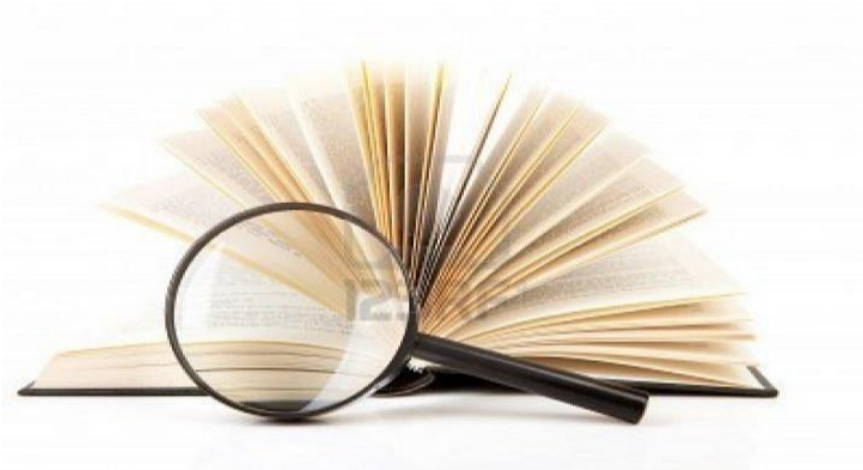


MODULE-2

Literature Review and Technical Reading



Literature Review

Describe the importance of performing a thorough literature review in engineering research, while also illustrating how a proficiently executed literature review aids in show casting originality in research. -- C02, L2, 10 marks

Answer key:

- Understanding the purpose of Literature Review and its research Role.
- Navigating sources of existing knowledge.
- Effective strategies for conducting a comprehensive literature review.
- analysing and synthesizing prior research: research process evaluating information sources for research validity.

Understanding the purpose of Literature Review and its Research Role.

A **literature review** is a systematic study of existing research, books, articles, and other sources related to your topic.

Why it is important:

- **Builds Background Knowledge** – helps you understand what has already been studied.
- **Identifies Research Gaps** – shows what has not been answered yet.
- **Avoids Duplication** – prevents repeating the same work already done.
- **Supports Your Research** – provides evidence and credibility.
- **Refines Problem Statement** – helps you define your research question better.
- **Framework Building** – creates a foundation for your methodology and analysis.

Example: If you are researching **wireless power transfer**, a literature review helps you learn what methods are already used, their limitations, and where you can contribute something new.





- **Significance of Technical Reading**

Technical reading means carefully reading and understanding subject-related or research-based texts such as journal papers, datasheets, standards, patents, or technical reports.

Why it is important:

- **Improves Subject Knowledge** – strengthens understanding of core concepts.
- **Develops Critical Thinking** – helps you analyze and compare different approaches.
- **Enhances Research & Innovation** – inspires new ideas based on existing work.
- **Improves Communication** – helps in writing precise reports, papers, and proposals.
- **Professional Growth** – keeps you updated with the latest trends and technologies.

Example: An engineer reading a **technical paper on solar cell efficiency** learns the experimental methods, results, and limitations—which can inspire improvements.

New and Existing Knowledge

- **Foundation of Existing Knowledge** : means the **established facts, theories, principles, and research findings** that are already available in a particular field. It acts like the **base or starting point** for any new learning, research, or innovation.
- **Constructing the foundation** means **building a strong base of knowledge, skills, and understanding** on which advanced ideas and innovations can be developed.
- **Sources of existing knowledge**
 - Textbooks: it serves as a starting point for understanding basics.
 - Research Papers: goal of a research paper is to present a small piece of new knowledge.
- **Literature Review Process**

It explains how a research item builds on existing work, providing a clear and detailed explanation or clarification of the technical development.

- **Steps for literature survey:**

- Identification: identify major topics, subtopics or concepts relevant to the research subject under consideration.
- Categorization: organize the topics by placing citations of relevant sources in the correct category of concepts.

- **Effective reading and note taking**
- **Continuous learning and writing**

Analysis vs. Synthesis of Prior Art

Aspect	Analysis of Prior Art	Synthesis of Prior Art
Meaning	Breaking down existing knowledge into parts to understand details.	Combining insights from different sources into a unified understanding.
Focus	Examines <i>what each prior work did</i> (methods, results, limitations).	Shows <i>how different works connect</i> and what overall trends/gaps exist.
Approach	Critical evaluation of individual papers, patents, reports, or products.	Integration of multiple studies to build a bigger picture.
Goal	To understand and compare contributions of prior research.	To identify patterns, highlight gaps, and justify new research.
Outcome	List of strengths, weaknesses, and limitations of existing works.	A framework or narrative that explains the current state of knowledge and where your research fits.
Example (Wireless EV Charging)	Analyze one paper for efficiency, another for cost, another for safety.	Combine findings to conclude: "Most systems improve efficiency but neglect safety → research gap."

To effectively analyze the pertinent information , researchers should engage in the following steps:

- i) **Understanding the Hypothesis:** Clearly understand the main hypothesis or research question addressed in each article.
- ii) **Understanding Models and Experimental Conditions:** Gain insight into the models and experimental setups used in each study.
- iii) **Making Connections:** Highlight similarities and differences among the articles.
- iv) **Comparing and Contrasting:** Highlight similarities and differences among the articles.
- v) **Finding strong points and loopholes:** evaluate the strengths and weaknesses of each article , acknowledging areas of robust evidence and potential limitations.

Critical Analysis:

- Being suspicious of claims: Approach the information with a critical mindset , especially when encountering bold claims.
- Avoiding blind acceptance: resist accepting information at face value , critically analyze and question the data.

Literature Survey Goal:

- (i) Identifying Unsolved Issues:** Recognize gaps or unresolved issues in the existing literature.
- (ii) Determining Problems in Models or Designs:** Evaluate flaws or limitations in current models and experimental designs.
- (iii) Presenting Novel Ideas and Recommendations:** Aim to contribute something new by suggesting innovative ideas or proposing recommendations.

Critical Evaluation of Information: Here are a few criteria that could help the researcher in the evaluation of the information under study.

- Authority:** Assess the author's credentials and affiliation, as well as the publisher of the information.
- Accuracy:** Verify the credibility of the information based on existing knowledge and presence of citations to support claims.
- Scope:** Determine if the source is at an appropriate comprehension or research level.

Additional Criteria:

Currency: Ensure the information is up-to-date.

Objectivity: Assess the neutrality and impartiality of the information.

Purpose: understand the goal or intention behind the information.

Avoiding Extremes: it is important to ensure that the search question is neither too narrow nor too broad, striking a balance for effective exploration.

Describe the significance of bibliographic databases like web of science and their role in aiding researchers to access scholarly articles efficiently, while highlighting the limitations of search engines like Google scholar in the academic context. – CO2, L3, 10 marks

Answer key

- Bibliographic Databases
- Web of Science
- Google and Google Scholar
- Navigating Scholarly Publications
- Effective information retrieval: tools, strategies and ongoing learning.

Bibliographic Databases

“Bibliographic databases” refer to “abstracting and indexing services” useful for collecting citation-related information and possibly abstracts of research articles from scholarly literature and making them available through search.

Indexing service

Indexing = creating a **systematic list** of publications (authors, titles, journals, keywords, subjects, etc.).

Purpose: Makes it easy to **search and locate** references.

Example: Scopus indexes millions of articles by subject, year, author.

Abstracting service

Abstracting = providing a **summary (abstract)** of each publication.

Purpose: Lets researchers **quickly understand the content** of an article without reading the full text.

Example: PubMed provides abstracts of biomedical research papers.

So, a **bibliographic database** is essentially both:

Indexing → helps you find *where* the work is.

Abstracting → tells you *what* the work is about.

Feature	Web of Science (WoS)	Scopus	Google Scholar
Owner	Clarivate Analytics	Elsevier	Google
Coverage	Selective, ~21k journals	Broad, ~25k+ journals	Very broad (includes grey literature)
Start Year	1900–present	1960s–present	No limit
Quality Control	Very strict	Moderate–high	Low (includes predatory sources)
Citation Tracking	Excellent, reliable	Very good	Unreliable
Access	Paid (subscription)	Paid (subscription)	Free
Best For	Citation analysis, impact evaluation	Broad literature search + metrics	Quick searches, free access

Effective Search

- **Effective search** refers to the process of **finding accurate, relevant, and reliable information** for a research problem or study by using the right tools, strategies, and evaluation methods.
- It is not just typing random words in Google, but a **planned and systematic approach** to locate scholarly, peer-reviewed, and trustworthy sources that truly support research.
- Clear Understanding of Need
- Selection of right sources
- Use of Search Strategies
- Iterative Process
- Critical Reading After Search
- Summarizing & Comparing Findings
- Continuous Process

Effective search = Right information + Right place + Right strategy + Critical evaluation

Explain the essential steps and strategies involved in technical reading for researchers, emphasizing the importance of critically evaluating research papers, creating meaningful research objectives and effectively taking notes during the reading process. --- C02, L3, 10 marks

Key Answers:

- Introduction to Technical Reading
- Conceptualizing Research.
- Critical and Creative Reading
- Taking Notes while Reading
- Reading Mathematics and Algorithms.
- Reading a Datasheet.

TECHNICAL READING

Introduction to Technical Reading

Why Technical Reading is Needed

- Research knowledge is stored in journals, conference papers, books, and technical reports.
- This knowledge is **fragmented** – meaning it is scattered across many sources.
- A researcher will usually find that **only a small fraction** of the available papers are actually relevant to their work.
- Because of the huge number of papers available, it is impossible to read everything. Hence, one needs a **systematic method** of reading.

Difference from Normal Reading

- Reading a research paper is **not like reading a newspaper or magazine**.
- It requires more focus, rereading, and often several hours.
- Technical reading is **purpose-driven**: the aim is to extract useful knowledge, not just to read for entertainment

Step-by-Step Approach to Technical Reading

◆ Step 1: Skimming

Start by looking at the **title and keywords**.

If they do not match your research interest → **stop immediately** and move on.

This saves time.

◆ Step 2: Abstract

If the title seems relevant, read the **abstract**.

The abstract provides a short overview of the problem, method, and results.

Again, if it is not important for your field, stop here.

◆ Step 3: Conclusion and Visuals

If the abstract is interesting → skip directly to the **conclusion**.

Conclusions summarize what the authors achieved.

Next, look at the **figures, tables, and captions**. These are quick to understand and give a broad idea of the findings.

◆ Step 4: Introduction Section

If still relevant, read the **Introduction** carefully.

This tells you the **background, motivation, and objectives** of the work.

You will also see what is **new or different** in this paper compared to earlier work.

◆ Step 5: Results and Discussion

This is the **heart of the paper**.

Read carefully to understand the main findings, interpretations, and contributions.

◆ Step 6: Experimental Setup / Methodology

Read this only if you need to know **how the experiments or models were done**.

This is useful if you want to **replicate or extend** the work.

Otherwise, it can be skipped in the first reading.

Critical and Creative Reading

Aspect	Critical Reading 🔍	Creative Reading 💡
Main Aim	To evaluate and judge the validity, accuracy, and reliability of the research.	To explore possibilities , find new ideas, and identify extensions or applications.
Attitude	Skeptical, questioning, cautious.	Open, imaginative, constructive.
Key Questions	- Is the problem well-defined? - Are the assumptions reasonable? - Is the data correct and sufficient? - Are there flaws or missing links?	- Can the idea be generalized? - Are there new applications? - What improvements are possible? - What is the next research step?
Focus	Errors, weaknesses, limitations, logical flaws.	Strengths, opportunities, new directions, creative insights.
Outcome	Identification of what is wrong or weak in the paper.	Generation of what can be extended or applied beyond the paper.
Difficulty Level	Relatively easier – most reviewers can quickly spot problems.	Harder – requires insight, positive thinking, and imagination.
Approach to Data	Verify if the data is appropriate, correctly gathered, and properly interpreted.	Think about how the same data might reveal new insights or be applied elsewhere.
Usefulness for Researcher	Helps avoid being misled by flawed research.	Helps find research gaps, new projects, and innovative contributions.

Taking Notes while Reading

- Reading alone is not enough in research — you read in order to **write later** (a paper, report, or thesis).
- Memory fades quickly; even important insights can be forgotten. Notes act as a **bridge** between reading and writing.
- As the saying goes: *“The faintest writing is better than the best memory.”*

How to Take Notes While Reading

1. Highlight Key Information

- Definitions, formulas, explanations, and core concepts.
- Mark important diagrams, results, and conclusions.

2. Write Marginal Notes / Digital Annotations

- Use the paper margins or tools like Mendeley, Zotero, EndNote, or even PDF editors.
- Add small comments: “Check this assumption,” “Compare with [Author, Year],” “Possible limitation.”

3. Capture Questions & Criticisms

If something seems unclear, biased, or incomplete — note it down immediately.
Later, these become useful for literature reviews or when writing your own paper.

4. Summarize Each Paper in a Few Sentences

Write 3–4 lines about what the paper contributes.

Example: “Introduces a new machine learning algorithm for fingerprint matching, tested on XYZ dataset, but does not address real-time constraints.”

Comparative Perspective

When reviewing, don’t just summarize the paper alone. Compare it with others you’ve read:

Novelty: Are there new ideas, or is it just an extension of existing work?

Application: Is it applied in a new field or context?

Integration: Does it combine multiple existing ideas into a new framework?

Strengths & Weaknesses: Where does this paper stand compared to others?

Outcome of Good Note-Taking

Saves time when revisiting old papers.

Helps build structured arguments for your own writing.

Makes literature surveys **organized, critical, and insightful.**

Reading Mathematics and Algorithms

Importance of Reading Math & Algorithms

- Mathematics is **the backbone of engineering research** — proofs, derivations, and algorithms show *how* and *why* something works.
- These sections are not just details; they are often **the real contribution** of the paper.
- Skipping them may lead to **missing the core idea**.

How to Approach Mathematical Derivations

- **Identify Relevance First**
 - ✓ Don't dive into equations blindly. Check if the math is central to your research problem.
 - ✓ If yes → read carefully. If no (too advanced / not needed now) → skim and come back later.
- **Read Line by Line**
 - ✓ Follow each step in the derivation.
 - ✓ Write small notes explaining each transformation in your own words.
- **Connect to the Bigger Picture**
 - ✓ Ask: *"What does this proof/derivation achieve in the context of the paper?"*
 - ✓ Example: Proves convergence of an algorithm, shows stability of a system, etc.

How to Approach Algorithms

1. Understand the Logic, Not Just the Steps

1. See the algorithm as a *process* solving a problem.
2. Focus on **inputs, outputs, and assumptions**.

2. Skim or Skip if Needed

1. If it explains something already known or is too advanced for your current stage → you can skip and revisit later.

3. Implement to Verify

1. Even if the algorithm seems correct in the paper, implementation may reveal flaws or missing details.
2. Try coding it in C, C++, Python, or Java to confirm correctness.

Strategies for Better Understanding

Rewrite Equations: Copy them down and expand intermediate steps if skipped by authors.

Use Examples: Plug small numerical values to check if formulas hold.

Flowcharts & Pseudocode: Convert algorithms into visual or simplified representations before coding.

Cross-Check References: Sometimes, the paper skips steps assuming readers know prior work → trace back to original references if stuck.

Reading a Datasheet

A **datasheet** is a technical document that describes the features, specifications, and proper usage of an electronic component. For an electronics researcher, it is as essential as a “map” or “manual” that tells you how the part behaves, what it requires, and how to safely integrate it into a circuit.

Even researchers from other fields (e.g., mechanical, biomedical, or robotics) may need to use datasheets when incorporating sensors, microcontrollers, or other electronics into their projects.

1. Initial Skimming

Start with a **quick overview** to see whether the component fits your needs before reading in depth.

Look for:

- Part number and manufacturer**

- General description / highlights**

- Applications** (where it is commonly used)

- Key features** (voltage, power consumption, speed, accuracy, etc.)

This step helps you decide whether to keep reading or move to another component.

2. Absolute Maximum Ratings

- This section lists the **upper and lower limits** beyond which the part may be damaged.
- Example:
 - Supply voltage range: $3.3V \pm 10\%$
 - Maximum input current: 20 mA
- Exceeding these values can permanently destroy the component.
- **Tip:** Always design with a margin of safety, not right at the limit.

3. Electrical Characteristics / Specifications

Lists how the device behaves **under recommended operating conditions**.

Includes:

Input/output voltage levels

Current consumption

Frequency range / speed of operation

Noise margins, accuracy, efficiency

Helps you verify if the part works with the **rest of your system**.

4. Functional Block Diagram

- A simplified schematic showing the **internal structure** of the component.
- Useful for understanding how the part works (e.g., ADC → comparator → digital logic).
- Helps in predicting behavior and troubleshooting.

5. Pin Configuration and Pin Descriptions

- **Critical section** for using the part correctly.
- Pin diagram shows the **physical layout** (e.g., Pin 1 = Vcc, Pin 2 = GND, etc.).
- Incorrect wiring = non-functional circuit or damage.
- Datasheet often provides **recommended connections** (pull-up resistors, decoupling capacitors, etc.).

6. Timing Diagrams and Truth Tables

- **Truth Tables:** Define logical behavior (input combinations → output states).
- **Timing Diagrams:** Show how signals must be applied and how fast data can be sent/received.
 - Example: Setup time, hold time, clock speed.
- Crucial for digital ICs, microcontrollers, memory chips, communication modules.

7. Performance Graphs

- Plots showing how performance varies with **temperature, voltage, frequency, or load**.
- Examples:
 - LED brightness vs. current
 - Amplifier gain vs. frequency
 - Microcontroller power consumption vs. clock speed
- Helps in **design optimization** and **reliability planning**.

8. Application Notes / Typical Circuits

- Many datasheets include **example circuits** demonstrating how to use the component.
- Great for beginners—saves design time and avoids mistakes.
- Often include **recommended external components** (resistors, capacitors, crystals).

9. Mechanical Dimensions / Package Information

- Provides **accurate measurements** of the part's size, pin spacing, and packaging.
- Essential for **PCB layout and 3D mechanical design**.
- Even a small mismatch can cause the part not to fit on your board.

10. Ordering Information

- Lists available versions of the part (e.g., temperature grade, package type, speed grade).
- Example: Same IC may come in DIP, QFN, or BGA packages.

Practical Tips for Using Datasheets

- Always cross-check **voltage and current requirements** with your power supply.
- Highlight **important values** (max ratings, pin descriptions).
- Keep the datasheet open while designing or debugging.
- Make a **summary sheet** of key specs for quick reference.
- When comparing components, use the same datasheet sections side by side.

Why Careful Reading Matters

- Saves **hours of debugging** by preventing miswiring or misuse.
- Ensures **safe operation** (avoiding burnout of expensive chips).
- Guides **component selection** based on exact project needs.
- Helps in **troubleshooting** circuits—knowing whether an unexpected behavior is due to the part or the design.

Explain the importance of citing sources in academic writing and discuss the functions of citation , highlighting the significance of details. Also analyze the benefits of citations, factors influencing citation rates, the role of keywords, and ethical considerations in citations. - CO2, L3, 10 marks

Answer Key

- Introduction, Materials Eligible for citation, citing source twice, LaTeX for Citation Management, Connection between Old and New Research, Functions of Citation, Importance of Details in Citations, Benefits of Citation.
- Factors influencing Citation Rate, Role of keywords, Unethical Citations.

Attribution

- **Definition:** Acknowledging the **original creator or source** of an idea, text, image, dataset, or method.
- **Purpose:** To give **credit** and avoid plagiarism.
- **Format:** Can be informal or formal.
 - In presentations: *"Image courtesy of NASA"*
 - In text: *"As proposed by Einstein (1905)..."*
- **Scope:** Broader — applies not just in research, but also in art, media, software (e.g., Creative Commons licenses).

Citation

Definition: A **formal reference** to a published work, following academic styles (APA, IEEE, MLA, etc.).

Purpose: To allow **verification, traceability, and scholarly connection**.

Format: Strictly formal.

Example (APA): *Einstein, A. (1905). On the electrodynamics of moving bodies. Annalen der Physik, 17, 891–921.*

Scope: Mostly academic and research writing.

- **Attribution = credit = tells who/where an idea came from**
- **Citation = reference = tells exactly how to find the source in the scholarly record.**

Eg:

.

[1] J. Smith, K. Lee, and R. Patel, “Advances in renewable energy storage systems,” *Journal of Energy Research*, vol. 45, no. 2, pp. 123–140, 2020, doi: 10.1016/j.jer.2020.02.005.

Figure 1. Battery storage efficiency trends (Adapted from Smith et al., 2020).

This is **attribution** → it tells the reader who created the original figure/idea

Role of Citations

Citations are **much more than just references** — they are the backbone of academic and scientific communication. Here are the **main roles of citations**:

1. Acknowledgement & Academic Integrity

- Give credit to original authors for their ideas, data, or methods.
- Prevent plagiarism and demonstrate ethical research practices.

2. Evidence & Support

- Strengthen arguments by showing they are backed by established research.
- Help readers see that claims are not just opinions but grounded in prior knowledge.

3. Verification & Transparency

- Allow readers to **trace the source** of information and check accuracy.
- Build trust by showing where the information came from.

4. Connectivity & Knowledge Flow

- Create links between works, showing how knowledge evolves.
- Help map the **scholarly conversation** and identify influential works.

5. Recognition & Impact Measurement

Authors gain recognition when their work is cited.

Citations are used in metrics like **h-index**, journal **impact factor**, and institutional rankings.

6. Encouraging Further Research

Guide readers to additional resources for deeper exploration.

Spark new ideas by connecting different studies and disciplines.

Citations (references) credit others for their work, while allowing the readers to trace the source publication if needed.

Any portion of someone else's work or ideas in papers, patents, or presentations must be used in any new document only by clearly citing the source.

This applies to all forms of written sources in the form of texts, images, sounds, etc. and failure to do may be considered plagiarism

When a bibliography of previously published patents or papers is placed in the new works of a researcher, a connection is established between the new and previous work.

As per relevance to context, the researcher provides due credit through the use of a citation.

Citations help the readers to verify the quality and importance of the new work and justification of the findings. It is a way to tell readers that certain material in the researcher's present work has come from another source and as an ethical responsibility; appropriate credit has been given to the original author or writer.

Materials that can be cited include journal papers, conference proceeding, books, theses, newspaper articles, websites, or other online resources and personal communication.

Preferably, citations should be given at the end of a sentence or the end of a paragraph as can be seen even in this particular paragraph. Citation must contain enough details so that readers can easily find the referenced material.

Dual Citation Practice

1. **In Text Citation** : within the text of the article , precisely where the source is quoted or paraphrased.
2. **References**: a second time, typically at the end of the chapter, book , or research article.

Example:

- In-text: *Einstein (1905) introduced the theory of special relativity.*
- Footnote: 1 A. Einstein, *On the electrodynamics of moving bodies, Annalen der Physik*, 1905.

Consistency in Citation Styles

- **Why Consistency Matters**
- **Professionalism & Credibility**
 - A paper with mixed citation styles (e.g., some APA, some IEEE) looks careless and unprofessional.
 - Consistent style shows attention to detail and respect for academic norms.
- **Readability & Clarity**
 - Readers can easily locate sources if all references follow the same format.
 - Avoids confusion (e.g., APA uses author–date, IEEE uses numbers).
- **Indexing & Referencing**
 - Databases (Scopus, Web of Science, Google Scholar) rely on standard formats for indexing.
 - Inconsistency can cause **missed citations** or misattribution.
- **Academic Integrity**
 - Following one style completely ensures correct acknowledgment.
 - Reduces risk of unintentional plagiarism.

Example of Inconsistent Citation (✗ Wrong)

- In-text 1: (*Einstein, 1905*) → APA style
- In-text 2: [1] → IEEE style
- Reference list: Mix of APA and IEEE entries

This creates **confusion** for the reader.

Example of Consistent Citation (✓ Correct)

APA style (consistent)

In-text: (*Einstein, 1905*)

Reference:

Einstein, A. (1905). *On the electrodynamics of moving bodies*. Annalen der Physik, 17, 891–921.

IEEE style (consistent)

In-text: [1]

Reference:

[1] A. Einstein, “On the electrodynamics of moving bodies,” *Annalen der Physik*, vol. 17, pp. 891–921, 1905.

Inappropriate Citations

- **“Spurious citations”** means **false, misleading, irrelevant, or fabricated references** that do not genuinely support the claims being made in a research paper, article, or report. These citations may look legitimate but are problematic
- **Biased citations** refer to a selective or unbalanced way of citing literature that favors a particular viewpoint, author, or group, while ignoring or downplaying other valid sources. Unlike *spurious citations* (which are false or irrelevant), **biased citations are real but used unfairly.**
- **Self-citations** are references that authors give to their **own previously published work** when writing a new research paper, article, or book.
- **Coercive citation** refers to the **unethical practice where authors, editors, or reviewers pressure someone to include citations to specific works**—often to boost citation counts, journal impact factor, or personal recognition—even when those citations are not relevant.

Impact of title and keywords on citations

- The **title** and **keywords** of a research paper are critical for how widely the work is discovered, read, and ultimately **cited**. They act as the *entry points* in databases, search engines, and indexing systems.
- **Impact of Title on Citations**
- **Clarity and Specificity**
 - Clear titles attract relevant readers.
 - Example: *“Deep Learning for Medical Image Classification”* is more discoverable than *“Some Studies on AI.”*
- **Inclusion of Key Concepts**
 - Titles with strong, discipline-specific terms are more likely to appear in search results.
- **Length**
 - Extremely short = too vague.
 - Very long = difficult to read.
 - Balanced titles (10–15 words) generally perform best.
- **Appeal**
 - A well-crafted title can increase click-through rates in search results → more reads → more citations

Impact of Keywords on Citations

1. Indexing and Searchability

1. Keywords determine how databases (Scopus, Web of Science, Google Scholar) tag your paper.
2. Poor keywords → your paper gets “lost.”

2. Search Engine Optimization (SEO) for Research

1. Well-chosen keywords align with how other researchers search.
2. Example: “Renewable Energy Storage” is stronger than just “Energy.”

3. Relevance and Precision

1. Too broad = irrelevant readers, low citations.
2. Too narrow = limited audience.
3. A mix of broad + specific keywords works best.

4. Consistency with Title and Abstract

1. Repeating important terms across title, abstract, and keywords improves visibility.

Titles attract attention and determine first impressions.

Keywords ensure discoverability in databases.

Together, they **increase visibility → readership → citations.**

A paper titled “*Deep Learning in Image Recognition*” with keywords like “**Convolutional Neural Networks (CNNs), pattern recognition, AI, computer vision**” is more discoverable (and likely more cited) than if it only used “**image recognition**” as a keyword.

Knowledge Flow Through Citation

- It is the way **ideas, methods, and findings move across time, authors, and disciplines** through the act of **citing prior work**.
Every citation creates a **link** that shows how one piece of research influenced another.
- **How Knowledge Flows via Citations**
- **Knowledge Creation**
 - A researcher publishes new work (Paper A).
- **Knowledge Transfer**
 - Another researcher (Paper B) cites Paper A, applying or extending its ideas.
- **Knowledge Accumulation**
 - Multiple papers (Papers C, D, E) cite A and B, building a growing knowledge network.

Knowledge Diffusion

Citations spread ideas across **fields** (e.g., physics → computer science → AI),
geographies (local → global), and
time (older foundational work → modern innovations).

Knowledge Validation

Frequently cited works gain recognition as **authoritative knowledge**.

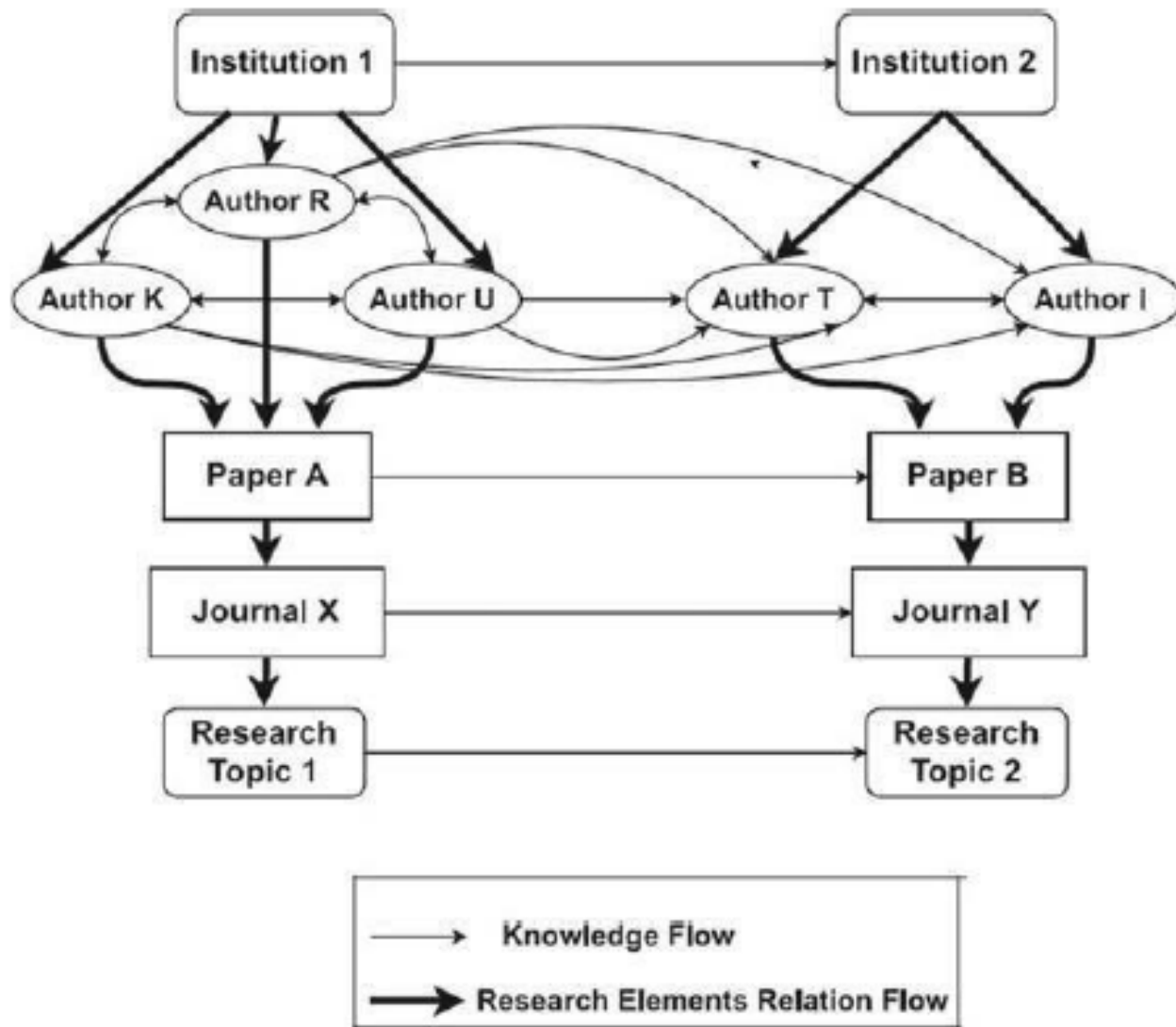
Example

Shannon's (1948) paper on *Information Theory* → cited in electrical engineering.

Later → spread into computer science (data compression, coding).

Today → widely cited in machine learning and biology.

👉 A perfect example of **knowledge flow through citations across disciplines and decades**.



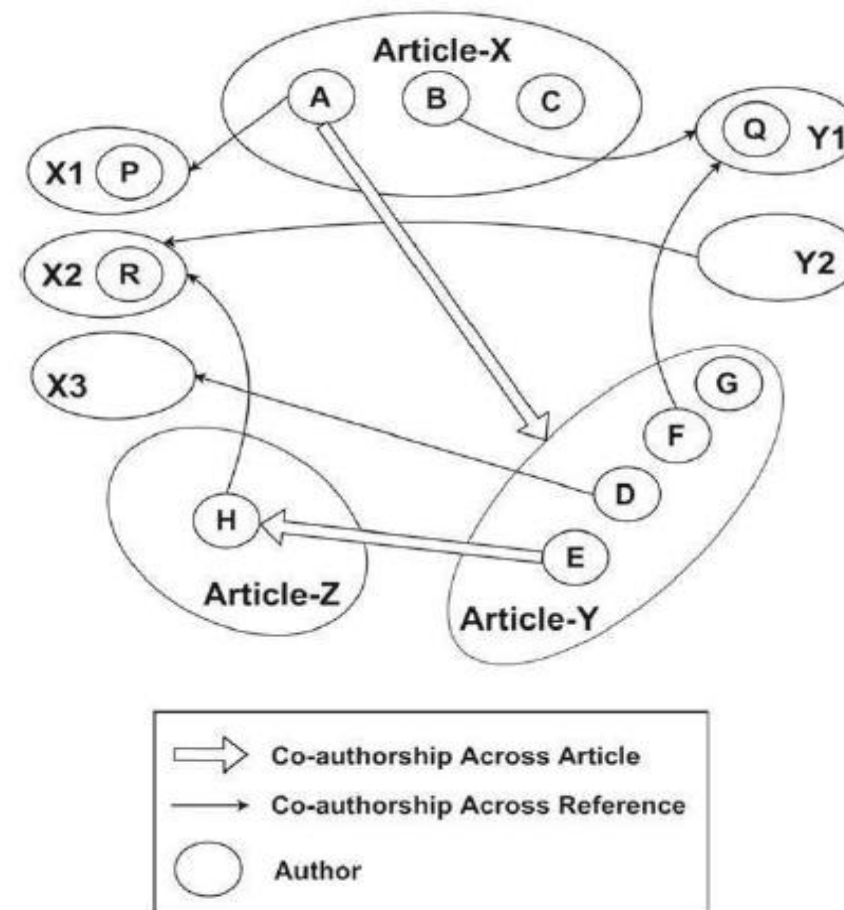
Knowledge flow happens between co-authors during research collaboration, among other researchers through their paper citation network, and also between institutions, departments, research fields or topics, and elements of research.

If paper A is cited by paper B, then knowledge flows through citation networks across institutions.

The complex interdisciplinary nature of research encourages scholars to cooperate with each other to grab more advantages through collaboration, thereby improving quality of the research

Citation Databases

The figure shows a relationship between co-authorship and different types of citations. Three articles (X, Y, and Z) and five references (X1, X2, X3, Y1, and Y2) of article X and Y, respectively, are considered. A, B, and C are authors of article X, and D, E, F, G, and also A are authors of article Y. Article Z has two authors H and E. References X1, X2, X3, Y1, and Y2 have authors (A, P), (H, R), (D), (Q, B, F), and (R), respectively.



CITING DATASETS

- The nature of engineering research has evolved rapidly and now relies heavily on data to justify claims and provide experimental evidences and so data citations must fetch proper credit to the creator of the dataset as citations of other objects like research articles.
- Data citations should have provisions to give credit and legal attribution to all contributors, enable identification and access, while recognizing that a specific style may not apply to all data.
- Ascertaining the ownership of data can be a complicated issue especially with large datasets, and issues of funding can also make it a difficult matter.
- A researcher should obtain necessary permission for using data from a particular source.
- Citations related to datasets should include enough information so that a reader could find the same dataset again in the future, even if the link provided no longer works.
- It is proper to include a mixture of general and specific information to enable a reader to be certain that the search result is the same dataset that was sought.

Examples:

1. Historical Data, Sotavento (Wind Farm), Corunna, Spain (July 2016): [Accessed: 4 Oct, 2016] Retrieved from <http://www.sotaventogalicia.com/en/real-time-data/historical>
2. Deb, D (2016). [Personnel survey]. Unpublished raw data.

STYLES FOR CITATION

- Citation styles differ primarily in the order, and syntax of information about references, depending on difference in priorities attributed to conciseness, readability, dates, authors, and publications.
- Some of the most common styles for citation
 1. **ASCE style (American Society of Civil Engineers)**
 2. **IEEE style (Institute of Electrical and Electronics Engineers)**

Template for books:

Author Surname, Author Initial. (Year Published). Title. Publisher, City, Pages Used.

Example:

Wearstler, K., and Bogart, J. (2004). Modern glamour. Regan Books, NY.

Template for websites:

Author Credentials / Company Name (Year Published). 'Title'. [http://Website URL](http://WebsiteURL) (Oct. 10, 2013).

Example:

Blade cleaning services (2015): <http://www.bladecleaning.com/problematica> (29 Oct, 2016).

Template for journal publications:

Author Surname, Author Initial. (Year Published). 'Title'. Publication Title, Volume number(Issue number), Pages Used.

Example:

Johnston, L. (2014). "How an Inconvenient Truth Expanded The Climate Change Dialogue abd Reignited An Ethical Purpose in The United States". 1–160.

(b) In-text citation for journals or books: The following part is to be placed right after the reference to the source of the citation assignment:

Template

(Author Surname/Website URL Year Published)

Examples:

- i. Citation is a very important part of technical writing. (Deb 2016)
- ii. Engineers create devices to monitor mountains so that nearby inhabitants can be warned of impending eruptions. (Teachengineering.org 2014)

2. IEEE style (Institute of Electrical and Electronics Engineers)³ IEEE style is standard for all IEEE journals and magazines, and is frequently used for papers and articles in the fields of electrical engineering and computer science. The IEEE style requires endnotes and that references be cited numerically in the text.

Those submitting to an IEEE publication should see guidelines for the specific journal or magazine and may also refer to the complete IEEE editorial style manual. Some examples of IEEE styles of citations for different types of sources are enumerated below:

Chapter in an edited book

[1] A. Rezi and M. Allam, "Techniques in array processing by means of transformations," in Control and Dynamic Systems, Vol. 69, Multidimensional Systems, C. T. Leondes, Ed. San Diego: Academic Press, 1995, pp. 133–180.

Acknowledgments and Attributions

- Acknowledgment section is a place to provide a brief appreciation of the contribution of someone or an organization or funding body to the present work. If no particular guideline is available for the intended publication, then it can be introduced at the end of the text or as a footnote.
- Acknowledgment is a common practice to recognize persons or agencies for being responsible in some form or other for completion of a publishable research outcome. Acknowledgment displays a relationship among people, agencies, institutions, and research.
- In some case, certain individuals may help in the research work but may not deserve to be included as authors. As a sign of gratitude, such contributions should be acknowledged. Classification of acknowledgment into six different categories like moral, financial, editorial, institutional or technical, and conceptual support.

- Giving proper credit wherever it is due is very important and even if the contribution is minor, it should not be neglected. A researcher should always recognize the proprietary interest of others. Whenever possible, author shall give name of persons who may be responsible, even if nominally, for designs, inventions, writings, or other accomplishments. Given the importance of work published, authorship is also important. The reward triangle theory shows a relationship between citations, acknowledgment, and authorship.
- In engineering research, acknowledgments are meant for participating technicians, students, funding agency, grant number, institution, or anyone who provide scientific inputs, shared unpublished results, provided equipment, or participated in discussions.

What Should Be Acknowledged?

Every author should know that what should/should not be acknowledged. Author should acknowledge quotation, ideas, facts, paraphrasing, funding organization, oral discussion or support, laboratory, and computer work.

(i) Quotation: In technical writing such as in the field of engineering, quotes are used very rarely. Quotations are of two types:

- Direct quotations are used when author use actual words or sentences in the same order as the original one. Author should use quotation marks for the words or sentences with proper acknowledgment.
- Indirect quotation summarizes or paraphrases the actual quote. In such cases, it is important to acknowledge with proper name and date.

(ii) Authors should acknowledge people who give appropriate contribution in their research work. Non-research work contributions are not generally acknowledged in a scientific paper but it may be in a thesis. Persons must be acknowledged by authors, who gave a scientific or technical guidance, take part in some discussions, or shared information to author. Authors should acknowledge assistants, students, or technicians, who helped experimentally and theoretically during the research work.

(iii) If the researcher received grant from a funding agency and if those funds were used in the work reported in the publication, then such support should always be acknowledged by providing full details of the funding program and grant number in the acknowledgment section.

- The authors should also gratefully acknowledge use of the services and facilities of any center or organization with which they are not formally affiliated to .

Acknowledgments:

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(iv) If the results were presented as an abstract in a journal, then there should be a suitable citation. If the results were presented as part of scientific meeting, symposium, or other gathering, then some relevant information should be provided. At the very least, the name of the gathering and year should be cited. Other helpful items include the location of the gathering (city and state or country) and the full date of the occasion.

- Acknowledgment is no longer simply a means of expressing gratitude. **Funding agencies** these days often require that their grant be acknowledged and explicitly state the exact information to be provided if the research work leads to a publication. The grantee is responsible for assuring that an acknowledgment of support is made in any publication (including websites) of any direct or indirect outcomes from the funded project.
- The format of required information is often explicitly stated in the terms and conditions of grants provided. Acknowledgments are also appropriate in technical presentations. Failure to acknowledge funding may result in the discontinuation of current funding and/or ineligibility to receive future funding for a certain number of years or indefinitely

Acknowledgments in Books/Dissertations

A page of acknowledgments is usually included at the beginning of a thesis/ dissertation immediately following the table of contents. These acknowledgments are longer than the one or two sentence statements in journal papers or articles in conference proceedings. These detailed acknowledgments enable the researcher to thank all those who have contributed in completion of the research work.

Sample Acknowledgement in Thesis:

I wish to express my sincere appreciation to my supervisor Prof. Gang Tao for the useful comments, remarks and encouragement throughout this thesis work. Furthermore, I wish to express my thanks to Prof. Jacob Hammer for introducing me to the topic and for the support along the way. Also, I like to thank my peers in the Adaptive Control Lab such as Yu Liu and Shan-shan Li, who have shared their precious time during many lively technical discussions. I would like to thank my family members who have supported me throughout this journey in many different ways.

Dedication or Acknowledgments?

- Dedication is almost never used in a journal paper, an article in a conference proceedings, or a patent, and it is used exclusively in larger documents like books, thesis, or dissertations.
- While acknowledgments are reserved for those who helped out with the book in some way or another (editing, moral support, etc), a dedication is to whomever the author would like it to be dedicated to, whether it is the author's mother, the best friend, the pet dog, or Almighty God.
- And yes, it is possible to dedicate something to someone while also mentioning them in the acknowledgments.
- For example, one may dedicate a book to one's spouse, but acknowledge them for being the moral support and putting up with when one gets stressed.