

LITERATURE REVIEW, TECHNICAL READING, AND CITATION IN RESEARCH

MODULE - 2



LITERATURE REVIEW AND TECHNICAL READING

- **Primary Goal:**

- Identify and understand a vaguely known **research problem**.
- Advocate a specific **approach** to understanding the problem.
- Assess the **choice of methods** to be used.

- Helps researchers confirm their work is **new and innovative**.

- **Quality Indicators:** Appropriate **breadth and depth**, clarity, rigor, consistency, effective analysis.

NEW AND EXISTING KNOWLEDGE

- **New knowledge** is interpreted *only* within the context of **existing knowledge**.
- It cannot exist without this foundation.
- **Perception of new knowledge** can vary greatly based on researcher's background and existing understanding.
- **Significance of a problem** is argued by demonstrating its existence within current knowledge.
- **Originality**: Inferred by describing existing knowledge and pointing out missing parts.
- **Foundation of Existing Knowledge**: Provides context, significance, originality, and tools.
- **Challenge**: New knowledge is harder to challenge with a strong foundation and many references.

ACQUIRING KNOWLEDGE: TEXTBOOKS VS. RESEARCH PAPERS

- **Textbooks:** Contain older, established knowledge and provide background for newer work.
- **Research Papers:** Record newer work, written for other researchers at the "edge of knowledge," assuming prior field understanding.
- **Effective Review:** Explains how research builds on previous work.
- **Benefits of a Good Literature Review:**
 - Firm foundation for advancing knowledge.
 - Facilitates theoretical growth.
 - Eliminates uninteresting areas.
 - Opens new avenues for research.
- **Supervisor's Expectation:** A good literature survey creates a strong impression of understanding the state of the art.

ANATOMY OF A GOOD LITERATURE SURVEY

- **Avoid Hasty Conclusions:** Look into individual references for underlying causes, assumptions, or mechanisms.
- **Synthesize Information:** Combine findings meaningfully.
- **Typically a Two-Step Process:**
 - **Identify:** Major topics, subtopics, or concepts relevant to the subject.
 - **Place Citations:** Categorize relevant sources (articles, patents, websites, data) under correct concepts/topics.
- **Note-Taking:** Highlight, underline, or mark important sections (definitions, explanations, concepts, questions, criticisms) for later use and easier recall.
- **Comprehensive Survey:** Methodically analyzes and synthesizes quality archived work.
 - Provides a firm foundation for topics and methodology choice.
 - Demonstrates novelty of proposed work.

ANALYSIS AND SYNTHESIS OF PRIOR ART

•Process:

- **Break Down Each Article:** Identify useful content.
- **Synthesize Collection:** Integrate articles to identify group conclusions.

•Steps for Analyzing Information:

- Understand the **hypothesis**.
- Understand **models and experimental conditions**.
- Make **connections**.
- **Compare and contrast** various information.
- Identify **strong points and loopholes**.

•(Visual Aid: You can include a simple grid representation here for **N** topics and **M** sources.)

•**Critical Mindset:** Be suspicious of claims, especially tall ones, to avoid blindly accepting literature and to critically analyze your own results.

	Source 1	Source 2	...	Source M
Topic 1		✓		
Topic 2	✓			✓
⋮				
⋮				
Topic N	✓	✓		

GOAL AND EVALUATION OF LITERATURE SURVEY

- **Ultimate Goal:** Identify **unsolved issues**, problems in existing models/designs, and present **novel ideas/recommendations**.
- **Critical Evaluation:** Every resource cited must be critically evaluated for suitability.
- **Reliable Sources:** Relying on refereed articles (scholarly journals, granted patents) saves time.
- **Criteria for Information Evaluation:**
 - **Authority:** Author's credentials, affiliation, publisher.
 - **Accuracy:** Credibility based on existing knowledge; citation of other sources.
 - **Scope:** Appropriate comprehension/research level.

BIBLIOGRAPHIC DATABASES

- **Definition:** Abstracting and indexing services that collect and provide access to citation information and abstracts of scholarly articles.
- **Benefit:** Allows simultaneous searches across large databases, reducing reliance on single sources.
- **Identification:** Researchers should quickly identify useful databases for their specific ideas or problems.

WEB OF SCIENCE

- **Features:** Includes multiple databases and specialized tools.
- **Search Capabilities:** Search by topic, title, author, address, etc.
- **Sorting Options:** By number of citations (highest to lowest), publication date.
- **Refinement:** Use quotes for phrases, add keywords, or use "Refine Results" (keyword, material type, date, language).
- **"Cited Reference Search":** Trace articles that cited a previously published paper, useful for finding extensions of ideas.
- **Effective Search:** Narrows and refines results for relevant sources.
- **Information Provided:** Title, authors, journal type, volume, issue, year, abstract, keywords – helps decide if full paper is needed.

GOOGLE AND GOOGLE SCHOLAR

•Google:

- Great starting point for broad searches, finding freely available information (government, organizations).
- **Limitations:** "Black box" (no quality control), limited search functionality/refinement.

•Google Scholar:

- Limits search to scholarly literature.
- **Limitations:** Not all results are truly scholarly; not comprehensive (some publishers don't share content); limited search functionality.

•Search Operators (to narrow results):

- **OR:** Broadens search (synonyms, variant spellings).
- **Brackets/Parentheses ():** Group synonyms.
- **Quotation Marks " ":** Finds exact phrases.
- **Site:** Limits to specific domains/websites.
- **File type:** Limits to specific file extensions (e.g., pdf, ppt).

•**Recommendation:** Supplement Google/Google Scholar with academic databases for best resources.

EFFECTIVE SEARCH: THE WAY FORWARD

•**Scholarly Publications:**

- Authored by experts, cite all sources, peer-reviewed.
- Audience: Fellow experts, students. Content is complex.

•**Popular Publications:**

- Informal, wide readership (experts/amateurs), focus on news/trends.
- Research outcomes typically not first disseminated here.

•**Comprehensive Search:** Use all search tools (scholarly and popular) as appropriate.

•**Information Access:** Not all information is online; some is only in print.

•**Publication Lag:** Scholarly/peer-reviewed info takes time to publish; current news may not have scholarly studies yet.

EFFECTIVE SEARCH: ITERATIVE PROCESS

•**Searching is Iterative:**

- Experiment with different keywords and operators.
- Evaluate, assess results, and use filters.
- Modify search as needed.
- Look at citations/references of relevant articles.

•**Post-Search Activities:**

- Critical and thorough reading.
- Observe salient points, summarize findings.
- Detailed comparison and contrast of findings (may be repeated multiple times).

•**Conclusion of Literature Survey:** Summary of relevant work, identification of missing links and open challenges.

•**Continuous Process:** Literature survey is cyclical; new literature appears, understanding grows, leading to more search.

•**Purpose:** Avoid spending excessive time without active reading and developing original ideas. It's not a discrete "end then research begins" step.

INTRODUCTION TO TECHNICAL READING

- **Volume of Papers:** Few papers are directly relevant compared to the vast number available.
- **Reliable Sources:** Prefer refereed journals and reputable books over random web articles.
- **Goal:** Understand the authors' **technical contributions**.
- **Reading Style:** Not like reading a newspaper; requires rereading, many hours.
- **Initial Skimming:** Decide if a paper is worth careful reading.
 - Start with **title and keywords**. If not interesting, stop.
 - Read the **abstract**. If not important, stop.

TECHNICAL READING FLOW

- **If Abstract is Interesting:**

- Skip to **conclusions** for relevance.
- Read **figures, tables, and captions** for a broad idea of the work.

- **If Still Interested:**

- Read the **Introduction** for background, authors' purpose, and how the paper advances the state of the art.
- Read **Results and Discussion** sections (the heart of the paper).

- **Detailed Sections (Experimental Setup/Modeling):** Read only if deeply interested in precise methodology or data interpretation.

- **Ongoing Process:** Continually search for relevant literature and stay updated. For larger projects, develop your own reading strategy.



CONCEPTUALIZING RESEARCH

- **Research Objective Characteristics:**

- Must center on **new knowledge**.
- Must be **accepted and recognized as significant** by the research community.
- Must be **solvable/achievable** (considering methods and tools).

- **Foundation:** Significance, originality, theory, and tools come from existing recorded literature.

- **Expertise:** A good research objective implies the researcher is already an expert at the edge of knowledge.

- **PhD Level:** Be prepared to become an expert; continually read literature to connect:

- A significant problem.
- Knowledge to address it.
- A possible way to create new knowledge.

- **Smaller Scope Projects:** Supervisor's help is crucial for conceptualizing research and identifying objectives. An established researcher can point to landmark literature.



CRITICAL AND CREATIVE READING

- **Critical Reading:** A skeptical process; don't assume reported results are correct.
 - Ask: Right problem? Simpler solutions missed? Limitations (stated/ignored)? Reasonable assumptions? Logical flow or flaw?
 - Judge the data: Is it the *right* data? Was it gathered and interpreted correctly?
 - **Easier than creative reading;** easier to find mistakes than good ideas.
- **Creative Reading:** A positive approach, actively looking for:
 - Other applications, interesting generalizations, or extended work missed by authors.
 - Plausible modifications that pose practical challenges.
 - Ideas for your next research focus.

TAKING NOTES WHILE READING

- **Purpose:** The bridge between reading and writing. "The faintest writing is better than the best memory."
- **Methods:** Margins of copies, digital tools.
- **What to Note:** Definitions, explanations, concepts, questions, criticisms.
- **Benefits:** Avoids forgetting, aids in rereading content later.
- **Concluding a Technical Reading:**
 - Summarize paper contributions in a few sentences.
 - Compare with existing works in the area.
 - Determine if new ideas, new implementations of existing ideas, or novel frameworks are presented.
 - Understanding contribution type requires reading other papers in the field.

READING MATHEMATICS AND ALGORITHMS

- **Foundation:** Mathematics is crucial for new advances and evolution in engineering research.
- **Importance:** Often the "heart" of technical papers; avoid skimming.
- **Meticulous Reading:** Develop sound understanding of the problem and authors' solutions by carefully reading proofs or algorithms.
- **Algorithm Implementation:** Prone to errors; quickly coding to check functionality is often recommended, even if confident.

READING A DATASHEET

- **Purpose:** Essential for engineers (mechanical, civil, electronics) to understand components or designs.
- **Initial Skimming:** Determine if further, careful reading is needed.
- **What is a Datasheet?** Instruction manual for electronic components, detailing function, features, and usage. Aids in circuit design and debugging.
- **Key Sections/Information:**
 - **First Page:** Part function, features, basic specifications, functional block diagram.
 - **Pin Out:** Physical location of pins, mark for Pin 1.
 - **Graphs:** Performance vs. criteria (voltage, temperature), safe operating region.
 - **Truth Tables:** Input/output relationships.
 - **Timing Diagrams:** Data transmission speed and method.
 - **Dimensions:** Package dimensions for PCB layout.
- **Benefit:** Careful reading can provide shortcuts and save many hours.

ATTRIBUTES AND CITATION: GIVING CREDIT

- **Academic Writing Rules:** Follow conventions for citing, referencing, attributing, and acknowledging others' works.
- **"Giving Proper Credit Wherever Due."**
- **Citing:** Quoting or referring to others' works/ideas within your text, ensuring clear context.
- **Referencing:** Listing full publication details of cited work (background info for readers).
- **Acknowledgment:** Indicating contributions to scientific work in publications.
- **Distinction:** These differ in application.

CITATIONS: FUNCTIONS AND ATTRIBUTES

- **Credit & Traceability:** Credit others' work, allowing readers to trace sources.
- **Mandatory Use:** Any portion of someone else's work (text, images, sounds) must be cited; failure is plagiarism.
- **Connection:** Bibliographies connect new work to previous work.
- **Ethical Responsibility:** Provide due credit to original authors.
- **Verification:** Readers can verify quality, importance, and justification of findings.
- **Citable Materials:** Journal papers, conference proceedings, books, theses, newspaper articles, websites, personal communication.
- **Placement:** Preferably at sentence or paragraph end. Must contain enough detail for readers to find the material.

CITATIONS: DUAL PRESENCE & FUNCTIONS

- **Dual Presence:**

- **In-text citation:** Exactly where source is quoted/paraphrased.
- **References:** Full list at chapter/book end or article end.

- **LaTeX:** Document preparation system effective for tracking and updating citations.

- **Three Main Functions of Citation:**

- **Verification:** Readers can ascertain if original source is justified, and if assertion is properly described.
- **Acknowledgment:** Researchers receive credit, crucial for promotion, employment, funding. Enhances reputation.
- **Documentation:** Documents scientific concepts and historical progress of technology.

CITATIONS: CURRENCY AND PURPOSE

- **"Currency" for Authors:** Citations are a form of credit for contributions.
- **Honoring Originators:** When authors cite, they honor those who initiated the ideas.
- **Significance:** Indicate work's significance to the reader.
- **Clarity:** Help authors develop understandable arguments, preventing irrelevant work.

WHEN REFERENCES DON'T FULFILL GOALS

- **Spurious Citations:** Including a citation when not required or an appropriate one isn't found.
- **Biased Citations:**
 - Citing friends/colleagues without significant connection.
 - Not citing genuinely significant work to deny credit.
- **Self-citations:** Permissible if truly relevant; natural for ongoing research projects.
- **Coercive Citations:** Editors coercing authors to add citations to their journal to boost impact factor (unethical).

INTRODUCTION TO CITATION FACTORS

- **Beyond Significance: Factors Influencing Citation Rate**

- Significance & availability of the journal
- Publication types & research area
- Importance of published research work
- **Crucial Additions:** Title length, title type, and selected keywords.

- **The Title: Your Research's First Impression**

- Main indication of research area/subject.
- Source of information during literature surveys.
- Plays a vital role in **marketing** and making papers **traceable**.

THE ART OF A GOOD TITLE

- **Characteristics of an Effective Title:**

- **Informative:** Clearly represents the paper's content.
- **Attractive:** Gains readers' attention.

- **Common Title Pitfalls:**

- Informative but not attention-grabbing.
- Attractive but not informative or relevant.

- **Impact on Metrics:** Download count and citation of a research paper are influenced by the title.

KEY ASPECTS INFLUENCING TITLE BEHAVIOR

- **Three Pillars of Title Behavior:**

- **Types of the Title:** Different structures yield different results.
- **Length of the Title:** Longer titles often include more detail.
- **Presence of Specific Markers:** Punctuation and content matter.

TITLE LENGTH AND SPECIFIC MARKERS

- **Longer Titles & Citations:**

- Often include study methodology and/or detailed results.
- Tend to attract **more attention and citations**.

- **Markers & Citation Rate:**

- Titles with **question marks, colons, or specific geographical regions** are associated with **lower citation rates**.
- **Result-describing titles** generally receive more citations than method-describing titles.

- **Publication Type Impact:**

- **Review articles** and **original articles** typically receive more citations than short communication articles.

THE POWER OF KEYWORDS

- **Keywords in the Title:**

- At least **two keywords** in the title can significantly increase discoverability and citation.

- **Role of Keywords:**

- Represent essential information and main content.
- Used by search engines, journals, digital libraries, and indexing services for:
 - Categorization of research topics.
 - Directing work to the relevant audience.

UNDERSTANDING KNOWLEDGE FLOW

- **Channels of Knowledge Dissemination:**

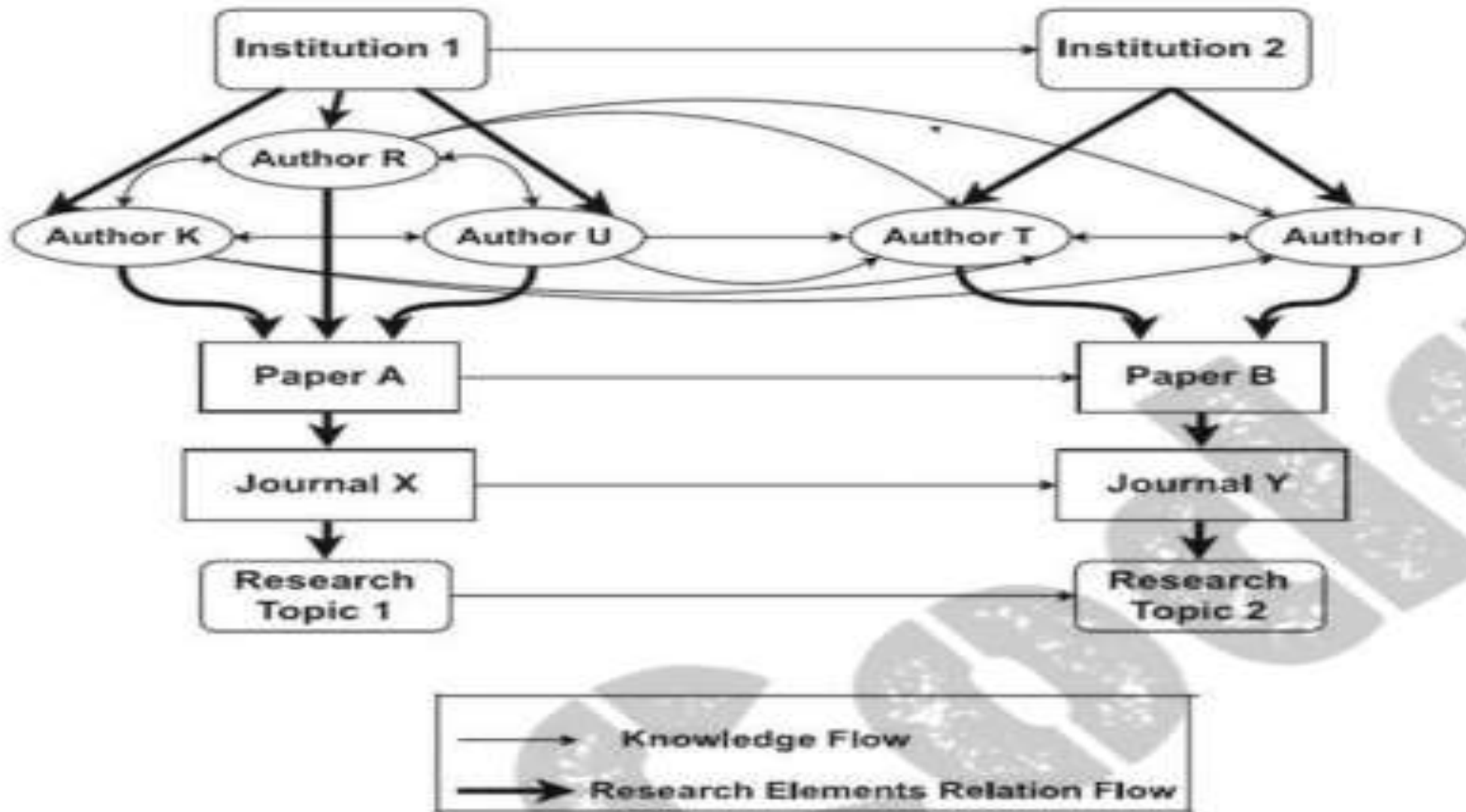
- Verbal communications, books, documents, video, audio, images.
- Crucial for formulating new knowledge.

- **Knowledge Flow in Engineering Research:**

- Primarily through: books, theses, articles, patents, and reports.

- **Citation: A Bridge for Knowledge Transfer:**

- Important for transmitting knowledge from previous work to innovations.

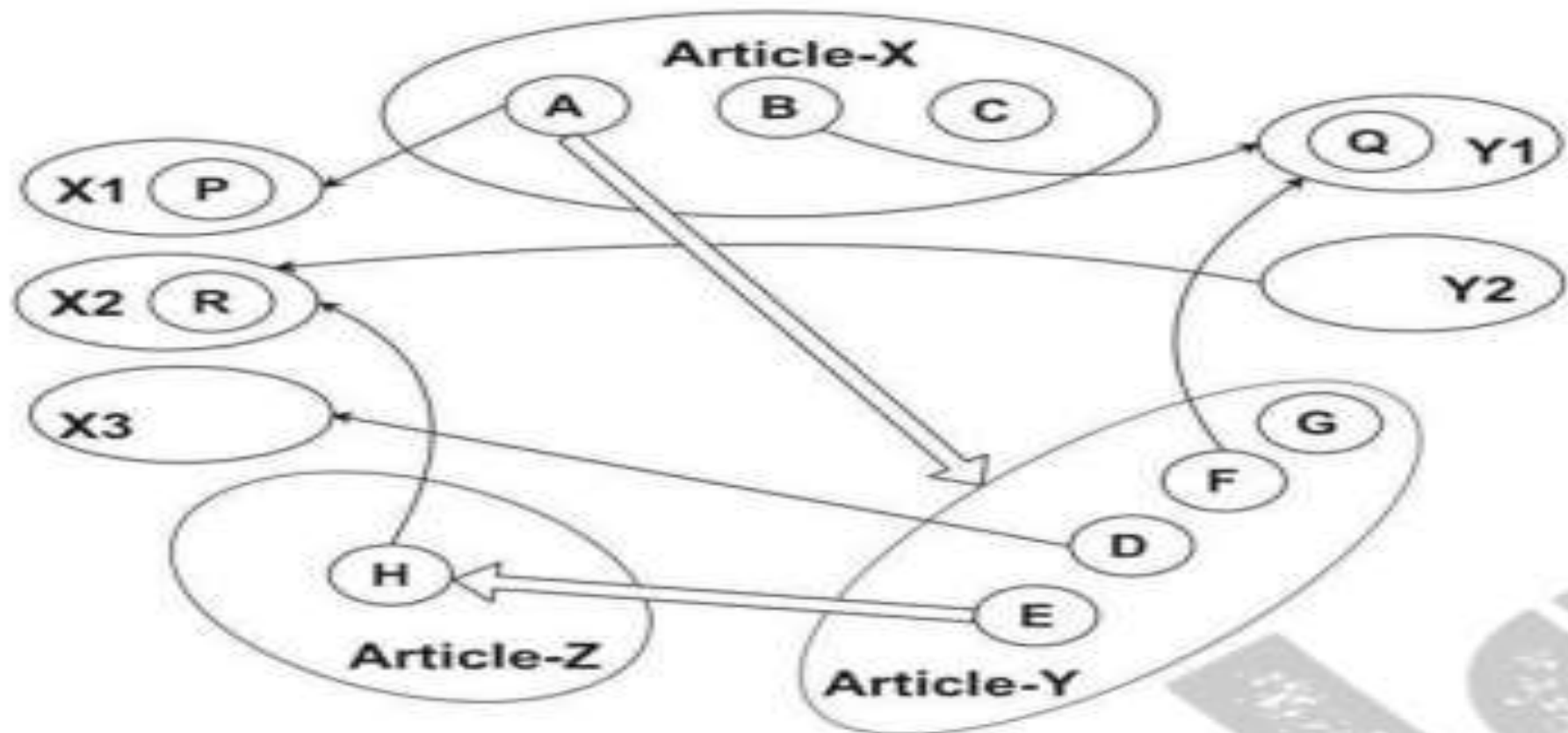


HOW KNOWLEDGE FLOWS IN RESEARCH NETWORKS

- **Between Co-authors:** During research collaboration.
- **Among Researchers:** Through paper citation networks.
- **Across Entities:** Between institutions, departments, research fields/topics, and research elements.
- **Example:** If paper A cites paper B, knowledge flows across institutions via the citation network.
- **Collaboration's Role:** Complex interdisciplinary research encourages collaboration for improved quality and knowledge sharing.

Visualizing Knowledge Flow (Co-authorship & Citation)

- **(This slide would ideally contain the "below figure" mentioned in your text.)**
- **Figure Description:** Illustrates relationships between co-authorship and different types of citations.
 - Articles X, Y, Z.
 - References X1, X2, X3, Y1, Y2.
 - Authors A, B, C for X; D, E, F, G, A for Y; H, E for Z.
 - Authors of references.
- **Key Takeaway:** Demonstrates the intricate web of knowledge transfer through collaborative and citation networks.



The Importance of Data Citation

- **Evolving Engineering Research:** Heavily relies on data for claims and evidence.
- **Why Cite Data?**
 - Proper credit to the data creator.
 - Legal attribution to all contributors.
 - Enable identification and access.
 - Acknowledge that specific styles may not apply universally.
- **Challenges:**
 - Ascertaining data ownership (especially large datasets).
 - Issues of funding.
 - **Crucial:** Obtain necessary permission for data use.

Best Practices for Data Citation

•Ensuring Discoverability:

- Include enough information for readers to find the dataset even if links break.
- Mix general and specific information for certainty of finding the correct dataset.

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.

Understanding Citation Styles

- **Purpose of Citation Styles:**

- Standardized format for referencing sources.

- **Key Differences:**

- Order and syntax of information.
- Priorities: concision, readability, dates, authors, publications.

- **Common Styles in Engineering:**

- **ASCE style** (American Society of Civil Engineers)
- **IEEE style** (Institute of Electrical and Electronics Engineers)
- *(You could briefly show a small example of each style here if desired, e.g., for a book or journal article)*

ASCE style (American Society of Civil 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> (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.

IEEE style (Institute of Electrical and Electronics Engineers)

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.

The Acknowledgment Section

- **Purpose:**

- Brief appreciation for contributions from individuals, organizations, or funding bodies.

- **Placement:**

- End of the text or as a footnote (if no specific guidelines).

- **Significance:**

- Common practice to recognize those responsible for publishable research outcomes.
- Displays relationships among people, agencies, institutions, and research.
- **Crucial:** Acknowledges contributions (even minor ones) that don't warrant authorship.

Who to Acknowledge in Engineering Research

• Typical Acknowledgees:

- Participating technicians
- Students
- Funding agency (with grant number)
- Institution
- Anyone providing:
 - Scientific inputs
 - Shared unpublished results
 - Provided equipment
 - Participated in discussions

What Should Be Acknowledged

•Essential Items to Acknowledge:

• Quotations:

- **Direct Quotations:** Actual words/sentences (use quotation marks, proper acknowledgment).
- **Indirect Quotations:** Summaries/paraphrases (acknowledge with name and date).
- *Note: Direct quotes are rare in engineering technical writing.*

• Ideas, Facts, Paraphrasing.

• Funding Organizations: Full details of program and grant number.

• Oral Discussion or Support.

• Laboratory and Computer Work.

• Scientific/Technical Guidance: From individuals (e.g., discussions, shared info).

• Assistants, Students, Technicians: For experimental/theoretical help.

• Use of Services/Facilities: From unaffiliated centers/organizations.

•Example of Grant Acknowledgment: *(Include the example from your text here)*

Specific Acknowledgment Considerations

- **Reviewers:** Many journals discourage thanking reviewers (to avoid favoritism).
- **Previously Presented Results:**
 - **Journal Abstracts:** Provide suitable citation.
 - **Scientific Meetings/Symposiums:** Provide relevant information (gathering name, year, location, full date).
- **Benefits of Proper Acknowledgment:**
 - Demonstrates researcher integrity.
 - Encourages continued collaboration.
- **Consequences of Failure to Acknowledge Funding:**
 - Discontinuation of current funding.
 - Ineligibility for future funding.

Acknowledgments in Books / Dissertations

- **Placement:** Usually at the beginning, after the table of contents.
- **Length:** Longer and more detailed than in journal papers.
- **Purpose:** To thank all contributors to the extensive research work.
- **Best Practices:** Concise manner, avoid emotive language.
- **Common Acknowledgments:**
 - Main supervisor, second supervisor
 - Peers in the lab, other academic staff
 - Technical/support staff, colleagues from other departments
 - Other institutions/organizations, former students
 - Family and friends

An example of acknowledgment of grant received is as follows:

Acknowledgments:

This research work was funded in part by the Extra Mural Research Funding 2014–17 (Individual Centric) of the Department of Science and Technology (DST), Govt. of India.

The following are often acknowledged in these types of acknowledgments: main supervisor, second supervisor, peers in the lab, other academic staff in the department, technical or support staff in the department, colleagues from other departments, other institutions, or organizations, former students, family, and friends

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 vs. Acknowledgments

•Dedication:

- Almost exclusively used in larger documents: books, theses, dissertations.
- To whomever the author wishes to dedicate the work (e.g., family, friend, pet, deity).
- Can coexist with acknowledgments.

•Acknowledgments:

- For those who specifically *helped* with the work (editing, moral support, etc.).
- Length correlates with document length (e.g., technical reports longer than journals, shorter than dissertations).

Conclusion

•Recap Key Takeaways:

- Strategically crafted **titles and keywords** are vital for discoverability and citation.
- **Knowledge flows** through intricate citation and collaboration networks.
- **Data citation** is crucial for proper credit in data-intensive research.
- Adhering to **citation styles** ensures consistency and integrity.
- **Acknowledgments** are essential for recognizing contributions and maintaining research ethics.

•**Final Thought:** Investing time in these aspects enhances the impact and visibility of your research.

