RAMAIAH
Institute Of Technology

DEVOTION TO ENLIGHTENMENT

RESEARCH METHODOLOGY AND INTELLECTUAL PROPERTY RIGHTS

Course Code: AL58

Course Outline

Unit I

Research Methodology

Introduction: Meaning of Research, Objectives of Research, Types of Research, Ethics in Research, Types of Research Misconduct.

Literature Review and Technical Reading: New and Existing Knowledge, Analysis and Synthesis of Prior Art, Bibliographic Databases, Conceptualizing Research, Critical and Creative Reading.

Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge flow through Citations, Acknowledgments, and Attributions.

Unit II

Research Design: Need for Research Design, Important Concepts Related to Research Design: Dependent and Independent Variables, Extraneous Variable, Variable, Common Control, Confounded Relationship, Research Hypothesis, Experimental and Control Groups, Treatments.

Experimental Designs: Introduction to Randomised Block Design, Complete Randomised Design, Latin Square Design, and Factorial Design.

Unit III

Method of Data Collection: Primary and Secondary Data Collection.

Sampling Design: Sampling fundamentals, Measurement, and Scaling Techniques, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, and Types of Sample Design.

Data Analysis: Testing of Hypotheses: Null Hypothesis, Alternative Hypothesis, Type I and Type II Errors, Level of Significance. Procedure for Hypothesis Testing: Mean, Variance, Proportions. Chi-square Test, Analysis of Variance (One Way ANOVA), and Covariance (ANOCOVA)

Unit IV

Intellectual Property Rights

Introduction to IPR: Different forms of IPR, Role of IPR in Research and Development. TRIPS Agreement, Patent Cooperation Treaty (PCT).

Patents: Brief history of Patents-Indian and Global Scenario, Principles Underlying Patent Law, Types of Patent Applications in India, Procedure for Obtaining a Patent. Non Patentable Inventions. Rights Conferred to a Patentee, Basmati Rice Patent Case.

Unit V

Design: What is a Design? Essential Requirements for a Registrable Design, Procedure of Registration of a Design,

Trademarks: Essentials of a Trademark, Registration, and Protection of Trademarks, Rights Conferred by Registration of Trademarks, Infringements, Types of Reliefs, Case Studies.

Copyrights: Characteristics of Copyrights, Rights Conferred by Registration of Copyrights, Registration of Copyrights, Infringements, Remedies against Infringement of Copyrights, Case studies

Textbooks

1. C. R Kothari, Gourav Garg, Research Methodology – Methods and Techniques. New Age International Publishers.
2. Dr. B L Wadehra – Law relating to Intellectual property. Universal Law Publishing Co.

- Dipankar Deb, Rajeeb Dey, Valentina E. Balas “Engineering Research Methodology”, ISSN 1868-4394 ISSN 1868-4408 (electronic), Intelligent Systems Reference Library, ISBN 978-981-13-2946-3 ISBN 978-981-13-2947-0 (eBook), https://doi.org/10.1007/978-981-13-2947-0.

Reference Books

1. David V. Thiel “Research Methods for Engineers” Cambridge University Press, 978-1-107-03488-4

Course Outcomes

At the end of the course, the student will be able to:

1. **Possess** the knowledge of research and conduct a literature review**.**
2. **Apply** the knowledge of research design and design of experiments.
3. **Analyze** data collection methods, analysis, and sampling design.
4. **Understand** the global and Indian scenarios of patents and patent applications.
5. **Acquire** the requirements of registration and infringements related to trademarks, copyrights, and designs.

Course Assessment

- CIE- 30 Marks
- Quiz– 10 Marks
- Numerical Test-10 Marks

“Science is not belief, but the will to find out.”

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Research Methodology
AND
Intellectual property rights

Research Methodology

- Composed of two syllables “Re” and “Search”.
- “Re”=‘Again or over again or a new’ and
- “Search”=is the latter meaning ‘to examine closely and carefully’ or ‘to test and try’

Meaning of Research

Search for knowledge
Scientific and systematic search for pertinent information on a specific topic
An art of scientific investigation
Systematized effort to gain new knowledge
A movement from the known to the unknown.
It is actually a voyage of discovery

research comprises

- defining and redefining problems,
- formulating hypothesis or suggested solutions;
- collecting, organizing and evaluating data;
- making deductions and reaching conclusions;
- and at last carefully testing the conclusions to determine whether they fit the formulating hypothesis.

‘research’ refers

- The systematic method consisting of enunciating the problem, formulating a hypothesis, collecting the facts or data, analyzing the facts and reaching certain conclusions either in the form of solutions(s) towards the concerned problem or in certain generalizations for some theoretical formulation.

OBJECTIVES OF RESEARCH

- To gain familiarity with a phenomenon or to achieve new insights into it.
- To portray accurately the characteristics of a particular individual, situation or a group.
- To determine the frequency with which something occurs or with which it is associated with something else.
- To test a hypothesis of a causal relationship between variables

MOTIVATION IN RESEARCH

- Desire to get a research degree along with its consequential benefits;
- Desire to face the challenge in solving the unsolved problems, i.e., concern over practical problems initiates research;
- Desire to get intellectual joy of doing some creative work;
- Desire to be of service to society;
- Desire to get respectability.

TYPES OF RESEARCH

- Descriptive vs. Analytical
  - Descriptive research includes surveys and fact- finding enquiries of different kinds.
  - In analytical research, the researcher has to use facts or information already available, and analyze these to make a critical evaluation of the material.

—Applied vs. Fundamental

  - Applied (or action) research: aims at finding a solution for an immediate problem facing a society or an industrial/business organization,
  - Fundamental(to basic or pure) research : mainly concerned with generalizations and with the formulation of a theory.

TYPES OF RESEARCH

- Quantitative vs. Qualitative:
  - Quantitative research is based on the measurement of quantity or amount.
  - Qualitative research, is concerned with qualitative phenomenon, i.e., phenomena relating to or involving quality or kind.
- Conceptual vs. Empirical:
  - Conceptual research : related to some abstract idea(s) or theory.
  - Empirical research : It is data-based research, coming up with conclusions which are capable of being verified by observation or experiment. We can also call it as experimental type of research.

TYPES OF RESEARCH

- Some Other Types of Research:
  - One-time research or longitudinal research. In the former case the research is confined to a single time-period, whereas in the latter case the research is carried on over several time-periods.
  - Field-setting research or laboratory research or simulation research, depending upon the environment in which it is to be carried out.
  - Clinical or diagnostic research. Such research follow case-study methods or in-depth approaches to reach the basic causal relations.
  - Conclusion-oriented and decision-oriented. While doing conclusion-oriented research, a researcher is free to pick up a problem, redesign the enquiry as he proceeds and is prepared to conceptualize as he wishes.

Ethics in Research

- Provides guidelines for the responsible conduct of research.
- Some ethical principles are
  - Honesty
  - Objectivity
  - Integrity
  - Carefulness
  - Openness
  - Respect for Intellectual Property
  - Confidentiality

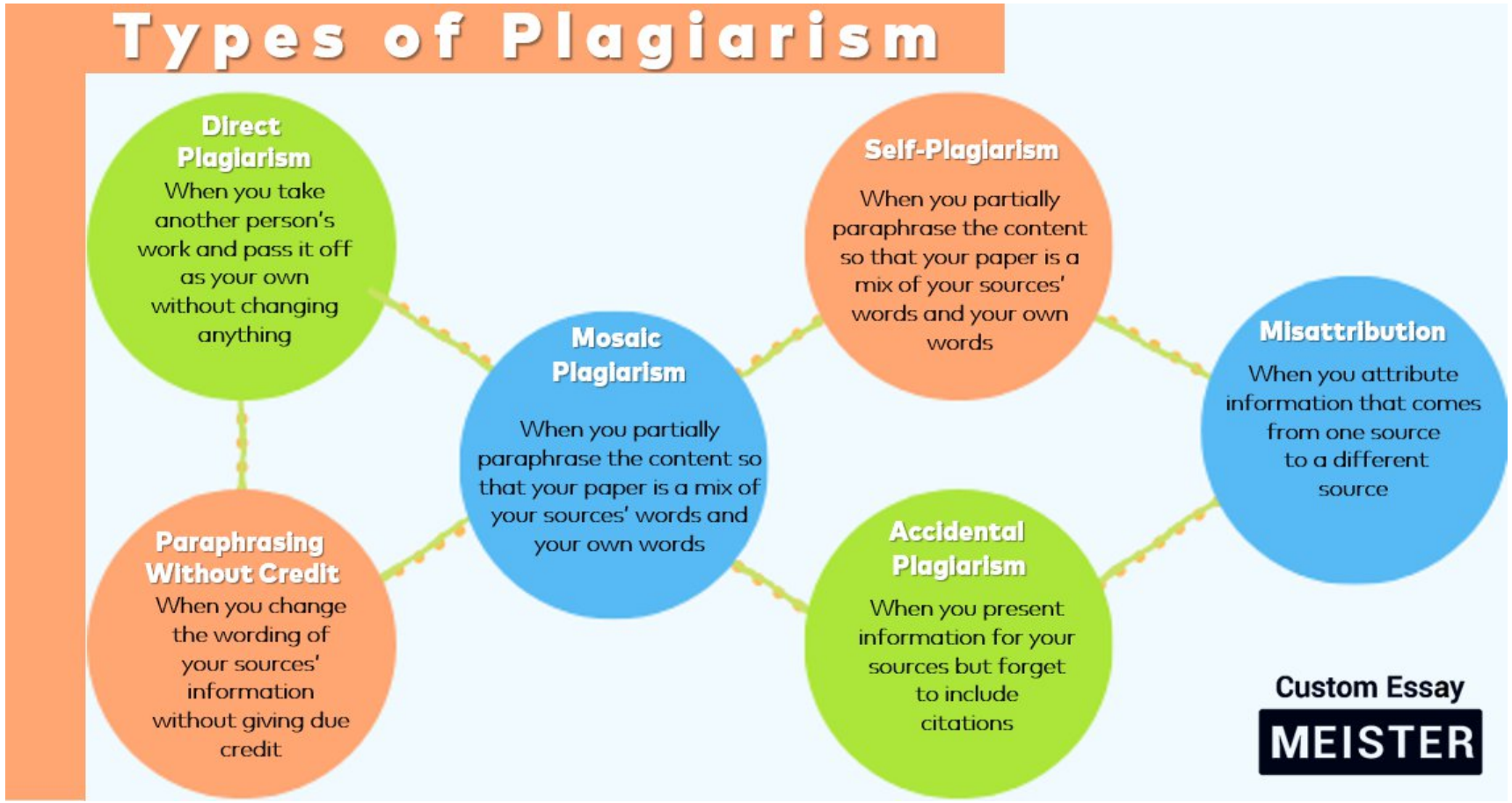
What are research misconducts?

Research Misconduct can be characterised as actions or questionable research practices that fall short of the standards of ethics, research and scholarship required to ensure that the integrity of research is upheld. It can cause harm to people and the environment, wastes resources, undermines the research record and damages the credibility of research.

TYPES OF RESEARCH Misconduct

- **Fabrication** - making up data or results and recording or reporting them.
- **Falsification** - manipulating research materials, or changing or omitting data or results such that the research is not accurately represented in the research record.
- **Plagiarism** - the appropriation of another person's ideas, processes, results, or words without giving appropriate credit.
- Research misconduct does not include honest error or differences of opinion.

Types of Plagiarism



Literature Review and Technical Reading

New and Existing Knowledge

- New knowledge in research can only be interpreted within the context of what is already known, and cannot exist without the foundation of existing knowledge.
- One can infer that the knowledge that is sought to be produced does not yet exist by describing what other knowledge already exists and by pointing out that this part is missing so that what we have is original. To do this, one again needs the existing knowledge:
  - the context
  - the significance
  - the originality
  - the tools.

A literature review

A literature review should be able to summarize as to what is already known from the state of the art, detail the key concepts and the main factors or parameters and the underlying relationships between those, describe any complementary existing approaches, enumerate the inconsistencies or shortcomings in the published work, identify the reported results that are inconclusive or contradictory, and provide a compulsive reason to do further work in the field.

A good literature survey is typically a two-step process as enumerated below:

1. Identify the major topics or subtopics or concepts relevant to the subject under consideration.
2. Place the citation of the relevant source (article/patent/website/data, etc.) in the correct category of the concept/topic/subtopic (with the help of a √, for example).

Analysis and Synthesis of Prior Art

- A researcher should analyze the following steps:
  1. Understanding the hypothesis,
  2. Understanding the models and the experimental conditions used,
  3. Making connections,
  4. Comparing and contrasting the various information, and
  5. Finding out the strong points and the loopholes.

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.
  - Web of Science
  - Google and Google Scholar

Conceptualizing Research

- Significant problem,
- The knowledge that will address it,
- A possible way to make that new knowledge.

Critical and Creative Reading

- Reading a research paper is a critical process.
- Critical reading is relatively easy.
  - It is relatively easier to critically read to find the mistakes than to read it so as to find the good ideas in the paper.
- In creative reading, the idea is to actively look for other applications, interesting generalizations, or extended work which the authors might have missed?
- Are there plausible modifications that may throw up important practical challenges?

Citations: Functions and Attributes

- Citations (references) credit others for their work, while allowing the readers to trace the source publication if needed.
- A researcher needs to cite each source twice:
  - in-text citation, in the text of the article exactly where the source is quoted or paraphrased,
  - a second time in the references, typically at the end of the chapter or a book or at the end of a research article.

Citations: Functions and Attributes

- There are three main functions of citation:

1. Verification function: Authors have a scope for finding intentional or unintentional distortion of research or misleading statements. Citation offers the readers a chance to ascertain if the original source is justified or not, and if that assertion is properly described in the present work.
2. Acknowledgment function: Researchers primarily receive credit for their work through citations. Citations play crucial role in promotion of individual researchers and their continued employment. Many reputed organizations and institutes provide research funding based on the reputations of the researchers. Citations help all researchers to enhance their reputation and provide detailed background of the research work.
3. Documentation function: Citations are also used to document

Citations: Functions and Attributes

- There are certain cases when references do not fulfill the actual goal of citations and acknowledgments, and thus do not benefit the reader.
  - Spurious citations
  - Biased citations
  - Self-citations
  - Coercive citations

Impact of Title and Keywords on Citations

- The citation rate of any research paper depends on various factors including significance and availability of the journal, publication types, research area, and importance of the published research work.
- Other factors like length of the title, type of the title, and selected keywords also impact the citation count

Title

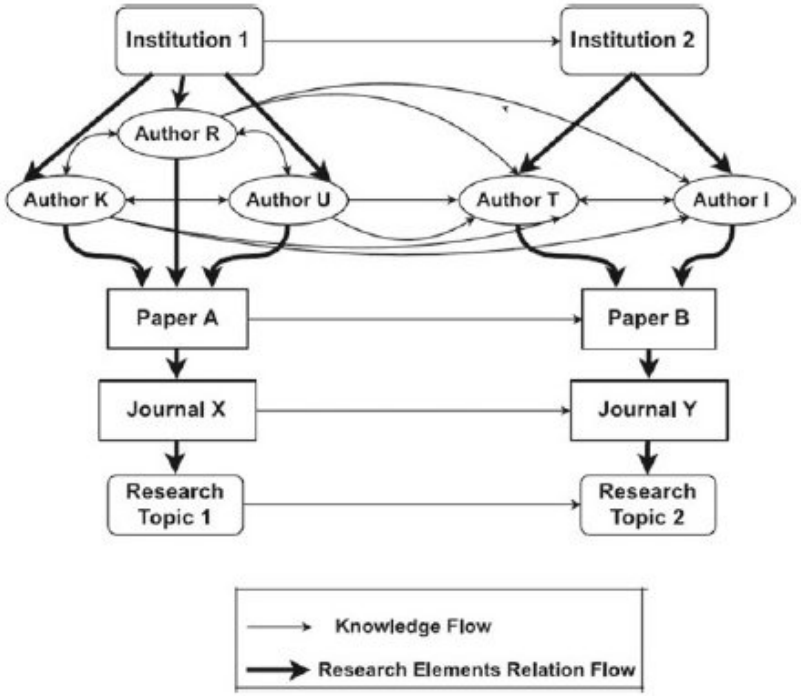
- Title is the most important attribute of any research paper.
- Title plays important role in marketing and makes research papers traceable.
- A good title is informative, represents a paper effectively to readers, and gains their attention.
- There are three different aspects which provide a particular behavior to the title:
  - types of the title,
  - length of the title,
  - presence of specific markers

Keywords

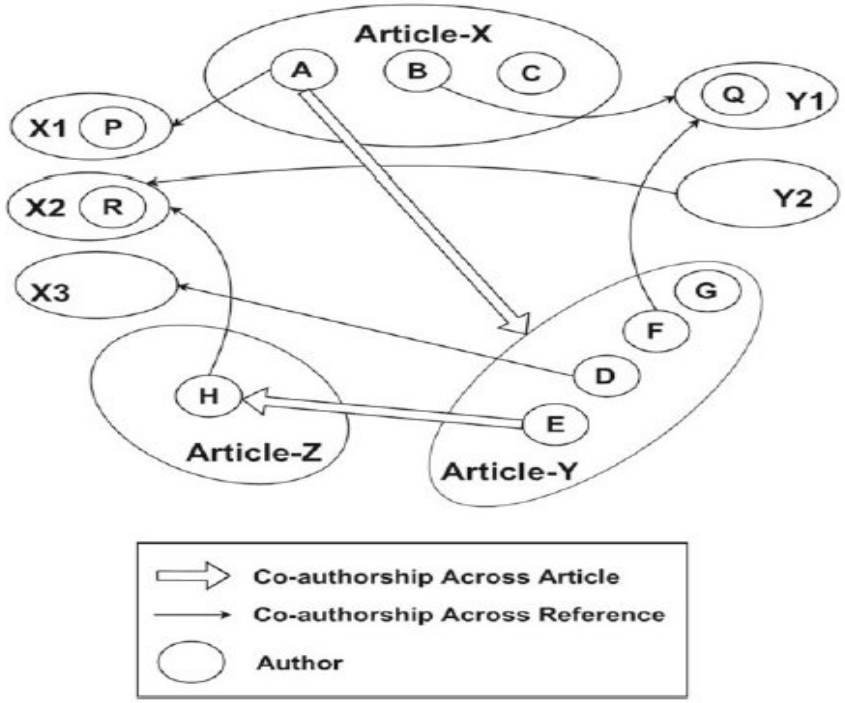
- Keywords represent essential information as well as main content of the article, which are relevant to the area of research.
- Search engines, journal, digital libraries, and indexing services use keywords for categorization of the research topic and to direct the work to the relevant audience.
- Keywords are important to ensure that readers are aware about research articles and their content.

Knowledge Flow Through Citation

- Knowledge flows through verbal communications, books, documents, video, audio, and images, which plays a powerful role in research community in promoting the formulation of new knowledge.
- In engineering research, knowledge flow is primarily in the form of books, thesis, articles, patents, and reports.
- Citing a source is important for transmission of knowledge from previous work to an innovation.
- Production of knowledge can be related to the citation network.
- 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.



Citing Datasets



Styles for Citations

1. ASCE style (American Society of Civil Engineers)
   - Reference list: this part is to be placed in the bibliography or references at the end of the article or report. A template with example for the same is given below:

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.

Styles for Citations

- 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.

3. ASME style (The Association of Mechanical Enginee

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.

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.

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.

Acknowledgments in Books/Dissertations

- A page of acknowledgments is usually included at the beginning of a thesis/dissertation immediately following the table of contents.

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 Shanshan 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 parents, Spouse, Children, the best friend, the pet dog, or Almighty God.

"Research is creating new knowledge."