

**Course Name: Technical Communication for Engineers**

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**Week- 04**

**Lecture      04-      Keywords      and      Introduction      sections**

Hello everyone and welcome to new discussion and in this discussion we are going to discuss very briefly about keywords which are required just after the abstract or extended abstract because these keywords help in the search and today we are having digital search so that is why it is important. And secondly, we will be also discussing later part of this discussion about introduction section. After the title then abstract then keywords and the fourth point comes or fourth section comes that is introduction section. But very briefly, I would recap the things about abstract, extended abstract and synopsis that an abstract is the short version of your paperwork. but only when you are having limited space. Extended abstract in that case you are having more space you can have a little larger version of your work but not as short as abstract but not bigger than synopsis.

And synopsis is again a shorter version of your total manuscript or total work. and all details we have already discussed. So, if we start from small to large then abstract, extended abstract, synopsis or summary and then comes your full thesis or full manuscript. Now let us start about the keywords and introduction section.

So, first as we have already covered like title and topic. We have covered these terms abstract, synopsis, summary and extended abstract. Now we are going to discuss keywords which is highlighted here in the red colour. and then remaining things we will be discussing in due course of time. So, as we know the name implies keywords are words that capture the essence of your paper.

So, very important words which are part of your paper, part of your work, part of your manuscript, they become your keyword. And while discussing you know good topics and bad topics, I also discuss these points about keywords. Anyway, so keywords make the paper searchable especially in digital world ensure that one can get more citations. Everyone would like to see that their work, their research, their manuscript or product gets publicity and that is what the more citation here means. Therefore, it is important to include the most relevant keywords that will help other authors to find your paper, your work.

And as also said earlier, here I am using word paper that does not mean only a research paper. It can be a manuscript, it can be a research report, it can be an article, it can be a project report, any kind of write-up basically. So, here I am using a common term here paper but that does not mean only research paper. So, keywords mainly used for indexing and searching and that is if appropriate keywords have been given just after the abstract then this will help in the searching. Indexing because you know these keywords are used in searching but earlier times in libraries, we used to have index and those index we are also using keywords.

So, somebody is searching you know like application of remote sensing in civil engineering then definitely he is using keywords like remote sensing and civil engineering. So, by which one can search very easily. And these keywords should not be only few and should not be too many. Further these keywords should not be too narrow and should neither be too broad. Very appropriately you have to choose the keywords.

The purpose is that they are searched, your work is searched immediately in the digital world. Avoid abbreviations because like in title, avoid abbreviations. Similarly, in keywords, do not use unless an abbreviation is so popular that everyone almost understand then it is fine. Now this is another thing is that whenever you are going for publications or as per the requirements of the conference or publisher, they always check the guide for authors. These will help.

They may allow 3-4 keywords, some may allow 6-7 keywords. So, if they are asking for 5-6 keywords, you should get ready 5-6 keywords for the uploading. So, search for your keyword. The keywords which you have chosen, try to search those online. Would readers find your article using these keywords? These are the keywords.

Later on, you can also check. So, in order to learn from past mistakes, you can see whether the keywords which I have provided, others are finding my article or not or my paper or not. Or can I find the similar articles based on the keywords which I have used in my manuscript? So, these keywords can be used to search and that is the main purpose. So, when one writes a research paper or manuscript for publication, a series of keywords are required to be submitted and which give a quick indication of the area of research one is intending. I gave the example, remote sensing and civil engineering.

So, these are the 2 key areas because my work is application of remote sensing in some civil engineering work, likewise. So, one may also have certain keywords in the title. That is again very useful because if those keywords are used, your paper will be picked or will show at the top of the list. So, these keywords should also be included if possible

in the title as well. For example, if a paper about the implication of remote sensing then the word remote sensing may be included in the list of keywords as well as in title if possible.

So, few tips that will help to create relevant and effective keywords for your paper, manuscript. Think from point of view of the reader. What keywords would reader search for that help retrieve your article. You know nowadays when we go and do a Google search or similar kind of using search engines, we would like to put very relevant keywords. Instead of say keywords, if you write a sentence for searching something, you may not get good results.

But if you use appropriate very precise keywords, you may get good information which is what you were searching. So, that is the importance of keywords. Ideally, we phrase it to 2-3 words. Single word keywords are acceptable but they may lead to many false matches. For example, remote sensing.

Remote is also having different meaning. So, a combination of 2 words can also be chosen as keyword. Further to create effective keywords for your paper, keywords should contain words and phrases that suggest that topic is about. Also, include words and phrases that are closely relevant to your topic or work or the paper which is being there. For example, if a work is on flooding, use the word like river, inundation, submergence, of course flooding.

So, somebody who is searching about flooding or these things, immediately he will get your paper. Similarly, use variant terms of phrases that readers are likely to use in keywords also. For example, if a paper is about drought, can use the word like rainfall, vegetation, groundwater, etc. Because in a paper of drought, these words might be used because there might be less rainfall or no rainfall that is why drought is there. There might not be vegetation because of no rainfall or drought.

Similarly, the groundwater levels may be down. So, if somebody is searching, they will get the idea about this. So, sometimes variant terms or phrases or variant related words can be used which are indirectly related with the topic. Further, the full forms of shortened words or acronyms or abbreviations should be included as well. But as I have said, these should be only if they are very popular.

Now you know journals generally may ask keywords between 3 to 8 words. This is quite good range. However, 4-5 keywords are optimum and be ready most of the time with 4-5 words. Add more depending on the journal requirement. If journal allows up to 8 words, you can add few more words.

But those have to be very-2 relevant with your title and your work. Otherwise, unnecessarily your paper might not be searched others' paper. So, one has to be very-2 careful about that. Now, we come to the introduction section after these title, abstract, synopsis, summary, extended, abstract and keywords. Now, we come to the introduction section.

So, this is while writing an introduction sometimes may be hard, may be difficult, may be challenging because while writing a research paper is no exception. And you know there are difficulties in every section but introduction is equally hard in that sense. So, many-2 people will be struggling to how to write an introduction for a research paper. But I will give you idea or we will discuss that how you should start writing introduction of your work. So, in this section of writing, the work purpose is introduced.

What the work which have been done is being introduced in this section. So, the work purpose is introduced in the introduction section. Overall, it should be brief. This is always true in all the sections. Focused, informative and easily understandable.

Introduction are always placed at the beginning of a paper. So, the sequence is as I have showed. Title, abstract, keywords and then introduction, that has to be almost it is a part of every thesis, paper, manuscript or report. Introduction has to be there. You are trying to introduce the work which you have done in a very brief and focused manner.

So, this will guide the reader from the general subject area to the narrow topic that paper covers. What is the general subject of the area which has been dealt in the paper? For example, the introduction can explain scope, the topic one would be covering inside the manuscript in further subsequent sections. So, that can be included in the introduction. Introduction, the context, the background of the topic that why this topic is being discussed? Why research has been done? Why manuscript is being written? That is what the context here.

an importance about the work. So, why research matters in this context of an industry or a world or whatever you know. Why it is important? So, the importance should also come here. What was missing in earlier research or in earlier work that can also come here. So, therefore you can emphasize that why it is important. Because you know the research is ongoing all the time activity.

So, someone has done the work up to certain. Now you have made some improvements on that work or you have made improvement in the understanding about certain phenomena. So, that importance you should emphasize in the introduction section.

Further introduction as you know of a research paper is just important, it is critical also. So, readers may not know what research paper is about from the title.

Sometimes if title is not good, abstract is not sufficiently reflecting what the work has been presented in the manuscript then the first section is read after of course keywords is introduction. So, while reading the introduction, the reader should get complete idea about the work which has been presented in subsequent sections. And that is where the introduction comes in. That is why it is critical, that is why it is important. And for a good introduction, what are the requirements? That help your reader understand your topic s background.

Why that work is? Why that topic has been chosen for this kind of? So, try that the reader should navigate through the topic or work which you have done and trying to do it and navigating through starting from introduction section. Here in the introduction section, you can explain your research paper that it is worth reading and the reader should go and read the subsequent sections also. And also offer a guide for navigation the rest of the page, piece or manuscript or paper that you know you start in a manner that he remain interested to read the work which is being presented. And pick your reader's interest.

Always this is important. So, without a clear introduction, reader will struggle. That is why introduction is critical and very-2 important. Further, reader may be confused when they start reading the paper. So, if your introduction has not been written as we have just discussed, not incorporating the important points then he may get confused. He may not read further the manuscript and you are losing a reader.

That means you are losing indirectly a citation of your work. or in social media terms, it is like. The like which you are going to miss from one of the readers. You know you have to have in a manner the introduction written that he remain interested to read further sections. Sometimes after reading title, abstract and once they reach to the introduction section and when they do not find interesting, they may give up entirely and will close that journal or website and will not read at all.

So, that is what I said that you are losing a reader, you are losing a citation. Now introduction will ground them, will prepare them for in-depth research to come in subsequent section. So, that is the main purpose of writing an introduction. So, research paper introductions are always unique because for different works, the introduction is going to be different. For different work, the title is different, abstract is different, keywords are different.

So, the introduction. So, always these are unique things so that one cannot repeat the

same introduction for different types of work. So, after all research is original by definition. This is very important point. Only you would be able to publish if it has something new, nobility, originality.

So therefore, your introduction is also unique. Introduction contains 6 essential items. What are those items? We will discuss one by one. The first one, an overview of the topic. Why that has been chosen and what is the importance? So, start with the general overview of your topic. Narrow the overview until you address your paper's specific subject.

So, you start with an overview and slowly after few sentences, you can highlight what the specific subject or research or a topic has been dealt in that paper. Further then mention questions or concern you find about the case. If it is say related with the environment, then you should show the concerns here. You should try to bring the concerns related with environment, climate change or any disaster or any other thing.

And here, you would address them in the publication. Now second point here that prior research that is always required. Who has done research in that particular area? That narrow field which you have chosen. So, prior research should always be quoted because if you have not read, if you are not giving references then you are not going to have a large audience to read your work. So, your introduction is the place to review the others conclusions on your topic.

that is what important. Include both older scholars and modern scholars. That means older publications and almost anybody who has done work related with that then you should include their references as far as possible because no one can do exhaustively So, as far as possible, at least one should have all the papers which have published in that domain, that field in last 10-15 years. That should be part of your introduction as prior research. Because this background information will show that you are aware of prior research. You know many times it happens that a person or a group of people have written a manuscript and they submit to a journal.

And then editor or reviewers write that this similar kind of work has already been done and therefore, this paper is rejected. You might have done a very good work but if a similar work has not been quoted and you have not brought any novelty, new things then it is highly likely that it will be rejected. Therefore, it is necessary to first develop the background. What are the gaps, research gaps in a particular field? and try to fill those gaps by your own work and try to present in the same way that these were the gaps in this subject, in this discipline. And the paper has dealt with those gaps and have brought a new insights about the subject.

So, it also introduces past findings that I have already mentioned to those who might not have that expertise. So, that is very much required. Now third point here is rational for the paper, rational behind the paper. Explain why the topic needs to be addressed right now. That means you are talking about the importance And that has to be there all the time that why you have been doing.

So, explain the topic. If applicable, connect to the current issues because if it is not a historical research or some other things then try to connect. Like earlier, I gave example of climate change or global warming and other things. Then, what are the current problems? Current issues are there in front of us. Those should also be there in the introduction or background section. Additionally also show a problem with other works or former theories or as I have already said, reveal a gap in the research that the current understanding about this phenomena, this subject is having these gaps.

And my paper, our paper is trying to fill those gaps, trying to bring new insight about those gaps. That is what it should be highlighted in the background or introduction part. Now this, how you do it? A good rationale behind interest the readers and demonstrate why they must read the rest of the paper. Because you have attracted a reader starting from topic, abstract, keywords, now in introduction. So, his interest should continue to read after introduction the subsequent section.

So therefore, it is important that interest should be kept alive and that can only be done in this section of introduction or background. Now fourth point here, describe the methodology you used. In a very briefly, you may have sometimes we also prefer to have a complete section for data or methodology or separately also. But very briefly, methodology can also be described in the introduction or background part. you can recount the processes to make the paper more creditable because you are attracting the reader to read subsequent sections.

So, here you would briefly describe the methodology so that his interest continues. Lay out the goal and the questions one would like to address. Now, here you can explain or you can provide the details that what is the target of this study, what are the questions which have been raised or hypothesis and how it is going to be achieved. Now, reveal how research conducted. Very briefly in the introduction part that how that research has been conducted, how that experiment has been done, how the field data has been collected and also describe how results achieved.

Now avoid always repeating because results will be discussed in detail in result section. But very briefly, you can introduce the results here that these are the gist of results or

these are the important findings of your research work or paper or a product. Explain key choices. This is another important thing that also have these what are the choices.

Fifth point here is a thesis statement. That is your main introduction should end with a thesis statement. Thesis also one can say hypothesis or what the problem, what the question was. The statement summarizes the idea that will run through the entire research article. the focus of your work that is what the thesis statement meaning here is. That what was the idea on which the entire research work has been done, the article has been written and you want that the reader should keep focusing on that part.

And obviously, it has to be very straightforward and clear. This is true for all sections. It has to be clear, precise, brief, focused that is always required for all sections. Now the sixth point here is an outline. Introduction often conclude with an outline.

Now we are reaching the last part of introduction. Here we are saying that these are the achievements, these are the results or these are the findings of my work. And this layout about this outline or last part of your introduction should quickly review what is intended to cover in the subsequent sections. So, like if you go through a PhD thesis or dissertation, in the last that will bring the layout of the chapters and in which chapter what has been discussed. So, it becomes basically an important section where most of the things in very brief manner has come into that part that is introduction or background. So, you have to have a kind of a road map and important guiding the reader to the end of the paper or end of the thesis or manuscript.

So, this layout will guide him to read further or subsequent sections. Now an introduction for a research paper should include what your topic is focused on, how the research was conducted, what the findings are, how your paper contributes to the overall field, an interesting opening hook. means you are suggesting that these are still things to be explored further, opening hooks and a clear and concise thesis statement. And all these things should indirectly, we have discussed these things that you should introduce or focus first on the topic then how the research was conducted, what was the idea and how things have been solved or experimented. And then overall contributions in the field and interesting opening you are leaving with some that these are the things which can further be explored in particular area and a clear and concise thesis statement.

So, the introduction should be well written. That is true for all sections. So, for introduction section, well written set the reader up the rest of the paper. that means his interest should remain alive that he subsequently read the further sections. The introduction sets out your plan to say and provide a brief summary of the problem under discussion. It may also touch briefly on your conclusions because you are trying to attract



any reader. So, what were your findings, conclusions? Very briefly, you can introduce in the introduction section.

Further in this section, work purpose is introduced. Again, it should be brief, precise, focused, informative and easily understandable. and introduction to a research paper can be most challenging part of the paper to write. This point has come again for standard abstract keywords and also introduction. So, trying to convey that basically all parts are challenging. But by practice, by writing and discussing with your colleagues and having experience of publication, papers or research, one becomes quite comfortable.

So, this challenging part may not be there in later part of the case. But one has to start and initially, it may require lot of efforts to write the first manuscript of your life. And once if it is published, your confidence will rocket to sky, I tell you. And then you start writing sequence of manuscript very easily. So, the initial part may be challenging, may be difficult but not all the time. So, length of the introduction will vary depending on the type of research paper one is writing.

If it is thesis, it can go to many pages. If it is manuscript or research paper then it can be 2-3 pages maximum depending on what you are basically writing. An introduction should announce the topic, provide context, a rationale of work before stating the research questions and hypothesis. Well-written introduction sets the tone of the paper and that means you are keeping alive the interest of the reader. catch their interest, communicate the hypothesis or thesis statement here itself.

So, what type of information should be included in introduction? 3 main types. The established territory, say that the topic is about that we have been saying. Establish an issue that show why there need to be further research on the topic. why you have written, why you have done that work, you should show that these were the gaps and this paper, this research work trying to fulfill those gaps. So, that is important.

Introduce the current research which we have already discussed indirectly. Make hypothesis state the research questions. Three tips for writing your introduction. The first one is write the introduction last. This is very-2 important. You know sometime we start going in the sequence and may find difficult to write introduction in the beginning.

So, you may write introduction last or an abstract summary also in the last. Because an introduction is summarizing all the things learned from the research. And that is why it is recommended that it should be written last that it can feel good to get the preface done quickly and one should write the rest of the paper first. And this is basically a preface of your work or paper, manuscript, thesis. And one should find it easy to create a clear

overview.

Once you have written the thesis, then this part is written. You know what is in different chapters or different sections. So, overview can be presented in the introduction section. 3 tips for writing, include a strong quotation or story upfront but that does not mean it should feel boring or flat. Add a relevant quotations or surprising anecdote to the beginning of your introduction.

And this technique will pick the interest of your reader and leave them wanting more. And that means their interest will be alive. Further, be concise which we have been saying, discussing. So, very quickly research papers cover complex topics because in order to explain certain things, one may go in length in terms of paper. So, be concise because the reader should not deviate or should not lose the interest. concise sentences, check the confusing grammar or syntax and read the introduction loud to catch awkward phrases.

This is very important point which I want to emphasize here. Once you have written in isolation or you know in your home or office, you read that one because when reading that thing, you may find that the phrases are awkward. And therefore, they require editing. Another thing is that if you write small sentences, concise sentences, things can be explained much better way. Because when long sentences are written, they may be little confusing.

So, try always to write short sentences. Before finishing the paper, be sure to proofread. You should proofread. As I have said in the first lecture that whatever you have writing, if it is a manuscript, research paper or thesis, you should go through many times. This is what the proofreading means here. Before final print, before submission that is what is meaning here is proofread here. Similarly, I have also suggested for even sending an email, writing an official letter or sending a message through WhatsApp or X or whatever, you must read at least once after typing.

And if your point is not getting conveyed, you are not finding appropriate phrases or not words, so to others. Take the help of others because once it is dispatched, it is no more under your control. So, that will give a very bad impression about your work or about your personality.

So, that is a good practice to do the proofreading. If it is very-2 important, do it multiple times. If it is okay, then do it at least once. You would find mistakes immediately. So, because you know it will give you a complete impression that you are complete unprofessional. And in some cases, one may lose even job, have a lot of troubles and then

you keep actually know it was a typo error or typographic mistake.

No, that is not good statement. This is the manuscript or paper or letter you have submitted. So, you should check all those things rather than saying that it is a typo mistake. So, this is very-2 important that proofreading must be done. At least once for small communications but very important communications related with jobs, research or any other thing, do it multiple times.

Involve your friends, colleagues. Show to them. Read loudly and you may find some awkward topics. So, finally we are coming in this thesis introduction. The stage is in the thesis introduction or manuscript or a dissertation. That first point is state the general topic and give some background.

Provide a review of the literature related to the topic. define the terms and scope of the topic. This is just summary what we have discussed so far. Outline the current situation. Evaluate the current situation that means current research, advantages, disadvantages and identify the gap. Identify the importance of proposed research.

How you would be able to identify gaps? This is another very important point. How you would be able to identify? When you read the work which has already been done in your area, then you would be able to find the gap. So, that study of previous work that is very much prerequisite here to find the gaps in the research or whatever the phenomena or product which you are working. Let me give you one example. Few years back, 2 students came to me and they said that sir, I have developed a sensor.

So, I said what kind of sensor is that? So, they explained. Luckily on that particular day, I had much better sensor working the same way on my table. So, I said that you have created this sensor in such a big box and I am showing in a very small version of that sensor. So, I told them you should have done a background research that whether such sensors already exist in market or not. And since they are already there, that research has already been done, that product is already there that means either recycling or reinventing the wheel.

So, that is not good. And that is why always it is necessary whenever you are starting a new research or new topic, finding interesting for you, always try to search whatever the work or background in the past things have been done in that particular narrow field. and then find the gaps. That if I continue give the example of that sensor then they should have said that this is the improvement on the already existing sensor. So, that was not improvement, that was a larger version of one thing.

So, you know these things will bring a bad impression about whatever. And for some time, they were very excited that they have done some innovation. But once I showed them, they felt little bad about that. So, one should not fall in that situation. So, before you go for any kind of these things, do the background search whether things have already been done or not.

If not, what are the gaps? What are the new things innovations are required? then only it should be done. So, spend some time on the background search. Further identify the importance of proposed research. Why it is important? Who would be interested to go through? Who would use that your work? State the research problem questions.

State the research aim or research objectives. Objectives are very-2 important. If somebody is writing a thesis, they have to write what are the objectives of research. And that is only in a very just form in few points, maybe 3-4 points that this is the objective of my research. And in the end of thesis, you should say that I have achieved these objectives either fully or partially. Similarly, for research projects or grants or seeking funds, you have to write what is the objective of your research.

or the proposal and how you would be able to achieve those objectives. So, that part will come in subsequent section. But research objectives have to be very-2 clear. State the hypothesis, how it is relevant, why it is important and how it is going to be achieved. Outline the order of information in the thesis. So, if you are writing a manuscript, thesis, dissertation or any report, outline in the beginning part in the introduction section that what is the sequence of the things. So, with this I am going to end also final point is the outline the methodology and similar kind of sequence has to be followed in almost in by the manuscript, thesis, dissertation, etc. Even in research reports or research project reports also. So, with this I end this discussion. Thank you very much.