

RESEARCH DOCUMENTATION GUIDELINES

1 Summary

In this guide, we analyze and give a detailed overview of each of these major sections and the rest of the subsections not highlighted in this overview.

- The Research Document is always written in third person. Never use “I”. Instead use “this project”, “the study”, “this study” or “we” .
- It has 6 Chapters.

2 Similarity measure

Ensure that you do a critical review of your work so that your document similarity index does not exceed 25%. If you review some work, avoid copy pasting all the work, instead state briefly the work, the positive/relevance and how you intent to use it in your work. Use diagrams from the sources and explain in the author approach instead of copy pasting the statements.

3 Proposal Corrections

Some of the notable corrections that you will do include but are not limited to.

- Change of tenses - moving forward, your tenses will change to past tense or past participle since you are now forming your documentation. For this uniformity, you will also have to change the tense in your proposal.
- In case you had formatting issues in the original proposal, this should be the right time to change it moving forward.

4 Chapter 4: System Analysis and Design

4.1 Introduction

Talk about what the chapter is about, what is covered in different sections and what analysis and design diagrams you have drawn, you can also recap on the design paradigm that you have used for instance OOAD, SSAD/SSADM, CRISP-DM.

4.2 System Requirements

System requirements are the configuration that a system must have in order for a hardware or software application to run smoothly and efficiently. Failure to meet these requirements can result in installation problems or performance problems. The former may prevent a device or application from getting installed, whereas the latter may cause a product to malfunction or perform below expectation or even to hang or crash.

You may start by writing:- Some of the system requirements reviewed in the project include:

4.2.1 Functional Requirements

These are product features or functions that developers must implement to enable users to accomplish their tasks. So, it's important to make them clear both for the development team and the stakeholders. Generally, functional requirements describe system behavior under specific conditions. For example:

In your documentation, using a listing format, you can list and describe some of these requirements as follows. You will need to change your listing to **roman numbers: small**.

- I. Authentication Modules - Describe what it is and how it was done, that is what type of data you are collecting (Login and Registrations, mention how the hashing was done to make it a bit secure)
- II. File transfer Module - description of this module
- III. List more information about what your system requirements are and how they were implemented.

4.2.2 Non - Functional Requirements

They are not related to the system functionality, rather define how the system should perform. For example:

- The website pages should load in 3 seconds with the total number of simultaneous users <5 thousand, this shows the performance of the system.
- The system should be able to handle 20 million users without performance deterioration.

In your documentation, using a listing format, you can list and describe some of these requirements as follows.

- I. System Security - Describe what it is and how this was achieved. [password hashing, safe https usage]
- II. Secure File transfer - Did you have End to end encryption? If yes, then give more information.
- III. You may also add something to do with privacy and security or encryption or even the speed at which the system performs or how your model performs against other benchmarks.

4.3 System Analysis Diagrams

In this section, you will heavily rely on the design paradigm that you defined.

4.3.1 System Analysis Diagrams

- some of the system analysis diagrams considered are as follows;

4.3.2 Use Case Diagram

- Description of the diagram drawn - prose
- The diagram itself
- Each diagram MUST be captioned.

4.4 System Design Diagrams

- Takes the same format as in 4.3

For Consistency, Use these tools

- Star UML (database schema, class diagrams)
- Visual Paradigm (Other diagrams) - use the offline version (download, use for free for 30 days)
- To avoid watermarks on the document, take screenshots of the drawing
- You can use any other tool of your choice like Ms Visio

5 Chapter 5: System Implementation and Testing

Important summary

It is important to note that in this chapter, you will need to be as creative as possible and you will also need to work very closely with your supervisor in order to cover what is relevant to your project. Additionally, this chapter's numbering and contents will **NOT** be the same for everyone. The type of your project will dictate the sections and the subsections that you will be having. In this guideline, you will have sections laid out for ML, IoT and General Software Projects. In case your project is not listed here, please be as dynamic and creative as possible.

5.1 Introduction

In this section, talk about what the chapter is about, what is covered in different sections and how you decided to layout various subsections. It is important to cover everything in one short paragraph.

5.2 Description of the Implementation Environment

The implementation environment covers information about how you availed your product or service for people to use. It also describes what hardware and software people need to have in order to implement your product or service. These platforms can be in the form of personal

computers, servers that can either be local or in the cloud, and personal mobile phones with various application stores.

Notes:

Every software application or service will need a platform to run on, therefore this section covers the information about the platform both hardware and software. Refer to your project type in order to have the correct information here.

- This section should also be written in prose and you may use tables too in order to minimize the usage of including the 4th multilevel numbering.
- **For example: 5.2.1.1 - this is not encouraged.**

5.2.1 Hardware Specifications

In this section, you should indicate the various hardware specifications you need or used to implement your solution or product. This can include various servers, cloud or mobile specifications. You need to mention the **bare minimum** hardware requirements.

5.2.2 Machine Learning and the Normal Product Projects

This section will be similar for all these kinds of projects. For instance, a machine learning project will need an interface to interact with the model. Therefore, you will need to state the hardware requirements needed to run the project. In your statement, you need to capture the bare minimum specification requirements needed for the projects, whether it is in the servers, local devices or in mobile phones.

For clarity, it is important to add these requirements in a table, say a two column table that has item name, description and justification for each item.

For example:

Hardware Name	Description and Justification
2 Gb RAM	Describe and justify why this is needed.

5.2.3 IoT Projects

IoT is about how different components used in your project interact and communicate with each other. It would be very important to show how this works by involving the usage of different communication platforms such as sms servers, email servers that trigger the next action. For example, when the soil humidity is low, and irrigation is needed, a soil humidity sensor should trigger how the next action is invoked.

For clarity, it is important to add these requirements in a table, say a three column table that has item name, item image, description and justification for each item.

For example:

Item Name	Item Image	Description and Justification

You will need to outline and discuss how each sensor is used and the justification as to why it is required in the projects. Additionally, just provide one image in the image section.

5.3 Software Specifications

- Define and describe the software required to run your project e.g Android 7+, or Windows server 2020, Windows OS, Linux Box, Mac OS. you should include the versions as well to show the threshold that users should be looking out for. Provide the justification as to why this is needed.
- In case one is using Docker, show why it is needed, npm, composer. [Discuss in detail how they were used to set up and run the projects] -> Add what is relevant to your project.
- In Case of additional software, you may include it here [IoT]
 - Applications used in running the projects [sms server, email server, firebase]

(ML)

5.4 Description of the Dataset

- Discuss the dataset, how it was retrieved, analysis of the data in it.
- Discuss, Training data, testing data and Validation data--> Give more information about this data
- Discuss the features and labels as extracted and used.
 - Discuss how the features were retrieved, one hot encoding and the reason for this.
 - To support your work, provide screenshots of your Jupyter Notebook [the important parts, graphs etc]

Description of Training.

Description of Testing and Validation

5.5 Description of Testing (replace with description of training, evaluations and the metrics used)

- Discuss how testing was done.

5.5.1 [ML]

- Discuss how training was done, mention how you prepared your data and files imported
 - you may support this with some screenshots of the code and some of the graphs
- Discuss how models were analyzed and saved [how it was prepared] and graphs analysed
- Did you use 10 fold testing??

5.5.2 [IoT]

- How the setup was done

- How testing was done to confirm the full functionality of the circuits, show more information on the testing of the components.

- Any other modules [WiFi, Sms and etc]

- You can add some of the screenshots here

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5.5.3 Testing Paradigm

- Discuss the testing paradigm used in details [provide a diagram if possible]

- White box testing

- Black box testing

- Penetration testing

- Unit Testing (provide the sample functions for testing the solutions and core functions in the codebase)

- You can support this with a screenshot of the unit test done

- A combination of any two?

- You need to modify this section based on your project [ML, IoT]

5.6 Testing Results

- Draw a table of modules done and their testing results

- Test Case

- Description

- Test Data [what data was used in the testing]

- Experimental Outcome
 - Result
 - Test Verdict [pass:fail?]

6 CHAPTER 6: CONCLUSIONS, RECOMMENDATIONS AND FUTURE WORKS

6.1 Conclusions

- What can you conclude from the project?
- Have you solved the problem in a better way? Will your solution be beneficial to the society and IT Community in General?

6.2 Recommendations

- What recommendations can you draw from the project?
- It is recommended that....
 - E.g For better Results, the Ram should be added from 3 Gb to 6 Gb
 - For full structured functionalities, the project should be hosted on a linux server

6.3 Future Works

- Tell future researchers what you would like to see in the project in case they choose to do a similar thing
- e.g In case CNN was used, you can tell them to use RNN for better results or a different opinions
 - What you'd like to be added to the project in case a similar work is done in the future

References [APA Style]

Appendix

- Display or show any other additional codes of interest that you'd like people to see [Screenshots]
- For clarity of images, do away with the dark mode on the images posted.

Gantt Chart

- Full Gantt Chart showing a year's work timelines. [Since the start of the project to the end]

7 Todo: Final Documentation Submission.

1.Submit proposal documents online by **8th January**

7.1 Late Submissions

There will be no late submissions allowed and students are urged to submit by 5th January 2024

No submissions means you will not be eligible to do the project defense scheduled from 9th January to 11th January

7.2 Things to Note Before Submission.

1. Make sure you have updated your Final project title on the e-learning.
2. Check the cover page, title, name, admission number, ICS Group, Supervisor Name and most importantly, current date of submission (Month, Year)
3. Confirm that your document formatting is on point and is according to the guidelines and set standards.
4. **Supervisor Approval by a Signature is Mandatory.** Non approved documents will not be accepted and graded.
5. Plagiarism is a serious offence, as such, ensure that the similarity index is not higher than 25 percent.
 - i. **NB:** For submissions, rename your documentation as Your Student Number_YourName_ProjectTitle.
 - ii. Only PDF digitally signed by your supervisor will be accepted. No manual signing. This is to ensure that your supervisor has read your final document before signing.

7.3 Todo: Final Presentation Slides.

For a comprehensive defense, you will need to have your slides cover the information below. Remember to always have less information on the slides and to only show the major points which allows you to describe your work more during the presentations.

In this section, I have divided the presentation guidelines in three parts, that is Machine Learning, IoT and General Product/Software projects.

NB: Your camera **MUST** be on when presenting. This is an online assessment requirement. As such, you will be required to do the necessary preparations as needed.

7.3.1 Cover Slide

This slide will contain your student, supervisor and project information such as.

1. Student Name, Admission Number and ICS Group that you belong to.
2. Title of your project
3. Supervisor Name

7.3.2 Background

In this slide (Just one slide), you will have major points on the occurrences leading to the problem statement. This means that this same slide will also have the **Problem Statement** in it. You should be creative enough to find out how you can fit in all this information in a way that is very informative, well presented and with no clutter of information at all.

7.3.3 Motivation

In this slide (just one slide), you will discuss/have points on what motivates you to tackle the problem under study. Remember that this slide will also have strong points that are linked to the **justification** of the research question. Just like in the background, you should be creative to fit all the information with no clutter at all.

7.3.4 Designed Solution

In this slide, with the support of the conceptual framework or the system Architecture, you will briefly discuss the solution you provided. For Machine Learning Projects, briefly discuss the datasets used as well without talking too much about them. The aim is to show the whole workings of the designed solution while pointing out the artifacts used.

7.3.5 Solution Demonstration

The projects will have the following different order of presentation.

As you are presenting your work, make sure that you touch on the following areas to have a flowing presentation.

1. Take the panel through the Dataset and you should be very thorough and detailed at this point. Mention its characteristics and how it was collected.
2. Preprocessing of the Data - how has the data been preprocessed in preparation to the training part.
3. Model Training - how was the training done? Go to the techniques of how the training was done. Do you have some Graphs? What are the Epochs or steps used?
4. Validation - How was the validation done? Show some artifacts. What techniques were used for the validation splits? Brief the panel with some heuristics.
5. Evaluation - Kill it with some inference. Show how you made your solution available to the public to use. Where is the model hosted? Do you have the system and how can we access it.
6. Final Remarks - This is your chance to be creative and add some of the information that the panel would want to hear. Ask the panel to give you feedback and welcome questions.

7.3.5.1 IoT Projects -

As you are presenting your work, make sure that you touch on the following areas to have a flowing presentation.

1. After the verbal presentation of the slides, you will ask the panel to view the video that you have recorded. This recording should not exceed 4 Minutes and must be very clear. You will then proceed back to the presentation and get questions from the panel. You have to be creative and mindful of the time in order to deliver a quality presentation.
2. Show the panel additional things that you have done to make sure that nothing is left out.