate the effectiveness, impact, or outcomes of policies, interventions, programs, or processes. It assesses whether they achieve their intended objectives and identifies areas for improvement.

Innovation and development: Research aims to foster innovation, creativity, and development in various fields. It seeks to generate new ideas, technologies, products, or services that can improve existing systems, processes, or practices.

Validation and verification: Research aims to validate or verify existing theories, hypotheses, or claims. It involves conducting experiments, gathering empirical evidence, and analyzing data to confirm or refute previous findings or assumptions.

Contribution to knowledge: Research aims to contribute to the existing body of knowledge in a specific field. It seeks to publish research findings, share insights, and engage in scholarly discussions to advance knowledge and promote intellectual growth.

It is important to note that the aims of research can be interconnected and may evolve throughout the research process. Researchers often have multiple aims and objectives that guide their investigations, and these aims provide a framework for the research design, methodology, and analysis.

OBJECTIVES OF RESEARCH

The objectives of research refer to the specific goals or outcomes that researchers aim to achieve through their study. These objectives provide a clear direction and purpose for the research project. While the specific objectives may vary depending on the nature of the research, here are some common objectives of research:

To explore or describe a phenomenon: The objective may be to gain a comprehensive understanding of a particular phenomenon, such as a social issue, natural process, or human behavior. The aim is to provide a detailed description or exploration of the subject under investigation.

To test a hypothesis: Research often involves formulating a hypothesis, which is a tentative explanation or prediction about a relationship between variables. The objective is to test the hypothesis through empirical investigation and analyze the data to either confirm or reject it.

To determine the causes or factors influencing a phenomenon: The objective may involve identifying the factors, variables, or conditions that contribute to a specific outcome or phenomenon. The aim is to investigate the causal relationships between variables and determine their impact.

To develop or evaluate a theory or model: Research objectives may involve the development or evaluation of theories, models, or frameworks in a particular field. The objective is to contribute to the theoretical understanding and provide a basis for further research or practical applications.

To assess the effectiveness or impact of an intervention or program: Research objectives may focus on evaluating the outcomes or effects of an intervention, policy, or program. The aim is to determine its effectiveness, identify strengths and weaknesses, and provide evidence for decision-making and improvement.

To generate new knowledge or insights: The objective may be to generate new knowledge, ideas, or perspectives in a specific field. The aim is to contribute to the existing body of knowledge, fill gaps in understanding, or propose alternative explanations.

To provide recommendations or solutions: Research objectives may involve providing practical recommendations or solutions to address a particular problem or challenge. The aim is to offer evidence-based suggestions for decision-making, policy development, or implementation.

To compare or analyze different phenomena or groups: Research objectives may include comparing different phenomena, groups, or variables to identify similarities, differences, or patterns. The aim is to gain insights into the comparative aspects and draw meaningful conclusions.

To contribute to academic or professional development: Research objectives may involve contributing to academic disciplines, professional fields, or specific industries. The aim is to advance knowledge, provide guidance for practice, or contribute to professional development.

These objectives help researchers establish a clear focus, guide the research process, and determine the appropriate research methods and data analysis techniques. They serve as a roadmap to achieve specific outcomes and contribute to the broader goals of the research endeavor.

PRINCIPLES OF RESEARCH

The principles of research are the fundamental guidelines and concepts that govern the process of conducting research studies in various fields. These principles are designed to ensure the integrity, validity, and reliability of research findings. While there may be some variations depending on the specific discipline or methodology, the following principles are generally considered essential in conducting rigorous and ethical research:

Ethical considerations: Research must be conducted with integrity and in accordance with ethical standards. This includes obtaining informed consent from participants, protecting their privacy and confidentiality, minimizing potential harm or risks, and ensuring the welfare of participants.

Objectivity: Research should be unbiased and free from personal or subjective influences. Researchers strive to maintain objectivity throughout the entire research process, from defining research questions to data collection, analysis, and interpretation of results.

Accuracy/Consistency: Research should be conducted using rigorous and systematic methods to ensure the reliability and validity of findings. This involves employing appropriate research designs, data collection techniques, and statistical analysis methods. Rigorous research minimizes bias and enhances the credibility of the results.

Validity: Validity refers to the extent to which a research study measures what it intends to measure. Researchers need to ensure that their research instruments, data collection procedures, and analysis methods accurately capture the phenomenon under investigation. Various types of validity, such as internal validity, external validity, and construct validity, are considered in different research contexts.

Reliability: Reliability refers to the consistency and repeatability of research findings. A study is considered reliable if it produces consistent results when repeated under similar conditions. Researchers use appropriate measures and statistical techniques to enhance the reliability of their research.

Generalizability: Generalizability is the ability to apply research findings to a broader population or context beyond the specific study sample. Researchers should carefully consider the characteristics of their study participants and evaluate the extent to which their findings can be generalized to other populations or settings.

Transparency: Research should be transparent, with clearly documented procedures and methods. This includes providing detailed information about the research design, data collection and analysis techniques, and limitations of the study. Transparent research practices enable other researchers to assess and replicate the study, contributing to the cumulative knowledge in the field.

Peer review: Peer review plays a crucial role in the research process. Research findings are subjected to evaluation by independent experts in the field before publication. Peer review helps identify any flaws, biases, or limitations in the research study and ensures the quality and credibility of the research.

Continuous learning and improvement: Research is an iterative process that builds on previous knowledge and findings. Researchers should remain open to new evidence, critique, and feedback. They should continuously update their knowledge, refine their methodologies, and strive for improvement in their research practices.

Intellectual honesty: Researchers have a responsibility to present their findings truthfully and accurately. Intellectual honesty includes acknowledging any conflicts of interest, reporting both positive and negative results, and avoiding selective reporting or data manipulation.

These principles collectively guide researchers in designing, conducting, and reporting their studies in a robust, ethical, and credible manner. Adhering to these principles helps ensure the quality and impact of research in advancing knowledge and addressing real-world problems.

PROBLEMS OF RESEARCH

Research, while essential for advancing knowledge and addressing various issues, can encounter several challenges or problems that researchers often face. Some common problems in research include:

Limited resources: Conducting research requires adequate resources such as funding, access to data or participants, equipment, and research facilities. Limited resources can pose challenges in terms of the scope, scale, or quality of research studies.

Time constraints: Research often involves complex processes, including literature review, data collection, analysis, and report writing. Time constraints can arise due to project deadlines, limited research periods, or competing priorities, making it challenging to conduct thorough and comprehensive research.

Sample selection and representativeness: Selecting an appropriate sample that is representative of the target population is crucial for generalizing research findings. However, issues such as sample size limitations, non-response bias, or difficulty in accessing certain populations can affect the representativeness of the sample and limit the generalizability of the results.

Ethical considerations and participant recruitment: Respecting ethical principles, such as informed consent, privacy, and confidentiality, can present challenges in participant recruitment. Researchers must ensure that they follow ethical guidelines and regulations while recruiting participants, which can be time-consuming and sometimes lead to a smaller or less diverse sample.

Measurement and validity: Choosing and implementing appropriate measures and instruments to capture the phenomenon under study can be challenging. Researchers must carefully consider

the validity and reliability of their measurement tools to ensure that they accurately assess the variables of interest.

Data quality and reliability: Research heavily relies on data collection and analysis. Challenges can arise in terms of data quality, accuracy, completeness, and reliability. Issues such as measurement errors, data entry mistakes, or missing data can compromise the integrity and validity of research findings.

Statistical analysis and interpretation: Conducting appropriate statistical analysis and interpreting the results correctly require expertise in statistical methods. Researchers may face challenges in choosing the appropriate statistical tests, handling complex data sets, and avoiding biases or misinterpretations during analysis.

Publication bias and dissemination: Researchers often face challenges in publishing their findings, especially if the results are not statistically significant or do not align with the expected or desired outcomes. Publication bias can lead to an imbalance in the available research literature, favoring studies with positive or significant results and potentially distorting the overall understanding of a research topic.

Lack of replication and reproducibility: Replicating research studies is crucial for validating findings and ensuring the robustness of research. However, replication studies are often scarce or receive less attention compared to initial studies, leading to concerns about the reproducibility and generalizability of research findings.

Interdisciplinary collaboration and communication: Research problems often require interdisciplinary collaboration and communication. Challenges can arise in effectively bridging different disciplines, understanding diverse perspectives, and integrating findings from multiple fields.

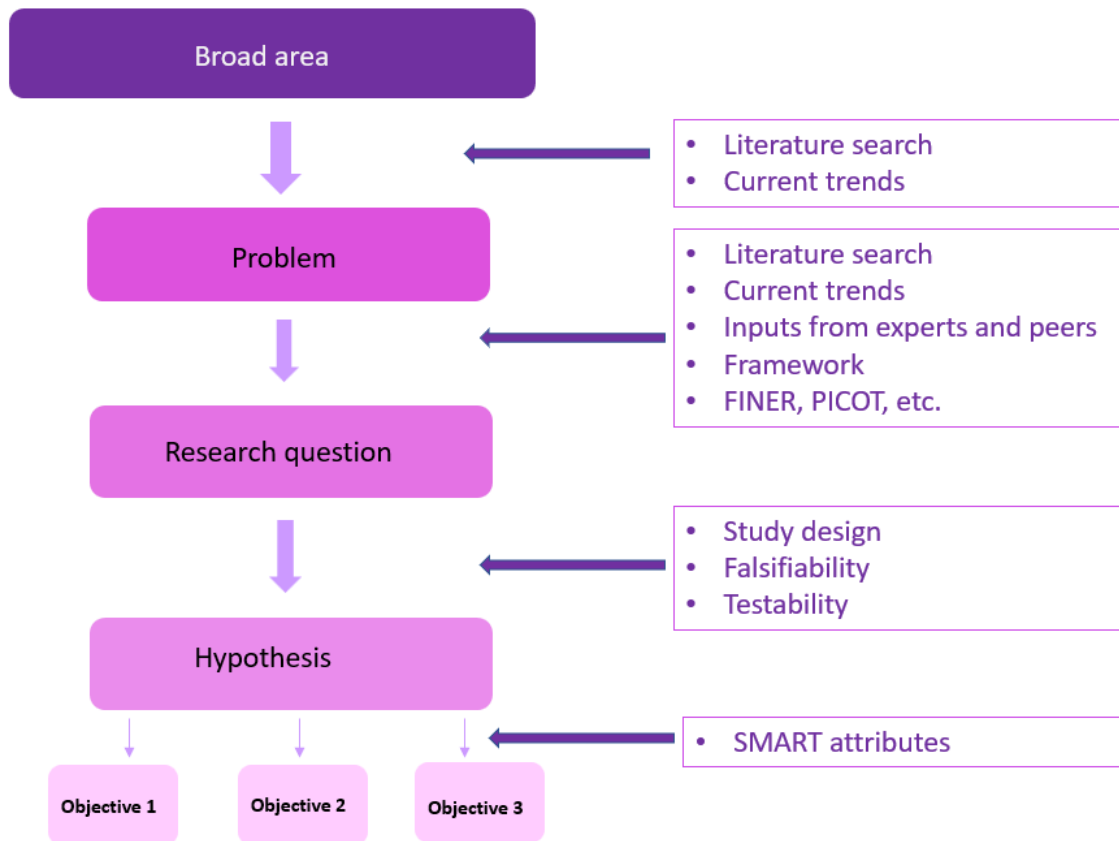
Researchers need to be aware of these problems and develop strategies to mitigate them. Adhering to rigorous research methodologies, seeking collaboration and feedback, maintaining transparency, and promoting open science practices can help address many of these challenges and improve the quality and impact of research.

SELECTION OF RESEARCH PROBLEM

The selection of a research problem is a crucial step in the research process. It involves identifying a specific issue or topic that requires investigation and aligns with the researcher's interests, expertise, and the broader research context. Here are some key considerations and steps involved in the selection of a research problem:

Identify a broad area of interest: Start by identifying a broad area or field of interest that you are passionate about or have expertise in. Consider your academic background, professional experience, and personal interests to narrow down potential research areas.

Review existing literature: Conduct a thorough review of existing literature to identify gaps, controversies, or unanswered questions in your chosen field of interest. Look for areas where further research is needed or where existing studies have limitations.



Consult with experts and colleagues: Seek advice and input from experts, mentors, or colleagues in your field. They can provide valuable insights and suggestions for potential research problems based on their knowledge and experience.

Brainstorm and refine research ideas: Brainstorm research ideas based on the identified gaps or issues in the literature. Consider the feasibility, significance, and relevance of each idea. Refine and narrow down the list to select the most promising research problem.

Assess the research problem's significance and relevance: Evaluate the significance and relevance of the selected research problem. Consider its potential impact on the field, its alignment with current research priorities or societal needs, and its potential to contribute to theory, practice, or policy.

Clarify the research objectives and scope: Clearly define the research objectives and scope of the study. Determine the specific research questions or hypotheses that the study aims to address. Ensure that the research problem is well-defined and achievable within the available resources and timeframe.

Consider practical considerations: Take into account practical considerations such as access to data, availability of resources, ethical considerations, and feasibility of conducting the research. Assess whether you have the necessary skills, time, and support to undertake the research problem effectively.

Seek feedback and validation: Seek feedback from peers, mentors, or advisors on your chosen research problem. Their insights can help validate your selection and provide suggestions for improvement or refinement.

Remember that the research problem should be specific enough to be manageable within the scope of the study, yet broad enough to be significant and contribute to the existing body of knowledge. It is also important to choose a research problem that genuinely interests and motivates you, as it will require sustained effort and dedication throughout the research process.

SURVEY OF SCIENTIFIC LITERATURE

A survey of scientific literature, often referred to as a literature review, is a critical and systematic examination of published academic and scientific works related to a specific research topic or question. It involves gathering, analyzing, and synthesizing information from various sources, such as research articles, books, conference papers, and dissertations. Here are some key steps and considerations for conducting a survey of scientific literature:

Define your research topic or question: Clearly define the specific research topic or question that you want to explore. This will provide a focus for your literature review and help guide your search for relevant literature.

Identify relevant databases and sources: Determine the appropriate academic databases, libraries, and online platforms where you can access scientific literature in your field. Examples of popular databases include PubMed, IEEE Xplore, ScienceDirect, and Google Scholar.

Develop a search strategy: Create a well-defined search strategy to ensure comprehensive coverage of relevant literature. Identify relevant keywords, synonyms, and Boolean operators (such as "AND," "OR," and "NOT") to construct effective search queries.

Conduct the literature search: Perform a systematic search using your defined search strategy. Use the selected databases and sources to retrieve relevant publications. Keep track of your search terms, databases used, and the number of results obtained.

Screen and select articles: Evaluate the retrieved articles based on their relevance to your research topic. Review titles, abstracts, and keywords to determine whether the articles align with your objectives. Exclude articles that are not directly related or are not of sufficient quality.

Read and analyze selected articles: Read the selected articles thoroughly and critically evaluate their content. Take notes on key findings, methodologies, theories, and any gaps or controversies identified in the literature. Extract relevant data and organize it in a structured manner.

Synthesize and analyze the literature: Analyze the collected information to identify trends, patterns, and common themes in the literature. Look for consistencies or contradictions across different studies and evaluate the strength and limitations of the evidence presented.

Summarize and report the findings: Summarize the key findings, arguments, and perspectives from the literature review. Organize your review in a logical and coherent manner, highlighting the main points and contributions of each study.

Identify research gaps and directions: Identify gaps or areas of further investigation that emerge from the literature review. Determine the specific research questions that have not been adequately addressed or require additional research to advance the field.

Cite and reference appropriately: Ensure that you accurately cite and reference the sources used in your literature review. Use a consistent citation style, such as APA, MLA, or Chicago, to maintain proper academic integrity.

A thorough literature review is essential for gaining a comprehensive understanding of the existing knowledge, identifying gaps, and informing your own research. It helps situate your work within the broader context of the field and demonstrates your familiarity with the current state of research.

PRIMARY AND SECONDARY SOURCES

Primary and secondary sources are two distinct types of sources used in research and academia. They differ in terms of their proximity to the original event or information being studied. Here's an explanation of primary and secondary sources:

Primary Sources:

Primary sources are original, firsthand, or direct sources of information. They provide a direct account or evidence of an event, period, or topic.

Examples of primary sources include original research studies, interviews, diaries, letters, speeches, official documents, eyewitness accounts, photographs, artifacts, experimental data, and raw data.

Primary sources are created by individuals who directly experienced or witnessed the events or phenomena being studied.

These sources are typically used to analyze and interpret historical events, study original scientific findings, or gain insights into the perspectives and experiences of individuals.

Secondary Sources:

Secondary sources are created by authors who did not directly witness or participate in the events or phenomena they are discussing.

These sources provide an analysis, interpretation, or commentary on primary sources or other secondary sources.

Examples of secondary sources include review articles, textbooks, scholarly books, encyclopedias, documentaries, literature reviews, and research papers that summarize, analyze, or synthesize primary sources.

Secondary sources are based on the interpretation, analysis, and evaluation of primary sources or existing secondary sources.

They often provide a broader perspective, synthesis of information, and a critical evaluation of multiple primary sources to support a particular argument or claim.

It's important to note that the distinction between primary and secondary sources can vary depending on the discipline and research context. For example, in scientific research, primary

sources are often research articles reporting original findings, while in historical research, primary sources may include archival documents or artifacts.

When conducting research, it is generally recommended to consult both primary and secondary sources. Primary sources provide direct evidence and firsthand information, while secondary sources provide context, analysis, and interpretation. Using a combination of both types of sources can help ensure a comprehensive and well-informed understanding of the topic at hand.

CITATION INDEX OF SCIENTIFIC PAPERS

Citation indexes are databases that track and provide information about the citations that scientific papers receive. They are valuable tools for researchers to explore the impact and influence of scholarly work. One of the most well-known citation indexes is the Web of Science, which includes the Science Citation Index (SCI), Social Sciences Citation Index (SSCI), and Arts & Humanities Citation Index (AHCI). Another prominent citation index is Scopus.

Here are some key features and benefits of citation indexes:

Citation tracking: Citation indexes track and record the citations that scientific papers receive. They provide information on which papers have cited a particular paper and how many times it has been cited. This helps researchers understand the influence and impact of a specific publication within the scholarly community.

Citation metrics: Citation indexes calculate various citation metrics, such as the h-index, which measures both the productivity and impact of a researcher's work. These metrics can provide insights into a researcher's citation performance and help evaluate the significance and visibility of their contributions.

Discovering related research: Citation indexes allow researchers to trace the intellectual lineage of a research topic by identifying earlier publications that have influenced subsequent studies. Researchers can also explore papers that have cited a particular work to find related or follow-up research.

Identifying influential authors and journals: By analyzing citation data, citation indexes can identify the most highly cited authors and the most influential journals in a specific field. This information can help researchers identify key contributors and important publishing outlets within their area of study.

Evaluating research impact: Citation indexes provide a quantitative measure of research impact. By analyzing citation counts and metrics, researchers, institutions, and funding agencies can assess the significance and influence of research outputs. This information is often used for evaluation and decision-making purposes, such as tenure and promotion evaluations or grant application assessments.

Bibliographic information and indexing: Citation indexes provide comprehensive bibliographic information about scientific papers, including authors, titles, abstracts, keywords, affiliations, and journal details. They also index papers by subject categories, facilitating focused searches and literature reviews within specific disciplines.

It's important to note that while citation indexes are valuable resources, they may not include every scientific paper published. Additionally, citation counts should be interpreted with caution, as they can be influenced by factors such as the discipline, citation practices, and citation biases. Therefore, it is advisable to use citation indexes in conjunction with other research tools and qualitative assessments to gain a comprehensive understanding of the scholarly landscape.

CITATION INDEX OF SCIENTIFIC JOURNALS

Citation indexes for scientific journals are databases that track and provide information about the citations that scientific articles published in those journals receive. These indexes allow researchers to assess the impact, influence, and visibility of specific journals within the academic community. Two prominent citation indexes for scientific journals are the Web of Science and Scopus.

Web of Science: The Web of Science, developed by Clarivate Analytics, includes the Science Citation Index Expanded (SCIE). It indexes and tracks citations from thousands of scholarly journals across various disciplines. The SCIE covers journals in the sciences, including natural sciences, life sciences, physical sciences, and applied sciences. It provides comprehensive coverage of cited references and allows researchers to search for articles based on citation information.

Scopus: Scopus, developed by Elsevier, is a large abstract and citation database that covers a wide range of scientific disciplines. It includes journals from the natural sciences, social sciences, health sciences, and engineering fields. Scopus indexes and tracks citations from thousands of scholarly journals and provides tools for analyzing citation data and identifying influential journals in different subject areas.

Types of indexing in journals

- Google Scholar.
- Scopus.
- PubMed.
- Web of Science.
- DOAJ.

Benefits of using citation indexes for scientific journals:

Assessing journal impact: Citation indexes allow researchers to evaluate the impact and influence of scientific journals by tracking the number of citations their articles receive. This information can be used to identify high-impact journals in specific fields.

Comparing journals: Citation indexes enable researchers to compare the citation performance of different journals within a specific subject area or discipline. This comparison can help researchers make informed decisions about where to publish their work and can assist institutions in evaluating the quality of journals for academic purposes.

Identifying influential articles: By analyzing citation data, researchers can identify highly cited articles within a particular journal. These influential articles often represent significant contributions to the field and can serve as references for further research.

Discovering related research: Citation indexes allow researchers to trace the citation network of a specific article or journal, helping them identify related or follow-up research. This feature aids in literature reviews, staying up-to-date with the latest developments, and identifying key contributors in a field.

Bibliographic information and indexing: Citation indexes provide comprehensive bibliographic information about articles, including authors, titles, abstracts, keywords, affiliations, and journal details. Researchers can use this information to find relevant articles, construct effective search queries, and navigate the scholarly literature.

It is important to note that different citation indexes may have variations in coverage, indexing practices, and citation metrics. Researchers should consider using multiple citation indexes and complement their analysis with other research tools and qualitative assessments to obtain a more comprehensive understanding of journal impact and influence.

JOURNALS

An academic journal is also known as a scholarly journal. It is a periodical publication that includes various original research work and reviews of the previous subjects. They are normally specialized based on discipline, with authors preference which one they send their manuscripts.

There are thousands of scientific journals in publication, most journals are highly specialized, although some of the oldest journals such as Science and Nature publish articles and scientific papers across a wide range of scientific fields. Scientific journals contain articles that have been peer reviewed, in an attempt to ensure that articles meet the journal's standards of quality and scientific validity.

Articles in scientific journals are mostly written by active scientists such as students, researchers, and professors instead of professional journalists.

The Standard International Journals publishes unique and innovative articles of professional interest that emphasizes research, development and application on all fields of research from Science, Engineering and Management.

SCOPUS INDEXED JOURNALS

Scopus is Elsevier's abstract and citation database launched in 2004. Scopus covers nearly 36,377 titles (22,794 active) from approximately 11,678 publishers, of which 34,346 are peer-reviewed journals in top-level subject fields: life sciences, social sciences, physical sciences and health sciences. It covers three types of sources: book series, journals, and trade journals. All journals covered in the Scopus database are reviewed for sufficiently high quality each year according to four types of numerical quality measure for each title; those are h-Index, CiteScore, SJR (SCImago Journal Rank) and SNIP (source normalized impact per paper).

Sources

Subject area Enter subject area

Improved Citescore
We have updated the CiteScore methodology to ensure a more robust, stable and comprehensive metric which provides an indication of research impact, earlier. The updated methodology will be applied to the calculation of CiteScore, as well as retroactively for all previous CiteScore years (ie. 2018, 2017, 2016...). The previous CiteScore values have been removed and are no longer available.
[View CiteScore methodology.](#)

Filter refine list

Display options

☐ Display only Open Access journals

Counts for 4-year timeframe

☒ No minimum selected

☐ Minimum citations

☐ Minimum documents

Citescore highest quartile

☐ Show only titles in top 10 percent

44,034 results

[Download Scopus Source List](#) [Learn more about Scopus Source List](#)

All Export to Excel Save to source list		View metrics for year: 2021 2021				
Source title ↓	CiteScore ↓	Highest percentile ↓	Citations 2018-21 ↓	Documents 2018-21 ↓	% Cited ↓	
☐ 1 Ca-A Cancer Journal for Clinicians	716.2	99% 1/360 Oncology	76,632	107	91	
☐ 2 Nature Reviews Molecular Cell Biology	140.9	99% 1/386 Molecular Biology	28,743	204	90	
☐ 3 The Lancet	115.3	99%	198,711	1,723	76	

IMPACT FACTOR

Impact factor is commonly used to evaluate the relative importance of a journal within its field and to measure the frequency with which the “average article” in a journal has been cited in a particular time period. Journal which publishes more review articles will get highest IFs.

The impact factor or journal impact factor of an academic journal is a scientometric index calculated by Clarivate that reflects the yearly mean number of citations of articles published in the last two years in a given journal, as indexed by Clarivate's Web of Science. As a journal-level metric, it is frequently used as a proxy for the relative importance of a journal within its field; journals with higher impact factor values are given the status of being more important, or carry more prestige in their respective fields, than those with lower values. While frequently used by universities and funding bodies to decide on promotion and research proposals, it has come under attack for distorting good scientific practices.

$$\text{Impact factor in 2018} = \frac{\text{Cited count in 2018 of papers published in 2017} + \text{Cited count in 2018 of papers published in 2016}}{\text{Number of papers published in 2017} + \text{Number of papers published in 2016}}$$

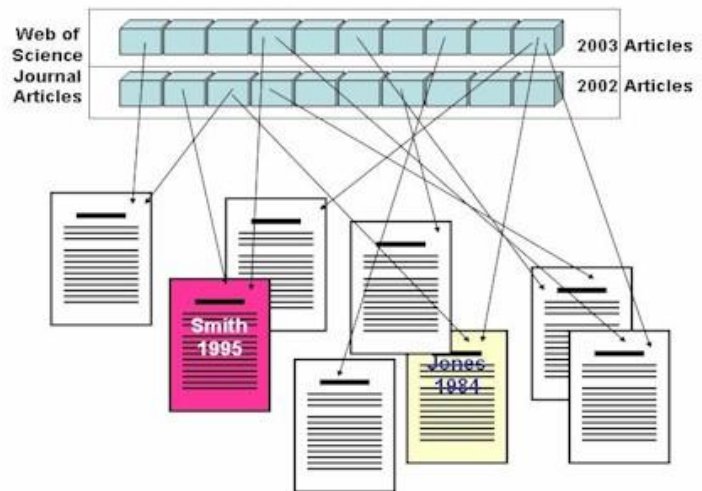
Journal Impact Factor

Cites in 2016 to items published in: 2015 = 5598 Number of items published in: 2015 = 26
2014 = 3754 2014 = 24
Sum: 9352 Sum: 50

Calculation = $\frac{\text{Cites to recent items}}{\text{Number of recent items}} = \frac{9352}{50} = 187.04$

CITATION INDEX

Citation indexing makes links between books and articles that were written in the past and articles that make reference to ("cite") these older publications. In other words, it is a technique that allows us to trace the use of an idea (an earlier document) forward to others who have used ("cited") it. The evidence that we take as indicating this "relationship" between earlier research and subsequent research are the references or footnotes or endnotes (citations) in the more recent work. A citation index is a kind of bibliographic index, an index of citations between publications, allowing the user to easily establish which later documents cite which earlier documents.



H-INDEX

The h-index is an author-level metric that measures both the productivity and citation impact of the publications, initially used for an individual scientist or scholar. Basically, the H-index score is a standard scholarly metric in which the number of published papers, and the number of times their author is cited, is put into relation. The formula is based on the number of papers (H) that have been cited, and how often, compared to those that have not been cited (or cited as much).

In this case, the researcher scored an H-index of 6, since he has 6 publications that have been cited at least 6 times. The remaining articles, or those that have not yet reached 6 citations, are left aside.

Journals also have their own H-Index scores. Publishing in a high H-index journal maximizes your chances of being cited by other authors and, consequently, may improve your own personal H-index score

h-index	
Paper	Number of Citations
1	100
2	78
3	62
4	43
5	32
6	18
7	3
8	2
9	1
10	1
h-index = 6	

the most commonly used databases that help authors find their H-index values:

- 1.Elsevier's Scopus: Includes Citation Tracker, a feature that shows how often an author has been cited. To this day, it is the largest abstract and citation database of peer-reviewed literature.
- 2.Clarivate Analytics Web of Science: a digital platform that provides the H-index with its Citation Reports feature
- 3.Google Scholar: a growing database that calculates H-index scores for those who have a profile.

PATENTS

Patents are legal rights granted to inventors by a government authority, typically a patent office, to protect their inventions from being used, manufactured, or sold by others without their permission. Patents provide inventors with exclusive rights for a specified period, usually 20 years from the filing date, in exchange for disclosing their invention to the public. Here are some key aspects and benefits of patents:

Protection of intellectual property: Patents protect the intellectual property rights of inventors, preventing others from using, copying, or profiting from their inventions without permission. This protection encourages innovation by providing inventors with a legal framework to safeguard and commercialize their creations.

Exclusive rights: Patents grant inventors exclusive rights to their inventions, allowing them to control how the invention is used, manufactured, sold, or licensed. This exclusivity provides inventors with a competitive advantage in the market, as they have the sole authority to exploit and profit from their invention.

Incentive for innovation: Patents serve as an incentive for innovation by rewarding inventors for their creativity and technological advancements. The exclusive rights provided by patents encourage inventors to invest time, resources, and effort into research and development, knowing that they will have protection and potential commercial benefits for their inventions.

Disclosure of information: Patents require inventors to disclose detailed information about their inventions in the patent application. This disclosure contributes to the public knowledge and facilitates further research and development in the field. Patents help disseminate technical information, allowing others to build upon existing knowledge and make advancements based on the disclosed inventions.

Technology transfer and licensing: Patents facilitate technology transfer and licensing agreements, enabling inventors to share their inventions with others for commercialization. Inventors can license their patents to other companies or individuals, allowing them to bring the invention to market and generate revenue through royalties or licensing fees.

Market advantage and commercialization: Patents provide inventors with a competitive edge in the marketplace. They can use their exclusive rights to differentiate their products or services, establish market dominance, attract investment, negotiate partnerships, and secure market share. Patents can enhance the commercial value of an invention, making it an attractive asset for investors, companies, or potential buyers.

Legal protection and enforcement: Patents offer legal protection to inventors, enabling them to enforce their rights and take legal action against infringement. If someone uses or copies the

patented invention without authorization, the patent holder can pursue legal remedies, including injunctions, damages, and licensing negotiations.

Recognition and credibility: Obtaining a patent is often seen as a mark of technical expertise, innovation, and credibility. It demonstrates that the invention meets specific criteria of novelty, inventiveness, and industrial applicability. Patents can enhance the reputation and visibility of inventors and their organizations, attracting attention from potential partners, investors, or customers.

It's important to note that patent laws and regulations vary between countries, and inventors should consult with a patent attorney or specialist to navigate the patent application process and understand the specific requirements and procedures in their jurisdiction.

PATENTING – PROCESSING

A patent is an exclusive right granted for an invention, which is a product or a process that provides, in general, a new way of doing something, or offers a new technical solution to a problem. To get a patent, technical information about the invention must be disclosed to the public in a patent application

Patent applications must satisfy the following three criteria:

Novelty

This means that your invention must not have been made public – not even by yourself – before the date of the application.

Inventive step

This means that your product or process must be an inventive solution. It cannot be a solution that would be obvious to a manufacturer. Take the example of a different attachment method. Instead of welding the tubes of a swing together, they might be screwed together. This may well be a new method of making swings. But for someone involved in making them, it is too obvious a solution to be called an inventive step.

Industrial applicability

This criterion implies that it must be possible to actually manufacture the new invention. In other words, you can apply for a patent on a new kind of playing card that is easier to hold than existing cards. But you can't obtain a patent for an idea for a new card game.

Understanding Patents

Most patents are valid for 20 years in the U.S. from the date the application was filed with the USPTO, although there are circumstances where exceptions are made to extend a patent's term. U.S. patents are only valid in the United States and U.S. Territories. If seeking protection outside of the United States, it is important to research the intellectual property rights of other nations and apply for protection with their governing authorities.

TYPES OF PATENTS

There are three types of patents available in the United States: utility patents, design patents, and plant patents. Each has its own specifications and durations.

Utility Patents

Utility patents, or patents for invention, issue legal protection to people who invent a new and useful process, an article of manufacture, a machine, or a composition of matter. Utility patents are the most common type of patent, with more than 90% of patents issued by the U.S. government belonging to this category.

A utility patent lasts for 20 years from the date of filing as long as maintenance fees are paid. Maintenance fees are surcharges applied to utility patent applications filed after December 12, 1980.

Design Patents

Design patents are patents issued for original, new, and ornamental designs for manufactured products. Design patents protect the design or look of something. They require the invention to which the design belongs to be original and useful. Design patents last for 15 years for applications filed after May 13, 2015. For applications filed before May 13, 2015, patents last for 14 years from the date of the filing. Maintenance fees do not apply to design patents.

Plant Patents

Plant patents go to anyone who produces, discovers, and invents a new kind of plant capable of reproduction. These patents are granted for 20 years from the date of filing and no maintenance fees apply.

Patents provide an incentive for companies or individuals to continue developing innovative products or services without the fear of infringement. For example, large pharmaceutical companies can spend billions of dollars on research and development. Without patents, their drugs and medicines could be duplicated and sold by companies that didn't research or invest the needed capital for R&D.

In other words, patents protect the intellectual property of companies to help their profitability. However, patents also serve as bragging rights for companies demonstrating their innovativeness.

PROCESS OF PATENTING

You can choose to apply for a patent all by yourself or take help from registered agents. When it comes to the cost of getting a patent, the following two elements come into the picture:

Government fees for forms and renewals, If you choose to have an agent, then the charges for the professional, It is always recommended to get a patent through a registered agent. Here are the steps required to apply for a patent:

Step 01: Invention disclosure

The first step is to disclose your invention to the professional. This is done by signing a non-disclosure agreement.

Pro-tip: It is recommended to submit each known fact about your invention. Do not hold anything back.

Step 02: Patentability search

Usually, a professional charges a fee (approx INR 10,000 to INR 20,000) at this step. At this stage, your professional performs extensive research for prior evidence in all the possible databases. Further, he or she builds a patentability search report based on your invention.

Step 03: Decision to file an application for patent

This is where the actual process begins. After detailed research about (any) existing history of your invention, you can decide if you want to go ahead with the patent application filing.

Please note: Your invention must have an ‘inventive step’ as compared with existing prior art pieces to qualify for a patent. It must have either ‘technical advanced’ or ‘economically significant’ or both, over any existing piece of arts.

The step where you decide to go ahead with the filing process by writing an application is called patent drafting.

Step 04: Patent drafting

You can choose to draft the application on your own or take a professional’s help to do this. If you choose to take help, you might have to pay somewhere around INR 20,000 to INR 30,000.

Please note: This is one of the most crucial steps of the entire process. It requires both technical and legal understanding. If not drafted the right way, all the efforts you put in gets wasted.

Hence it’s a good idea to take professional help here.

Step 05: Filing the patent application

After you are done with a review of your patent draft and are satisfied with the scope and details, you are ready to file for a patent.

You can file the patent application in a prescribed manner with appropriate forms with fees. You need to pay fees of INR 1,600 or 4,000 or 8,000 (based on the type of application) while submitting the patent application in the patent office. If you do not file a request for early publication, the patent application will be published on expiry of 18 months.

Step 06: Request for examination

This is the step where the applicant is required to request the Indian patent office to examine your patent application, within 48 hours. Request for examination fees ranges from INR 4,000 to INR 20,000 (based on the type of applicant).

Step 07: Responding to objections (if any)

The draft and the report submitted to the officers in the patent office are thoroughly examined at this step. At this step, there is a chance for the inventor to communicate his novelty or inventive step over any other piece of art found during the assessment. If all the things are well clarified and solved, the patent application is almost ready to come to action.

Step 08: Grant of patent

If the application meets all the prescribed requirements, it is placed in order for the grant. Usually, the final grant of the application is notified through a journal that is published

Step 09: Renewal of your patent

Usually, a patent is in force for 20 years. On completion of 20 years, the owner is required to renew the patent by paying a small fee.

Advantages of getting a patent for your business

- Prevents theft of your invention
- The freedom of exclusivity
- Easy to build a merchandise and commercialize
- Higher market share since your idea becomes a brand
- More monetary value and higher profit margins
- Although the entire process of filing a patent is long and complex, one must remember the importance it has. With digital advancements, it is probable that the process might get simplified and easy.

Having a patent in place ensures that no individual can claim rights over your invention. If at all there happens to be an infringement, you can take help from legal bodies and avoid the problems that can prove to be a hurdle in your growth.

Here are eight famous patent inventions without which our lives would be incomplete.

The Lightbulb. The electric lightbulb is perhaps one of the most famous patented inventions known to humankind. ...

The Internal Combustion Engine. ...

The Telephone. ...

The Computer. ...

Bluetooth. ...

The Maglev. ...

The FireEye Malware System. ...

The Google PageRank.

Importance of filing patents for fundamental research

Recently, Ministries of Education, and Science and Technology, and the National Intellectual Property Administration jointly issued Several Opinions on Enhancing the Quality of Patents Filed by Universities and Promoting Technology Transfer and Application, and Several Opinions on Regulating the Use of SCI (a Science Citation Index) Papers-Related Indicators at Universities and Establishing Sound Assessment Orientation.

A patent is intended to gain economic benefits, and fundamental research is a source of great innovation. The 60 most influential patented technologies in the world today, including the

internet, AI, 3D printing, quantum computers, mobile communications, and human genome mapping all result from strengthening fundamental research and transforming its findings into great innovations. It can be seen that fundamental research, as the basis for significant technological innovation, may result in high-quality patents with the evolution of its findings.

Patent basics

<https://www.uspto.gov/patents/basics>



Edited by

Dr. V. Magendira Mani
Assistant professor of Biochemistry

MKJC
Vaniyambadi – 635751