A GUIDE FOR IIIEE SCIENTIFIC PAPERS
(ARSCP 2014)

Student Name(s)

NOTE: This document is provided as a tool to help you write the ARSCP paper at the IIIEE. Although smaller in size and scope than a thesis, the end result should resemble an IIIEE thesis in appearance (thus it is intended to help prepare for you thesis work).

With one exception, this document adheres to the structure used for most journal-style scientific papers: Abstract, Introduction*, Methods, Results, Discussion, Conclusions and References. The exception we have chosen to apply is the separation of your ‘Literature Review’ from the introduction.

Your ARSCP paper should be submitted using the formatting in this document – Thus, you should use this document as a template.

DO NOT use this document as a ‘template’ for your thesis. Ensure you obtain the latest IIIEE template! Please check with your Programme MSc coordinator for the latest template before starting work on your thesis project.

Please report any errors or inconsistencies you find in this (draft) document to the author – Philip Peck (philip.peck@iiice.lu.se)

Course teachers

Name(s)

Course Paper: Applied Research in Sustainable Consumption and Production (ARSCP)
Master of Science in Environmental Management and Policy,
Lund, Sweden, month, year
Table of Contents

ABSTRACT ................................................................................................................................. II
EXECUTIVE SUMMARY ............................................................................................................... III
1 INTRODUCTION .......................................................................................................................... 1
   1.1 PROBLEM DEFINITION ......................................................................................................... 1
   1.2 RESEARCH QUESTION .......................................................................................................... 1
   1.3 LIMITATIONS AND SCOPE ................................................................................................. 2
   1.4 ETHICAL CONSIDERATIONS ............................................................................................... 3
   1.5 AUDIENCE ........................................................................................................................... 4
   1.6 DISPOSITION (OUTLINE) ..................................................................................................... 4
2 LITERATURE REVIEW AND ANALYSIS ................................................................................. 5
3 METHOD ....................................................................................................................................... 7
4 FINDINGS .................................................................................................................................... 8
5 DISCUSSION (AND ANALYSIS) ............................................................................................... 9
6 CONCLUSIONS ......................................................................................................................... 11
BIBLIOGRAPHY .......................................................................................................................... 12
APPENDIX (IF REQUIRED) ......................................................................................................... 13

List of Figures
Figure 4-1 Style ‘Caption’ ............................................................................................................. 8

List of Tables
Table 4-1 Style ‘Caption’ ............................................................................................................. 8

Abbreviations (if required)
Text style ‘Abbreviation intem’
Abstract

In a nutshell …. what have I done?

The abstract is a very brief text that gives the reader a quick insight into what your paper or thesis is about and what I as a reader can learn from reading it (note that you do not have to summarize the findings here, but you should indicate what type of findings I can expect).

Your abstract serves an informative purpose (i.e. it tells the reader what it can expect to learn from reading your work) as well as a “pitch” purpose (i.e. it should, ideally, convince people who are interested in the topic you write about, to read your full paper/thesis.) You will generally find that the maximum length of the abstract is predefined by the institution accepting a paper (e.g. a publisher for an article), but typically it should not be longer than one-third of an A4 page at most.

While varying guides on how to write an abstract can be found, the following points can be used for IEEE works:

An abstract –usually in one contiguous paragraph – summarizes the major parts of the entire paper in the following prescribed sequence:

- The question(s) you investigated (or your aim/purpose) [drawn from your Introduction]
  - Seek to state the purpose clearly in the first or second sentence
- The study design and methods used [drawn from your Methods section]
  - Clearly and briefly describe the basic methodology used and the key research techniques applied
- The major findings including key quantitative results or trends if applicable used [drawn from your Results section]
  - Report the central results that answered the questions you asked
  - Identify important trends, changes, differences found in the study
- A brief summary of your interpretations, conclusions and/or recommendations [drawn from your Discussion & Conclusions sections]
  - Clearly state the implications of the answers your results gave you
Executive summary

A shorter academic work – such as a paper generated for the ‘Applied Research in Sustainable Consumption and Production’ (ARSCP) course – will NOT require an Executive Summary. This section has been left in this guide simply to highlight that this item is expected in an IIIEE thesis.

For the thesis, the executive summary is important – not least because many readers may have time to read only the summary. You may spend all your time on writing a perfect thesis, but if readers do not have time to examine the entire work, it is likely they will judge your work based on executive summary. Thus it is important that includes its most important parts and that the language of it is as clear and straightforward as possible!

A useful rule of thumb for an IIIEE executive summary is that it should be about 5% of the length of a thesis or longer research paper.

Note that an executive summary should focus on explaining what you have done and why, and the inference/conclusions that we can draw from your work. In that sense it is not an evenly distributed summary of all your chapters – rather, it should focus on the chapters at the beginning and the end of your thesis/paper.

As such, an Executive summary usually contains text that covers the following items:

- Problem definition;
- research question (RQ);
- a brief summary of methodology and research design if it is important for understanding what and how you have worked, e.g. what theory/analytical frameworks you have used – as these have defined what sort of findings/conclusions you can make (the scope of your work);
- main findings;
- conclusions and recommendations.
1 Introduction

What is the problem?

Your introduction is a vital portion of the paper. It will critically influence how the reader understands and remembers the content of the work. It is important to invest time and effort in the introduction of the paper and make it as clear and as compelling as you can.

Your introduction has three main aims:

- place your research in the context of other research;
- make your readers understand why they should read your work;
- give your audience a framework for understanding your paper.

Introductions often run to around 10% of the length of the whole paper. In science papers this will generally be shorter.

1.1 Problem definition

Your problem statement serves to explain why you are doing this research – it justifies the entire piece of work!! A problem statement is not a research question (RQ), but an expression of dilemma, a situation that needs more knowledge or action. Typically we would encourage you to define the problem both from a practical perspective (e.g. it is worthwhile to do this research because the results can help us understand how we can reduce a significant negative environmental or social impact) and from a research perspective (e.g. it is worthwhile to do this research because it would allow us the explain something that the existing body of research does not adequately explain).

Your definition of the problem should help you define a relevant research question (or questions). In turn, the answer to your RQ(s) should contribute to resolving the problem.

The paragraph in your text that directly follows the sentence where you delineate your problem will often be a good place to make a clear statement of the purpose (or aim) of your work. It is useful to commence this sentence in a fashion similar to:

“The purpose/aim of this paper/work/research is to ….”

1.2 Research question

Please ensure that you review study material and other guidance references for the formulation of your research question (particularly the references used in the ARSCP course). It is also important to keep in mind that a research question should NOT:

- be formulated so that it can be answered by a YES or a NO;
- be formulated so that it can be addressed simply by delivery of a list of “facts” or “quantifiable data”.

---

A research question should promote REFLECTION upon facts, data, opinions, etc. and help promote your ANALYSIS of them. It should also be framed so that it helps you and your readers focus on the purpose/aim that you have delineated for your paper.

We encourage you to a) examine categorise your questions as detailed in Chapter 1 of Turabian (2013) and then b) ensure that you can respond to the ‘test of question’ queries listed in that Chapter. The three categories of questions are:

- Conceptual questions
  - What should we think?
- Practical questions
  - What should we do?
- Applied questions
  - What must we understand before we know what we should do?

Of key importance is that you should be able to answer your RQs based on the data that you create/collect and analysis in your research project.

You must check how your research questions are formulated before submitting your thesis or paper. They are to guide you throughout your research (!) but you may not be able to obtain the data that you wanted to get and therefore you may not have the answers to the questions you wanted. So it is important that at the end of your thesis or paper (journey) you adjust the RQs to the actual result that you obtained.

We consider that this is a first point where you could check your work by reviewing your text against the structure that was applied in the ARSCP course Task 4: Situation, problem, solution, evaluation, with key focus on ‘situation’ and ‘problem’. You may need to use this review tool again in Section 2 (Literature review & analysis) – however, there the focus will be more on ‘solution’ and ‘evaluation’.

| Situation          | Background information that establishes the topic. and ..
|--------------------|--------------------------------------------------------
|                    | Background information that describes a situation up to a point where a problem with that situation is to be introduced. |
| Problem            | That which is problematical.                      |
|                    | That which is unclear.                            |
| Solution           | Excerpts from literature that define a likely/possible solution (for a problem) or a position of clarity (for a knowledge gap). |
|                    | A hypothesis of a solution.                        |
| Evaluation         | Evaluation of validity of the validity of the hypothesis. |
|                    | Examples or statements that evaluate the merits of the proposed solution. |
|                    | These items help define the work required to ‘Test’ the hypothesis or ‘Fill’ the research gap. |

1.3 Limitations and scope

Use limitations to set boundaries and describe them regarding your research. It is useful to consider limitations from TWO perspectives. Firstly, restrictions/constraints placed upon you by CIRCUMSTANCE – for example that you have limited access to databases; do not speak
the language where important information might be found; experience that informants that you reasonably expected to contribute could not or would not (and so forth). Secondly, you include items that were matters of CHOICE – we also call this delimitations or scope.

Use scope to describe the focus area for your work. Note that such choices are in fact limitations on the work – for example, they have implications on the generalizability of your findings. Examples may be that you choose to study just one or a small number of companies in a large sector, or just organisations based in Sweden that are active in your research topic; or only-large scale companies in an area of business.

Making careful choices about your scope will be important for you as you seek to perform the work within the time and resource limitations of your study. It will also help you during a defence process – to prepare you for potential questions of 'why you have not looked at this or that?'. It is very important to think through your research design choices and scope.

Please don’t mention time as an “unexpected” limitation! While it may be important for the scoping of the work (boundary setting) you are expected to include this in your planning. Each and every research paper or thesis project for students at the IIIEE has a time budget!

1.4 Ethical considerations

Some authors need to carefully examine ethical issues related to their work – this can be especially important when studies are dealing with personal or sensitive information.

Useful guidance in English can be found at sites such as:

- Purdue University Online Writing Lab – Ethics in primary research: https://owl.english.purdue.edu/owl/resource/559/02/
- University of Greenwich – “What might be the ethical issues and risks that arise in my research?” http://www.gre.ac.uk/research/ethics/what-might-be-the-ethical-issues-and-risks-that-arise-in-my-research

On these topics, Lund University’s website reads as follows at:http://www5.lu.se/en/lecturer/academic-integrity/lund-university-regulations.html

**Practical ethics**

The academic community depends on scholars’ and scientists' personal ethics. In this context we speak of academic integrity, a value that underlies the University as an organization, as well as determining the quality of research.

Research ethics are thus founded on the researcher’s personal attitude, rather than on rules and regulations. Although discussions of research ethics often concern researchers, it is important to remember that students also are part of the academic community.

On April 22, 2005 the University’s ethical guidelines were published in "Ethical issues at Lund University". The document has not been translated into English but you are invited to consult the Swedish text at Lund University’s web site.

The full document in Swedish is available at http://www5.lu.se/upload/regelverket/forskning/etiska_riktlinjer_050422.pdf
1.5 Audience
Think strategically about which societal actors your thesis may be useful to – you will see that this is closely allied to matters of Scope discussed above.

Note that your audience should be clearly identified in the “questioning exercise” that is outlined for Section 1.2 above.

1.6 Disposition (outline)
This short section helps the reader to navigate through your document. It can ALSO be useful to you as it should delineate a logical path through your work. The content may appear as shown below.

Chapter 1 presents the nature of the problem addressed in this research and the specific problem(s) addressed. The content then identifies research limitations, provides a thesis outline and describes the intended audience .... and so forth

In Chapter 2, a more thorough analysis of the immediate field of study is presented and the main gaps in the research field are outlined. Based on these gaps, specific research questions are developed and an analytical framework/theory used for data analysis is developed/presented .... and so forth ...

Chapter 3 presents the methods .... and so forth ...

Chapter 4 presents the main findings .... and so forth ...

Chapter 5 presents the analysis and discussion .... and so forth ...

Chapter 6 presents the main conclusions of the analysis, explains how the work contributes to the literature/knowledge, and then provides recommendations directed to the principal audience(s). This final chapters then outlines areas future research .... and so forth ...
2 Literature review and analysis

NOTE: you will have provided a good deal of context, and references to important literature in your text under Headings 1 Introduction, and 1.1 Problem Definition. This section is intended to build upon that with a more thorough review. Depending upon how much material you have provided in those earlier sections, there is the risk of repetition here.

Use this section to establish context by providing a brief and balanced review of the pertinent published literature that is available on the subject. The key is to:

- summarize (for the reader) what we knew about the specific problem before you did your research work;
- summarize … how ...

This is accomplished with a general review of the primary research literature (with citations) but should not include very specific, lengthy explanations that you will probably discuss in greater detail later in the Discussion.

We consider that this is a second point where it may help you if you review your text against structure that was applied in the ARSCP course Task 4: Situation, problem, solution, evaluation. This time, with key focus on ‘solution’ and ‘evaluation’.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Excerpts from literature that define a likely/possible solution (for a problem) or a position of clarity (for a knowledge gap).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A hypothesis of a solution.</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Evaluation of validity of the validity of the hypothesis.</td>
</tr>
<tr>
<td></td>
<td>Examples or statements that evaluate the merits of the proposed solution.</td>
</tr>
<tr>
<td></td>
<td>These items help define the work required to 'Test' the hypothesis or 'Fill' the research gap.</td>
</tr>
</tbody>
</table>

Some additional notes that may help you in the formulation of this section are provided here in bullet form:

- Note that you are not just randomly reviewing literature, indeed you should be performing a literature analysis. You are to reflect on the items that you find in literature, and then place them in the context of your work area or problem.
- You also need to check that the problem you have identified and research questions you posed have not been already solved/answered.
- You are looking for:
  - existing answers to your research questions that will help you identify where the gaps in exiting body of knowledge exist and where your contribution will be most valuable.
- In addition to existing answers, you need to find information that would help you with your research design, choice of methods and theories and thus you are also looking for:
  - Any theories /analytical frameworks/conceptual models have been applied for answering RQs or problems similar to that which you are working on – e.g. – you might find a general theory that seems directly applicable to your question, however…
it is much more likely that you will find a theory that has been used in a different field/context that you consider it might be suitable/useful in your field,
• it may be that there are no directly applicable theories, but you can bring theories together and combine them;
• or you may find a more specific analytical framework (more specific than usually quite general theories) or develop your own;
  • however, if you follow this path then you will need to justify why you need a special framework and demonstrate how you have developed it
  o Any methods have been used in studies that addressed your or similar questions or the problem. For example:
    ▪ how different methods have been combined (or triangulation);
    ▪ what types of interview questions they used in studies;
    ▪ what contact lists can you find in appendixes – perhaps as ideas for who to interview (sometimes even emails or phone numbers are provided)
  o In which fields similar problem or RQs might have been addressed, e.g. EPR for electronics exists in Western Europe, but not in Russia …
  o who are the main institutions and actors in the field; experts, theorists, much cited persons, etc. (i.e. sources that are worth citing).
  o Which are the most important references – for example, the seminal works that you should cite in your thesis to demonstrate your familiarity with the literature
• If a deductive research process is to be followed the **outcome of the literature analysis** should be a defined theory; a well explained conceptual framework, or a well explained analytical framework that will provide **structure** to your data collection process (e.g. literature searches, interviews etc.), your analysis, and your criteria for evaluation – this in turn and will strongly influence the choice of data collection methods.
• If an inductive research process is followed then you will likely begin with specific observations and measures, and begin to elucidate patterns and regularities, throughout your initial analysis. With such, you would formulate some tentative hypotheses to explore throughout your work, and finally end up developing some general conclusions or theories.
• Note that these two methods of reasoning have a very different “feel” to them during the conduct of research. Inductive reasoning is more open-ended and exploratory, especially at the beginning.
• **NOTE** that the literature analysis provides you with insights into the “state of the art” in the field, but the knowledge you have gained **is not necessarily presented in this section on literature analysis**. For example:
  o ideas about methods go into section on methodology,
  o information on experts might be used when preparing to interview informants, and then be presented in your findings, analysis or even discussion.
3 Method

How did I solve the problem?

Your methods section should contain a detailed description of the hypothesis, procedures, participants, materials, and details used.

Seek to keep in mind that science is built on the idea that experiments can be done over and over and you will get the same or similar results if you follow the same method. Thus, this section must seek to convey to your readers how to replicate your experiment (i.e. how to repeat your research project). Details include the exact procedures you followed to scope data collection and gather data, how you selected participants, how you interacted with participants, and so forth.

Your methodology or your research design represents the logic or the argument you make to the reader that convince her/him that your inferences/conclusions are warranted. A first key task in the methodology chapter is to explain this logic of your research project to the reader.

A second key task is to describe what you have done to a level of detail that enable the reader to clearly understand what type of data you have used, how you have created/collection this data, and how you have processed the data in order to arrive at your conclusions.

Methodology is about making choices so you should also be able to argue why you have made choices about e.g. scope, methods for data collection and analysis etc.
4 Findings

Results are the findings of your study. This section is where you describe in as much detail as necessary the findings, or 'results', of your study. You should present the facts, figures, opinions, and so forth that you have collected during your research work.

While you should present all these items in a structured fashion (e.g. according to the logic provided by your analytical framework) you are not required to reflect upon them in depth or discuss them here. That is principally for the next stage of your paper.

The findings section includes content such as:

- demographic data
- statistical findings
- tables and charts that summarise information
- summaries of key phenomena found
- and so forth ….

When you have performed a case study, then here you would generally present the data you have collected (often a story with a volume of facts, figures and opinions woven into it) but you do not analyse them according to the chosen theory or a framework. If presenting a number of cases, then typically each would form a sub-section of the Findings chapter.

Findings tables should be formatted as follows:

<table>
<thead>
<tr>
<th>Style ‘Table text’</th>
<th>Table text</th>
<th>Table text</th>
<th>Table text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table text</td>
<td>Table text</td>
<td>Table text</td>
<td>Table text</td>
</tr>
<tr>
<td>Table text</td>
<td>Table text</td>
<td>Table text</td>
<td>Table text</td>
</tr>
</tbody>
</table>

Source: Style ‘Caption’

Figures presenting your findings should be presented as follows:

Sample figure

Figure 4-1 Style ‘Caption’

Source: Style ‘Caption’
5 Discussion (and analysis)

The purpose of the discussion is to:

- interpret and describe the significance of your findings in light of what was already known about the research problem being investigated, and
- to explain any new understanding or fresh insights about the problem after you've taken the findings into consideration.

Your discussion must connect to the introduction by way of the research questions or hypotheses you posed and the literature you reviewed. However, it should not simply repeat or rearrange the introduction; the discussion should explain to the reader how your study has moved the understanding of the research problem forward from the point you established at the end of the introduction.

This section is particularly important to your research paper because this is where you:

- demonstrate your ability as a researcher to think critically about an issue, to develop creative solutions to problems based upon a logical synthesis of findings, and to formulate a deeper understanding of the research problem under investigation.
- present the underlying meaning of your research, note possible implications in other areas of study, and explore possible improvements that can be made in order to further develop the concerns of your research.
- highlight the importance of your study and how it may be able to contribute to and/or fill existing gaps in the field.

If appropriate, the discussion section is also where you state how the findings from your study revealed new gaps in the literature that had not been previously exposed or adequately described.

To make your message clear, the discussion should be kept as short as possible while clearly and fully stating, supporting, explaining, and defending your answers and discussing other important and directly relevant issues. Care must be taken to provide a commentary and not a reiteration of the results. Side issues should not be included, as these tend to obscure the message. No paper is perfect; the key is to help the reader determine what can be positively learned and what is more speculative.

Another way of stating the above is that a discussion section should:

- Interpret your data in a discussion text of appropriate depth.
  - This means that when you explain a phenomenon you must describe mechanisms that may account for the observation.
  - If your results differ from your expectations, explain why that may have happened.

---

If your results agree, then describe the theory that the evidence supported.

Note: It is not appropriate to simply state that the data agreed with expectations.

**ANALYSIS:** You will note that the header provided for this Section contained the text *(and analysis)*. This addition seeks to align this guide with texts that refer to “Discussion and Analysis” or even just “Analysis” when describing this part of a research paper.

For the terms of this guideline text we wish you to follow the logic that you must ‘reflect’ and ‘analyse’ both prior to and during the process of drafting your discussion text.

In the first instance, you should approach your analysis as an evaluation of your data viewed from the angle that is given to you by your theory or analytical framework. You use the evaluation criteria that they provide to examine and structure your data. Here it can be helpful to think about the following types of analysis:

- comparative analysis of findings from literature – i.e. a comparison of answers that are provided from other studies juxtaposed to your own findings;
- comparative analysis of cases based on your analytical framework/theory or the criteria identified in them;
- analysis of your contribution to theory/knowledge – e.g. have you confirmed what theory/knowledge indicated would happen, or you found something new or different, with which you can contribute to the existing body of knowledge.

In the second instance, and particularly in order to help you address the last bullet point above, this is the place where you step back and reflect more objectively about:

- Methodological/Theoretical/Analytical choices:
  - How the choice of methods and theories affected the results you have obtained from your work?
  - Are there other theories/methods that you should have used? You can consult literature again and look for more information to help you in your reflection regarding the usefulness of your approach and findings.
- Legitimacy:
  - Was your research question legitimate?
  - Has it been answered fully or is further research needed?
  - Have perhaps new RQs have emerged in the course of your study?
- Sensitivity analysis (e.g. relevant for statistical analysis or modelling work):
  - Which factors or parameters affect the results the most?
- Generalisability:
  - How generalisable are your results?
  - Would your findings and conclusions be relevant in a different context (geographical or sectoral, temporary or cultural, different stakeholders, etc.?)?
6 Conclusions

According to Turabian (2013), your conclusion should have three objectives. It should achieve the following:

- provide the reader with a clear idea of your ‘claim’ (i.e. your conclusions);
- allow the reader to understand its importance;
- suggest further research.

To operationalize this, it is suggested that you should reiterate the problem that you have addressed in your study and the RQ(s) stated at the start of the paper.

Then you can:

- present conclusions that your analysis supports (your claim);
- explain how your work contributes to the body of literature or body of knowledge (i.e. establish importance for academia);
- provide recommendations to the audience stated in introduction – (if you have delineated more than one audience, then you will likely need to have a separate section for each audience) – (i.e. establish the importance for key audiences);
- provide suggestions for future research.

Note: Make sure that you check that the research question is the same as you posed at the start of the paper, and that the conclusions actually answer the question and address the problem stated in 1.1.

---

5 In other words; explain what the results of the analysis actually mean and what are the implications of the claims you make – in this case from an academic point of view, in the next bullet point, for your defined audiences.
Bibliography

Please provide your references using the guidelines on the IIIEE Library website under ‘Research, write & cite’ supplied by the IIIEE library. Citations at the IIIEE are to be formulated in APA 6th style. One reference is provided in this style below.

PLEASE NOTE: YOU ARE STRONGLY ADVISED TO UTILISE A REFERENCE MANAGEMENT SOFTWARE.

Our experience is that this will save you considerable time and if used correctly will result in sound formatting.

A comprehensive overview of such software is available at:
