A Step by Step Guide for Choosing Project Topics and Writing Research Papers in ICT Related Disciplines

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Abstract. ICT is fast-growing and changing field. A lot of researches are being done in various area of ICT, and results are presented in various platforms like conferences, journal and books. This is common observations in the publications from developing countries (especially in sub – Saharan africa) are not being published in reputed and established publishers even their technical/experiments are good. This is due to lack of several factors including professional presentation, the novelty of the topic, quality of literature review etc. This work guides final year bachelor's students, PG students (masters and PhD) and young researchers, especially working in computing-related disciplines, on how to convert their project works into quality publications. The authors provide details on how these researchers can select suitable project topics, do a proper review, write up the key components of a paper and present their results in an appropriate form (that is, writing style starting from abstract to conclusion). This paper also presents and guides on how to write various types of review papers.

Keywords: ICT · Project topic selection · Paper writing · Structure of research paper · Review paper

1 Introduction

Most of the students in their final year of study at bachelor, master and PhD level need to submit project work. For completing these projects, students work hard and put in effort to ensure their project is both innovative and novel to an extent. Based on the requirements of their various disciplines, the form of projects may differ. For instance, engineering and computer science students are required to produce hardware/software products along with the thesis. After the completion and presentation of the project, most of the students leave the institution, and these project reports are often kept in the archives of the department and / or the university library. In most cases, nobody reads and adequately handles those projects for further processing.

One of the issues in bachelors and master's projects is that after submission and final defence (final examination), neither student nor supervisor care to transform the work into articles that can be published in appropriate outlets. As a result, every year, millions

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of bachelors and master's project reports are being wasted without any outcome in terms of publications. However, suppose proper attention is given to the publication of the outcomes of each of these projects, it will not only boost and encourage the students but also help the supervisors and affiliated institutions in increasing their research profile.

The second issue is the quality of publication from masters and PhD theses. One can easily observe especially in developing countries that quality of publications from Master and Ph.D thesis are in low profile outlets. By considering these pitfalls, this work presents how to motivate and guide the students starting from the beginning of the project to work systematically so that it will be easy for them to extract the work for quality publication from their project. This proposed work provides the guidelines for the students for ICT and computing-related disciples. Researchers from other disciplines can also follow these guidelines, but writing and presentation style differs from discipline to discipline.

The paper is structured in five sections. The next section describes how to choose research/project topics. Section 3 prescribes ways to start working on collecting useful literature for review. In Sect. 4, the various components of the paper are described in detail. Section 5 discusses the types of review papers, and Sect. 6 summarize how to search quality journals and conferences, and finally, Sect. 7 concludes the paper.

2 Selection of Topic/Area of Research

It is a general observation that students often struggle with the selection of topics. At this point, it is essential that while selecting the topics, students are careful to follow the points highlighted in this section when deciding on a topic. It should be noted that these points are applicable to all levels of students doing projects. However, depending on the degree to be obtained (bachelors, masters or PhD), the rigour of work required may vary.

2.1 Area of Interest – Should be of Your Interest

The student should identify his/her areas of interest in the emerging regions of their field. Projects at both bachelors and master's level will give students a chance to gain in-depth knowledge of the problem in a particular area. It is up to the students to explore by themselves the areas of their field where they can better perform and are interested in.

2.2 Problem depending on Duration of Project

Some of the projects take a long time to complete. So, it would help if students chose at a bachelors' level, a work they can complete in 3–4 months. At master's level, they should be able to complete it in 6–12 months, and for PhD, they should be able to complete in 4 years. Besides that,

- At bachelor level, the concentration may be more on product development and development of some framework and models.

- At Masters Level- the topic should be more specific. At this stage, the student is going to take a specialization in a particular domain. It is for this reason that students' proposal/work should be based on strong theoretical background and product development.
- Selection of topic at the PhD level is similar to the previous one (masters) except the depth of work done at PhD level will be much higher than master level. It is advisable that before selecting any topic at this level, students should ensure that they have a solid foundation of background knowledge or are willing to put in the effort to learn the same.

2.3 Hot Topics on Current Issues

It is crucial that students should choose problems in a current emerging area. It is highly advisable not to take a topic on which a lot of work has been done unless the student is certain they can make distinct contributions. In other words the student is fully certain what new outcomes will be produced that would make significant contribution to the existing body of knowledge.

2.4 Related to the Job Market

It is highly advisable to try to choose a project topic that is not only of interest but also an emerging area (hot topic). Students can also choose based on the job market especially where they target to apply their expertise. For example – some countries have more jobs in IT (Germany/USA) and computing than management (Canada). Most of the African countries require more attention to IT, health, security and education, good governance etc.

2.5 Long Term Vision for Your Carrier

This is a crucial point of consideration while choosing a topic at a master or PhD level. Several students prefer to select a topic in the research area of their supervisors. In such cases certainly, the supervisor would be more helpful in the whole duration of the work. However, it may not be beneficial to the student's future career, especially if the topic is not of little interest to the student. For example, while selecting a topic at master's level in computing-related disciplines, if a student plans to work in the industry then s/he may choose a topic related to a specific industry (IT, management, human resources even in the financial sector) instead of selecting a topic only to complete the project. In the future, a student can plan for an MBA or PhD in IT management. Similarly, for students in management information systems, social science, engineering at bachelor or master levels, they can choose Informatics for PhD.

2.6 Selection of Topic and Supervisor

Finally, and most important of all is for the student to find a suitable guide. The student must be careful, especially in a masters or PhD program. If you don't have proper

synchronization with your guide – you may lose your motivation and focus on your work. You should not only check the area of research work of your supervisor but also need to know how much he is available and helpful for students during project work. Students must bear in mind that in all academic institutions, they may find three types of professors/academicians. The first type is those who are excellent teachers in terms of teaching and problem-solving skills but they may not be good researchers (in terms of product development and research publication). The second type of academicians may be expert in innovation and product development and may not be expert in converting their innovative ideas into publications. The third type may be good researchers- they know how to transform creative ideas in publications form. Apart from the above three categories, students may also find some exceptional academicians who are great at teaching, product development or research administrators. A student needs a supervisor who will not only train the students but also motivate and boost them to perform their best and achieve their goals. These young students are full of energy, and they are ready to do ground-breaking research, but they need proper guidance and mentorship. To get such supervisors, students should devote time to explore their perspective supervisors on various social media, e.g. Google Scholar, ResearchGate, LinkedIn, Scopus etc. One more very effective way is to talk with multiple people (predecessors, teachers, other members of the department) before taking the final decision on your topic and supervisor. Students should not rely on one feedback but instead should base their choice on various multiple feedback.

3 Review of Literature

In the previous stage, the student got to select the topic and area of research. Now they have to perform an exhaustive literature review. This stage is an important stage of the whole project. After a careful literature review, a student may decide to change the proposed title of his/her project – or even change the area of research altogether. This is because at this stage the student will be able to know the recent developments and the most important is to find out gaps in existing works which will become the base of the student's proposed project. If the literature survey is not done thoughtfully, it is highly possible that a similar work has already been done and that the student is not aware of. By considering the importance of the literature review, it is highly recommended to explore various databases systematically.

3.1 Prepare Search String – This Can Be Done in the Following Way

The search for relevant papers can be done based in the following way:

1. Obtain significant keywords from the research questions (Which you have prepared before starting review);
2. Recognize different spellings and synonyms for the keywords;
3. Identify keywords in relevant papers
4. Use Boolean "OR" or "AND" to relate significant terms.

3.2 Search Selection Procedure

The search should be done on major databases. We can divide the search engine (databases) into 3 categories:

1. General databases
2. Specific publishers' databases
3. Databases need subscription

General Search Engine/Databases
Google is the most popular search engine. However, it is highly advised not to use the search results on google but instead **Google scholar**. This is because Google scholar provides results only from scholarly literature available on the internet. On the other hand, Google provides everything (academic/nonacademic). In this way quality of results that would be obtained from Google scholar is much higher than results from google. The following are the recommended sites for searching for scholarly work.

1. Google scholar - https://scholar.google.com
2. DBLP (for computer science) - https://dblp.org
3. PubMed (for health and medical sciences) - https://pubmed.ncbi.nlm.nih.gov/advanced/
4. PMC (is the free full text/open access branch of PubMed) - https://www.ncbi.nlm.nih.gov/pmc/advanced

There are several other search engines like Microsoft academic research, Academic info, etc. (https://www.lowcountrygradcenter.org/the-6-best-search-engines-for-academic-research/), which you can choose based on your requirements and need. Here, we are only providing some of the popular and useful ones. Authors can also find more in their specific areas.

Specific Publisher Databases
It is always good to perform your search on specific publishers' website, which is most appropriate for you. For example, computer science and engineering disciplines, IEEE Xplore, ACM, Science direct will be a right choice for search. Some of the most renowned publishers and their website are given below.

5. Science Direct/ Elsevier, https://www.sciencedirect.com
6. IEEE Xplore- https://ieeexplore.ieee.org/Xplore/home.jsp
7. ACM- https://dl.acm.org/search/advanced
8. Springer digital libraries- https://link.springer.com/advanced-search
9. Wiley- https://onlinelibrary.wiley.com/search/advanced
10. Taylor & Francis- https://www.tandfonline.com/search/advanced
11. Sage Journal- http://methods.sagepub.com/Search

You can find more databases for health/medical science search databases such as - (https://paperpile.com/g/research-databases-healthcare/).

Databases Need Subscription
There are some databases which are more for indexing (Like Scopus and Clarivate Analytics (Web of Science)) but can also be used for searching. The search outcome from these databases is guaranteed to return quality materials because each work in these databases is already indexed and already passed from some quality checks. Both SCOPUS and Web of Science includes scholarly works (research papers, books, conference papers) from all disciplines. One of the options to access (free) Scopus is to review a paper of any Elsevier journal, and you will get SCOPUS to access for one month. Or contact one of your lecturers who are active in academics- s/he should have access.

Below are the websites of Web of Science(Clarivate Analysi) and Scopus

12. Scopus www.scopus.com
13. Web of Science- http://login.webofknowledge.com

Apart from the above official websites, you can also search relevant papers on social sites like

14. ResearchGate (www.researchgate.net),
15. Academia (https://www.academia.edu)

You can get a lot of research papers on ResearchGate which you cannot download from the publishers' website due to subscription issue. Several publishers allow authors to upload the last version of the accepted article (not published one) to upload on their own webpage for academic purpose and researchers available on ResearchGate and academia upload their papers.

Some useful tips during the search

Select the Most Appropriate 5–7 Databases
We have suggested 15 search databases for search. It is worth mentioning that it is not required to search in all of them. Instead, select 5–7 databases, which are most appropriate for your area of research. For example, we suggest for ScienceDirect, Google scholar and Springer for everybody and after then select 2–5 other databases. For engineering disciplines and computer science- IEEE Xplore and ACM and for medical and health, PubMed are appropriate databases. Based on the type of study, authors can increase or decrease the number of search databases.

Carefully Select Keyword
This is crucial for consideration while searching on these databases. Select the most appropriate keywords for your searching, as also suggested in Sect. 3.1. You can see some of the studies of how the keywords are selected in Alli et al. (2019) [3] and Odusami et al. (2020) [13], Adewumi et al. (2016) [4].

Use the Advanced Search Option
It is recommended to use the search string for advanced search. See examples of advanced search option in IEEE Xplore, Taylor and Francis and Wiley in Figs. 1, 2 and 3. The

same search should be done in other databases. Most of the renowned publishers have both options- search and advanced search. Without searching on advances search, you may not get the most relevant papers.

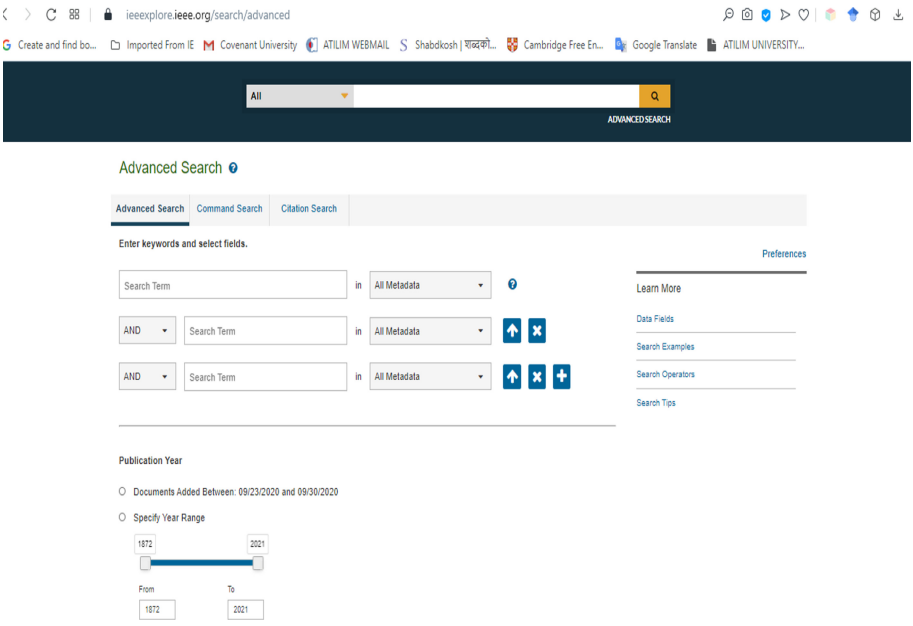

Fig. 1. Advanced search option on IEEE Xplore

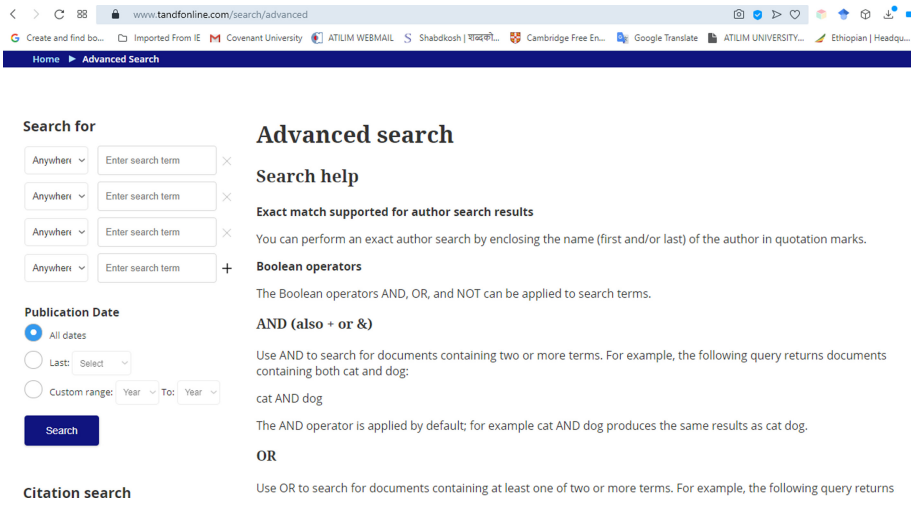

Fig. 2. Advanced search option on Taylor and Francis

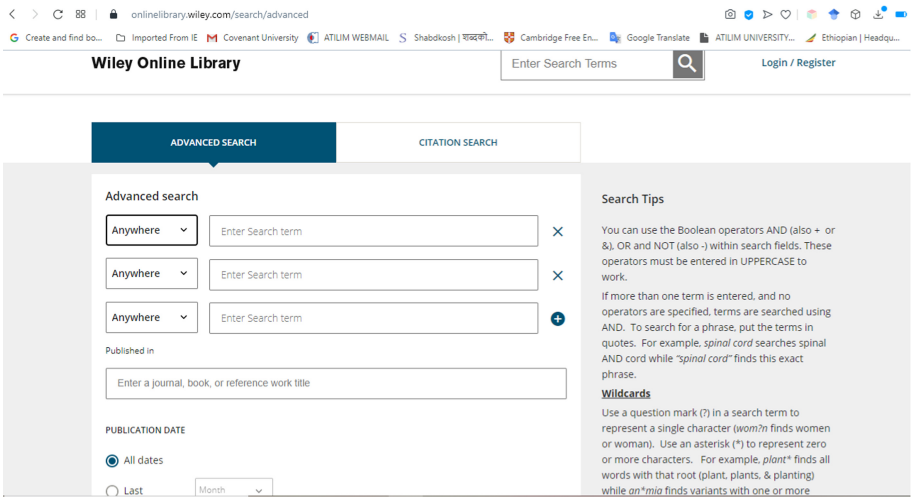

Fig. 3. Advanced Search Options on Wiley

You Don't Need to Download all the Papers

After an initial search, you may find 100–1000 or sometimes more papers depending on your search string. Read the title and abstract (both are freely available) on major publishers' website and afterwards decide if you need a full paper or not. If search result gives you more than a thousand of works in that case check that (1) you selected the most appropriate keywords and (2) selected proper duration/years for search. Depending on your study, duration of search for the published paper during last 5, 10, 20 years or all years.

Don't Worry if You Don't Have a Subscription

Searching in major databases are free, but you may have an issue of downloading. First, search the same paper on ResearchGate, you may get it if the author uploaded their final version. Another option is to explore your paper on Sci-Hub- https://scihub.wikicn.top (please check ethical and legal issues before you use it). If you do not get at researchgate and scihub then, simply request the corresponding author by stating that his article is essential for your work and you need his/her valuable work for completing a literature review and will also use in further study. In most cases, the author will send you the paper for increasing citation of his work (you are going to cite his/her work in your all incoming related articles).

4 Components of Paper

4.1 Title of the paper

The title of the article should be concise, short, clear and self-explanatory. Do not use a general title or one that is similar to available ones. As the beauty of a good title is its uniqueness. By reading the title, the reader can easily understand what a unique solution is provided in work. Avoid question mark and lengthy titles. In general, the title should be 4–12 words (not very strict) and also contain some keywords of the work.

4.2 Abstract

Usually, an abstract should not be too short or too long and should contain all the essential information. The typical size of an abstract should be of 200–300 words. However, it can vary from journal to journal and field of study. The following components should be contained in an abstract

Background- Provide 1–3 lines of the background and main reasons why you are doing that work (which existing problem you want to solve?).

Aim/Objective of paper- Clearly mention in 1–3 lines, the main aim/objectives of the paper.

Methodology- What methods are you applying to achieve your aim and objectives. The methodology may contain 1–4/5 lines depending upon the various methods/techniques used on the work.

Results- Provide quantitative results (if possible) which you got in your experimentation/study. This section should also be 1–3 lines.

Conclusion- What is the impact of your research.

Typically abstract should be written in one paragraph (200–300 Words) containing all the above components. The name of components may be changed in various disciplines, and types of papers (including review papers). It is a common observation that authors write 80% of the abstract as background, and in the last one-two lines, they write the aim of the paper, which is a bad practice. In all types of research papers abstract should contain purpose, and research problem, methods used to solve the problem, results and significant findings (similar to the provided headings). In summary, the abstract should show evidence to clarify the scientific contribution of the paper. Authors should include qualitative results that are investigated and conclusion based on it (results) so that the reader ends the abstract with the knowledge of what is the significant scientific contribution and the "concrete" conclusions.

Never do in the abstract:

- Citation of any reference
- Citation of any Table of Figures
- Avoid formula and abbreviation(s)

4.3 Introduction

The introduction is what and why the work is done. In general, the introduction should have 3–6 paragraphs depending on the type and length of the paper.

- In the first paragraph, you can introduce the topic by providing the background and write why this topic is important?
- In the second paragraph, you should provide a brief review of previous researches (relevant literature). You should always paraphrase relevant facts from the scientific literature, citing the sources to support each statement. You should also provide the gaps in the existing works.

- In the next paragraphs (3–5)- you should provide the different techniques and works and identify why are they used and what are the gaps in existing works. **Based on the gaps, you should give solid reasons(motivations) why you took/worked this project**. **It is always recommended to summarize your aim and objectives and provide research questions to be addressed in the work/project** (depending on the type of work) in the introduction section.
- In the last paragraph, always summarize the structure of the whole work. For example, in the present work, Sect. 2 summaries how to select the topics. Section 3 provides a systematic way of searching in various databases. Section 4 provides the various components of a normal paper.

4.4 Literature Review/State of the art

A literature review follows by a brief description of collections of articles with their pros and cons and finally the conclusion which also reflects gaps in the field (in general)- which becomes your motivation – reason of the proposed work. However, if the literature itself is the main topic of the project/work, you should require a different approach for presenting the complete literature review. Additionally, various types of review papers exist in the literature, which is summarized in the next Sect. 5. In this section- we present the writing style of literature review which are part of standard research articles.

In the introduction section, you have summarized the brief review on most important literature on the topic and gaps in the field in general. In this section (literature review), the student should provide all the available related works bearing in mind that s/he has to present the pros and cons of each work in the student's own words with proper citation.

It is always better to summarize the findings of the literature review in table form. The table should provide a quick and fast view of the student's review work. All the relevant and significant points of each considered article should be the content of the table.

At the end of the literature review section, the student should conclude the significant outcomes of the literature review. Here, the student can also mention the gaps in the field of research and based on that, his/her major reason for the proposed work.

Note- this section can also be sifted after methodology/ experimentation section where you will provide related work and then compare with your findings with others.

4.5 Materials and Methods/ Research Methodology/Proposed Work/Solution (Design/Framework/Model)

After the literature review section, this section will present the student's significant contributions. This section is the heart of any paper and demonstrates how the student has solved the problem.

The proposal and implementation/experimentation of a student's work depends upon the type and field of work. Also based on the type of paper, this section can be structured differently. For example, in theory, papers, the student would have to present a

formal/mathematical proof. However, in empirical papers, the student provides quantitative and qualitative analysis and, in some product development papers show algorithms, prototype implementation. Please search and follow some article in your area on ScienceDirect(https://www.sciencedirect.com)

Simple tips/suggested steps-

Demonstrate the research methodology- A design of the flow of whole activities of your work.

Demonstrate your proposed method- Framework, algorithms, design of your proposed method

Demonstrate the experimentation and implementations – provide all experiments and implementations

4.6 Evaluation and Validation

After presenting your proposed model and implementation, you have to evaluate and validate your work. The way of evaluation and validation again depends on the area of research and type of article. For example, for software engineering experimental works- a student would have to prove theoretically (based on some established criteria) and empirically (mostly from practitioners). In computing related research, usability evaluation is one of the criteria for assessment and validation.

4.6.1 Comparison and Related Work

The worth of any work cannot be proved if it is not compared with other similar works. In this section first, you have to summarize the existing works which are very close to your work, and then you will compare your proposed work with similar studies and show how your work is better than the existing works. Demonstrate clearly what is similar and what are differences. Also never try to criticize negatively other's work to prove your work as best- this is a bad practice- your comparison should be made objectively and in natural ways.

Note-It is possible that you can provide related works here instead of giving the same after the Introduction section.

Simple Tips/Steps-

- Provide a table which will evaluate all similar works with your proposal.
- Provide a comparison of experimental results by tables and graphs.
- Explain the comparative results shown in tables and figures.

4.6.2 Result and Discussion and Limitation of work

In this section, you need to discuss the experimental results, comparison and prove that your proposal (solution) solved not only the problem but also contributed in the field.

Limitation of your study and work should be outlined in this section.

Note- You may find specific guidelines for presenting experimental works and evaluation and validation. For example, to present the case studies – Runeson and Host 2009) [15] presented specific guidelines which are applied in several papers (Misra et al. 2014 [9]).

4.7 Conclusion and Future work

This section concludes your whole work. Be specific and point out your key findings. Bear in mind that the conclusion should be based on quantitative findings (not only theoretical findings).

Usually a conclusion should have 2–3 paragraphs. First and second paragraphs contains significant findings and achievements of your work, and in the last paragraph, you have to give ideas about future work. Future work can include your incomplete work, an extension of your work or some major task in another similar area of research. The future work always gives a chance to other researchers to glean ideas from what you have done and possibly extend your work.

4.8 References

This section typically (mostly) comes without numbering (of this section) so do not give any number to this section. You have to cite all references in order based on a specific style, e.g., MLA, APA, IEEE and several other styles based on journal and publishers where you plan to submit.

Simple Tips-

- Always use some referencing software. There are several available free and by subscription (https://elearningindustry.com/12-best-free-online-bibliography-and-citation-tools).
- If you cannot find any referencing software on internet, please use inbuilt MS-OFFICE Reference.
- Don't use Wikipedia as referencing.
- Avoid using references of local newspapers, local websites and contents from blogs unless they belong to reputed organizations- like IBM, Microsoft.
- Always mention last accessed whenever you give reference to a website.

4.9 Appendix

This is an optional section and can usually be used if there are some extra materials which are required for the paper but could not be accommodated in the main text. The contents in the Appendix may be supporting documents or some Figures and Tables containing useful information which could not be included in the main text can also be part of this section.

5 Types of Review Papers

While you start working on a project, your first job is to do an exhaustive review to know the real gaps in the field of your proposed topic. Based on experience, there is a huge possibility that if you are seriously reviewing the literature, you may publish several papers as review articles. Based on this, we are giving some examples of various types of review papers, e.g. comment paper (Misra and Kilic 2006) [10], review paper (Misra,

2010 [12]. Misra and Adewumi 2014) [11], meta-analysis (Odusami 2020) [13], survey (Oliveira et al. (2019) [14], systematic literature review (Adewumi et al. (2016) [4]. There are specific guidelines for review papers in each discipline (Tawfik et al. (2019) [16], Denyer and Tranfield, (2009) [7], Kitchenham, 2007, Biolchini et al.(2005) [6]). For the ease of students -a framework of the systematic way for the selection of articles is given in Appendix Fig. 4.

Example/Case Study - We are taking an example of an author (Dr. Adewole Adewumi) how he was able to publish various review papers during his PhD work.

5.1 Comment Paper

On the serious evaluation of literature, you may find some serious gaps in the field, and if you are smart enough, you can publish a paper on these gaps. See the following example of a comment paper. In this paper the author's main focus was to develop a complete framework for the evaluation and validation of software measures. In initial studies (reviews) they observed that measurement theory which is based on fundamental principles of mathematics and physics could not be applied in software engineering and authors publish a comments paper on the same.

> *Misra, S., and Kilic, H. (2006). Measurement theory and validation criteria for software complexity measures. ACM SIGSOFT Software Engineering Notes, 31(6), 1–3.* https://www.researchgate.net/publication/220630991_Measurement_theory_and_validation_criteria_for_software_complexity_measures.

Note- if you are not confident and do not have strong evidence for criticizing already exiting theory, do not try to do it.

5.2 Review/Analysis Paper Paper

Usually, a researcher can start writing the review paper. As soon as the researcher goes into the depth of the subject, s/he will gain more and more knowledge and expertise in the field. At this stage, s/he starts evaluating papers and can present his observations in terms of a research paper – called a review paper. However, the review paper does not mean that you can accumulate 20–30 articles and summarize their significant work and present. **Still, you have to evaluate the articles critically and present your novel outcomes which are not provided in previous reviews.**

Some useful tips-

- Always use several Tables for summarizing your findings and comparison of articles.
- Create some criteria for evaluation on which you will evaluate each paper. These criteria may be your major contribution to the review paper.
- Include 30–50 references for normal review papers (Total no of words 5000–7000).

As we mentioned earlier that we take a case study/example of an author for his journey to complete his PhD thesis. In his initial reviews, he presented a comparative study of 4 open-source software quality models and published in Elsevier conference.

"Adewole Adewumi, Sanjay Misra, Nicholas Omoregbe & Luis Fernandez-Sanz' A Review of Models for Evaluating Quality in Open Source Software', Proceedings of 2013 International Conference on Electronic Engineering and Computer Science, IERI Procedia Vol 4 (2013) 88–92 ***(Elesvier).*** http://www.sciencedirect.com/science/article/pii/S2212667813000178*"*.

In the second review paper, he evaluated the existing open-source quality models against ISO 25010.

"Adewole Adewumi, Sanjay Misra, and Nicholas Omoregbe, Evaluating Open Source Software Quality Models Against ISO 25010. Proc 15th IEEE International Conference on Computation and Information Technology, pp.872–877, 2015. https://www.researchgate.net/publication/308848262_Evaluating_Open_Source_Software_Quality_Models_Against_ISO_25010*"*.

In his third review paper, he added more models and based on the evaluation of models; he proposed a new framework/criterion for selecting the best quality model.

"A. Adewumi, S. Misra, and N. Ikhu-Omoregbe, 'Quantitative Quality Model for Evaluating Open Source Web Applications: Case Study of Repository Software', 2013 IEEE 16th International Conference on Computational Science and Engineering (Sydney Australia), pp.1207–1213."

https://www.researchgate.net/publication/261661037_Quantitative_Quality_Model_for_Evaluating_Open_Source_Web_Applications_Case_Study_of_Repository_Software.

5.3 Meta-Analysis and Survey

Meta-analysis is generally applied for medical, health and in bioinformatics research. This is also a type of systematic review and extracts quantitative results from the reviews. In these days, computer scientists also use meta-analysis for their reviews (Modupe et al. 2020). Haidich(2010) defined meta-analysis as "**Meta-analysis** is a quantitative, formal, epidemiological study design used to systematically assess the results of previous research to derive conclusions about that body of research. Typically, but not necessarily, the study is based on randomized, controlled clinical trials."

In meta-analysis review papers, the depth of analysis is much higher than the review/analysis paper. Quantitative interpretation or review results are presented by several tables and graphs.

Survey papers in computing disciplines are almost similar to meta-analysis. In both survey papers and meta-analysis, number of references are around a hundred, and results are presented by several Tables (10–20) and Figures (10–20).

Examples of meta-analysis and survey paper in both medical and computing are given below [1, 2, 13].

"Adeloye, D., Sowunmi, O. Y., Jacobs, W., David, R. A., Adeosun, A. A., Amuta, A. O., Misra S,…. and Chan, K. Y. (2018). Estimating the incidence of breast cancer in Africa: a systematic review and meta-analysis. Journal of global health, 8(1). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5903682/*"*.

"Odusami M, Misra S, Abayomi-Alli O, Abayomi-Alli A, Fernandez-Sanz L. A survey and meta-analysis of application-layer distributed denial-of-service attack. Int J Commun Syst. 2020;e4603. https://doi.org/10.1002/dac.4603*"*.

5.4 Systematic Literature Review

A systematic literature review (SLR) is the final version of any review process. It requires an exhaustive literature review in a systematic way. Anders Kofod-Petersen (2015) [5] defines systematic literature review as 'A systematic literature review is a formal way of synthesizing the information available from available primary studies relevant to a set of research questions.' It is also similar to the meta-analysis type of review, which requires a quantitative presentation of review results in various presentation formats (Tables, Figures, Graphs, etc.). It is prevalent to use statistical analysis of review results in SLR written in computer science and software engineering fields. Although necessary steps like the selection of articles, research questions, quantitative analysis are common steps in writing SLR in all discipline; however, different approaches are developed for other domains.

You can find the criteria for writing SLR in different disciplines on the following sites. These are only a few examples. Writing SLR in all fields (even domain and sub-domains) are fast-growing. It is highly advisable for students to find the most recent articles and new criteria while writing SLRs.

1. Medicine- gent.uab.cat › sites › gent.uab.cat.diego_prior › files

   https://tropmedhealth.biomedcentral.com/articles/10.1186/s41182-019-0165-6

2. Engineering- https://www.researchgate.net/profile/Pablo_Torres-Carrion/publication/323277902_Methodology_for_Systematic_Literature_Review_applied_to_Engineering_and_Education/links/5b6f04f245851546c9fb6004/Methodology-for-Systematic-Literature-Review-applied-to-Engineering-and-Education.pdf
3. Software engineering- https://www.cin.ufpe.br/~in1037/leitura/systematicReviewSE-COPPE.pdf
4. Business an dmanagement- https://link.springer.com/article/10.1007/s11301-018-0142-x
5. Education and social sciences- https://libraryguides.griffith.edu.au/c.php?g=451351&p=3333115.

An example of systematic literature Review in computing/software engineering is given below [4]. Bear in mind that nowadays, analytics has become more advanced and most of SLRs in computing are using statistical and other modern techniques which are not used in this example.

> *"Adewumi, A., Misra, S., Omoregbe, N., Crawford, B., & Soto, R. (2016). A systematic literature review of open source software quality assessment models. SpringerPlus, 5(1), 1936."*

6 After Completing Work-Searching of Conferences and Journal

Once you have completed paper, students are suggested to supplement their works with raw data, as well as uploading code to GitHub and following open research principle. There are several platforms provided by a renowned publisher like IEEE (https://www.ieee.org/about/ieee-dataport.html) and Elsevier who offer to upload your data.

Another significant issue is to where to publish your work. If you are only interested in publishing your work in quality outlets, then always search in the following databases:

- For Journals- search on the Web of Science- https://mjl.clarivate.com/search-results
- For Conferences and Journals- http://portal.core.edu.au/conf-ranks/

You can also search journals on SCOPUS, DBLP and other databases. Most of the renowned publishers also provide a Journal finder option where you can search an appropriate journal associated with a particular publisher. Some of links given below:

https://journalsuggester.springer.com
https://journalfinder.elsevier.com
https://authorservices.taylorandfrancis.com/publishing-your-research/choosing-a-journal/journal-suggester/
https://journalfinder.wiley.com/search?type=match
https://publication-recommender.ieee.org/home
https://www.pmid2cite.com/pubmed-journal-suggester

7 Conclusion

We have presented a simple systematic way of writing research paper extracted from MS and PhD thesis. These guidelines are only suggestions, and you have to apply them based on your type and size of paper and also area of research. Several section/subsections can be combined, for example, the literature review and introduction section, if you are writing a short paper. Similarly, proposed framework, experimentation/implementation, validation and comparative study can also be part of only one section if you are writing conference paper of 8–10 pages. You can also remove the literature survey and provide after your experimentation while making a comparison. You can also find several tips for writing papers on several websites.

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Disclaimer. Links and papers provided in the work is only given as examples. To leave any citation or link is not intentional.

Appendix

Systematic Way of Selection of Article for Review

The systematic review process and selection of the relevant articles at different stages is

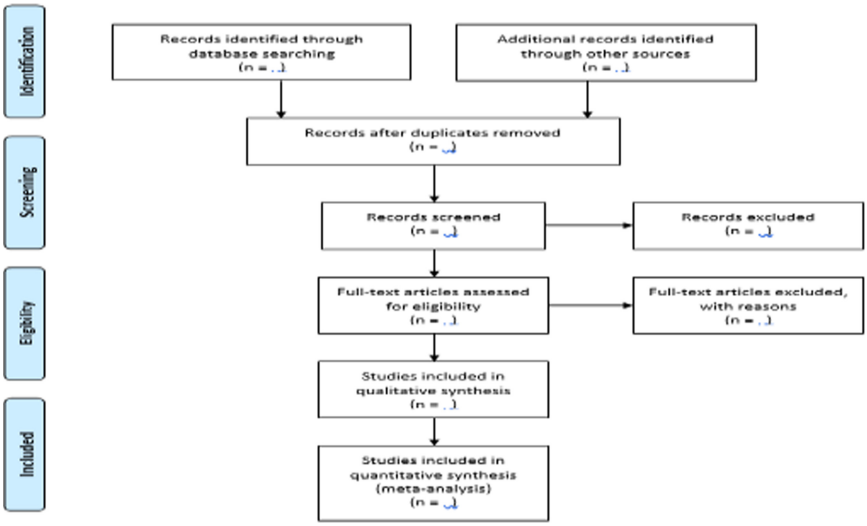

Fig. 4. PRISMA flow chart of the systematic review process and selection of the articles at different stages

illustrated in the PRISMA flow chart as shown in Fig. 4.

References

1. Adeloye, D., Sowunmi, O.Y., Jacobs, W., David, R.A., Adeosun, A.A., Amuta, A.O., Misra, S., Chan, K.Y.: Estimating the incidence of breast cancer in Africa: a systematic review and meta-analysis. J. Global Health, **8**(1) (2018). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5903682/
2. Adeloye, D., Adigun, T., Misra, S., Omoregbe, N.: Assessing the coverage of e-health services in sub-saharan africa. Methods Inf. Med. **56**(03), 189–199 (2017)
3. Abayomi-Alli, O., Misra, S., Abayomi-Alli, A., Odusami, M.: A review of soft techniques for SMS spam classification: methods, approaches and applications. Eng. Appl. Artif. Intell. **86**, 197–212 (2019). https://coek.info/pdf-a-review-of-soft-techniques-for-sms-spam-classification-methods-approaches-and-a.html

4. Adewumi, A., Misra, S., Omoregbe, N., Crawford, B., Soto, R.: A systematic literature review of open source software quality assessment models. SpringerPlus **5**(1), 1–13 (2016). https://doi.org/10.1186/s40064-016-3612-4
5. Anders, K.-P.: How to do a Structured Literature Review in computer science. https://www.researchgate.net/publication/265158913_How_to_do_a_Structured_Literature_Review_in_computer_science. Accessed 11 Oct 2020
6. Biolchini, J., Mian, P.G., Natali, A.C.C., Travassos, G.H.: Systematic review in software engineering. System Engineering and Computer Science Department COPPE/UFRJ, Technical Report ES, **679**(05), 45 (2005). https://www.cin.ufpe.br/~in1037/leitura/systematicReviewSE-COPPE.pdf
7. Denyer, D., Tranfield, D.: Producing a systematic review. https://gent.uab.cat/diego_prior/sites/gent.uab.cat.diego_prior/files/. Accessed 11 Oct 2020
8. Haidich, A.-B.: Meta-analysis in medical research. Hippokratia **14**(Suppl 1), 29 (2010)
9. Misra, S., Fernández, L., Colomo-Palacios, R.: A simplified model for software inspection. J. Softw. Evol. Process **26**(12), 1297–1315 (2014). https://www.froihofer.net/en/students/how-to-write-a-computer-science-paper.html
10. Misra, S., Kilic, H.: Measurement theory and validation criteria for software complexity measures. ACM SIGSOFT Softw. Eng. Notes. **31**(6), 1–3 (2006). https://www.researchgate.net/publication/220630991_Measurement_theory_and_validation_criteria_for_software_complexity_measures
11. Misra, S., Adewumi, A.: Object-Oriented Cognitive Complexity Measures: An Analysis, Handbook of Research on Innovations in Systems and Software Engineering. IGI Global, An Idea group publication, Cham (2014)
12. Misra, S.: An analysis of Weyuker's properties and measurement theory. In: Proceedings Indian National Science Academy, vol. 76, no. 2, pp. 55–66 (2010). http://www.insa.ac.in/html/journals.asp#insa
13. Odusami, M., Misra, S., Abayomi-Alli, O., Abayomi-Alli, A., Fernandez-Sanz, L.: A survey and meta-analysis of application-layer distributed denial-of-service attack. Int. J. Commun. Syst. e4603 (2020). https://doi.org/10.1002/dac.4603
14. Oliveira, M.R., Vieira, F.J.R., Misra, S., Soares, M.S.: A survey on the skills, activities and role of the software architect in Brazil. In: Misra, S., Gervasi, O., Murgante, B., Stankova, E., Korkhov, V., Torre, C., Rocha, A.M.A.C., Taniar, D., Apduhan, B.O., Tarantino, E. (eds.) ICCSA 2019. LNCS, vol. 11623, pp. 43–58. Springer, Cham (2019). https://doi.org/10.1007/978-3-030-24308-1_4
15. Runeson, P., Host, M.: Guidelines for conducting and reporting case study research in software engineering. Empirical Softw. Eng. **14**(2), 131–164 (2009)
16. Tawfik, G.M., Dila, K.A.S., Mohamed, M.Y.F., Tam, D.N.H., Kien, N.D., Ahmed, A.M., Huy, N.T.: A step by step guide for conducting a systematic review and meta-analysis with simulation data. Tropical Med. Health **47**(1), 46 (2019)
17. Kitchenham, B., Stuart, C.: Guidelines for performing systematic literature reviews in software engineering. (2007). http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=C6BEB78617FB06E26F622C8A9890080C?doi=10.1.1.117.471&rep=rep1&type=pdf