# PREPARATION GUIDE for PROJECT SPECIFICATION DOCUMENT (2022)

In a project specification document, you should define aim and scope of the project clearly and precisely. Potential social and technological impacts of the project should be presented. Detailed information on the methodology, solution techniques, as well as project management and risk management plans should be given as part of the document.

Your project specification document should include *all of the following sections.*

## Title Page

This page should include:

a. Title of project in capital letters
b. Date
c. Name and ID of the student(s)
d. Supervisor(s)

Note that title page will be a separate page and the other sections will have section numbers.

## 1. Problem Statement

Write a few sentences (3-4 sentences) that summarize your project. Give a brief information about the problem of interest.

## 2. Problem Description and Motivation

Provide general description of the problem and motivation of the study in multiple paragraphs. Background and/or context for understanding the nature of the problem should be provided. You should provide answers to the following questions:

- What is the motivation for this project? Why are you doing this project?
- Is the project important or worthwhile?
- What are you planning to do?

## 3. Main Goal and Objectives

Provide the main goal of the project, and the objectives to achieve that goal. A goal is an achievable outcome that is generally broad and longer term while an objective is shorter term and defines clear and measurable actions to achieve the overall goal.

After defining the main goal, provide a bulleted list of all objectives of the project. All objectives should be clear and specific, measurable, and achievable.

- Project objective 1
- Project objective 2
- …….

As an example, assume that the main goal of a project is "to present a violence detection framework using closed circuit TV cameras". Some of the objectives to achieve this goal can be listed as:

(i)  To collect video data that include multiple people that may or may not include violence (fighting and vandalism);

(ii)  To design and implement algorithms in order to detect presence or absence of violence in the monitored camera,

(iii)  To design and implement algorithms for recognition of the type of violence (fighting or vandalism),

(iv)  To implement a mobile application which enables remote monitoring of the camera video and sends alert/notification in case of a violence detection.

## 4. Related Work

You should investigate similar projects done so far, and solution approaches that have been presented before. Compare your intended work with the existing ones; and state all differences. As a conclusion sentence, you may declare the novelties (if any) in your project, compared to the related work.

## 5. Scope

Define your scope precisely and completely. For example, if you are implementing a particular part of a system, explain which parts are in the scope of your project and which parts are out of its scope.

If your project is based on another project (e.g., a previous student project, an open source project, a completed or ongoing project of your supervisor etc.), clearly describe the relationship between them; and specify all required inputs and outputs from the reference project or work.

You should list all constraints of the project clearly. Constraints are factors that create a boundary or a limitation on the project and the problem solution. Constraints are the known facts and hence have no uncertainty. Any resource limitations including hardware and memory constraints, software and technology constraints, all the known limitations related to the scope of the problem should be listed here.

Additionally, you should discuss any assumptions related to your project. Assumptions are defined as "influencing factors that are assumed to be true during the planning of the project but have not been proven due to lack of a proof (hence they may not be true)". For example, you may assume that you will be able to get access to currently unavailable data, or you may assume that there will be no more than a thousand simultaneous users for your online multi-user software. As another example, you may assume that an existing network infrastructure will be able to handle the bandwidth requirements for the hardware that will be used in your project. You should try to clear up as many assumptions as possible.

## 6. Methodology and Technical Approach

Describe your approach to solve the problem. It would be preferred to demonstrate your high-level solution approach using block-diagrams and flow charts. Additionally, explain any theory, known algorithms and methods that you will use (or plan to use) in your project. You have to demonstrate how these methods and techniques are suitable to achieve project objectives. This section should include details of performance evaluation of your project, as well. Also, you should present resources (including facilities, software, hardware, specific data, people, etc.) that you need to use in order to successfully complete your project.

## 7. Professional Considerations

This section should include proper explanations for all items listed below:

- *Methodological considerations/engineering standards*: Include all methodological standards and/or language/notational standards that will be used (such as GANTT charts, UML diagrams, Source Code Control via Git/Subversion/etc, IEEE standards, … ). Explain each related item with proper illustrations, i.e., figures, tables.

- *Realistic Constraints*: In addition to the traditional technological and economic considerations fundamental to the design of software and hardware components and systems, a modern engineer has become increasingly concerned with the broader considerations of realistic constraints which are particularly related to the better-off today's society and quality of life. In your project design, you have to be imaginative and ingenious enough to anticipate potentially hazardous situations and all the factors relating to the project outcome and make the best design decision to address those realistic constraint issues.

  Specifically, in your document, you should consider the following <u>*6 aspects*</u>: i) economical, ii) environmental, iii) ethical, iv) health and safety, v) sustainability and vi) social. If your

project does not have any consideration in one of these aspects, clearly describe the reason. Please see the Appendix for the details.

- *Legal considerations*, e.g. required permissions if the developed product should come to market, including licenses, medical, financial and ethical permissions.

## 8. Management Plan

Describe how the project will be managed, including a *detailed timetable with milestones*. Specific items to include in this section are as follows:

A. Description of all task phases and their durations.

B. Division of responsibilities and duties among team members.

C. Time line with milestones: This document should include detailed project time line. The time line should contain clear and well-defined descriptions of the work that must be completed before predetermined check points. Please use Gantt chart for this purpose.

## 9. Success Factors and Risk Management

*A. Measurability/Measuring Success*: You have to describe how success of your project will be measured. Specifically, for each objective given in Section 3, describe the key performance indicators to evaluate the success of that objective. In other words, describe how to understand whether each objective given in Section 3 is satisfied.

Consider the example given in Section 3 of this document. Note that there are 4 objectives given in the example. The key performance indicators for the objectives are given below:

(i) Success Factor for Objective 1: There should be at least 1000 video data collected where 50% of them include various forms of violence. All of the collected video data should include multiple people.

(ii) Success Factor for Objective 2: Our algorithms should detect presence or absence of violence in the monitored camera with at least 90% accuracy level, which is computed by "F1 Score". (The definition for F1 score will be given here).

(iii) Success Factor for Objective 3: Our algorithms should recognize the type of violence (fighting or vandalism) with at least 75% accuracy level, which is computed by "F1 Score".

(iv) Success Factor for Objective 4: The mobile application should stream the video with a maximum of 2 seconds delay in an uncongested network conditions; and it should send a push notification in case of violence detection.

Note that: Some of the objectives may not have quantitative performance indicators. You should still provide some measurable success factors.

A. ***Risk Management***: You need to specify possible risks that you may encounter throughout the project. For those risks, you are expected to propose a resolution. The project plan needs to change if constraints change, or assumptions are proven wrong. As an example, you may assume that you will be able to access currently unavailable data, but a potential risk is that you may never access to the intended data. How would you deal with that situation in your project? In this part, please provide a list of possible risks, for each of the risks specify the corresponding work package and provide a B-plan.

## 10. Benefits and Impact of the Project

- *Benefits/Implications*: What are the potential benefits of your project? Who will benefit from your project after its successful completion, and how?

    Additionally, you should answer all four types of impacts listed below. In case of any of them that does not apply to your project, indicate with an explanation.

i. *Scientific Impact*: What would be the scientific impact of your project. Do you expect that it will be published in a scientific paper?

ii. *Economic/Commercial/Social Impact:* What type of outcome(s) are expected from the project: A (commercial) product? A prototype? A useful model? Startup company? Potential of import substitution? Media influence? Increase in life quality? Improve in education level? Contribution to sustainable environment and energy?

iii. *Potential Impact on New Projects:* Do you expect that this project will have a pioneering effect for future projects?

iv. *Impact on National Security:* Cyber security, energy security, border security, food security, etc. (if exists)

**References:** You are required to add the list of references that you covered as part of your project. They can be journal papers, conference papers, books and web sites as well.

## Appendix (Realistic Constraints)

Some of the realistic constraints include (but not limited to) the following.

**Economic:**

- Prices of similar products.
- Expected cost and profit of the project.
- Potential impact to the local and national economy.
- Expected maintenance cost.

**Environmental:**

- Whether there will be any induced noise to the users or public.
- Any potential effect on air pollution, water pollution, landscape (plastic bags, computer cases, etc), and global warming.

**Ethical:**

- Implicit use of patent protected design/concepts.
- Violation of security and privacy of users and public.
- Under design for profit.

**Health and Safety:**

- Any potential effect on the health of users and public.
- Safety of users and public.
- Use of radioactive or toxic materials.
- Special safety consideration for the usage of infants/children.

**Sustainability:**

- Reliability and durability of the supposed function.
- Can this project survive?
- A well-defined life span under the assumed normal operation conditions.
- Consideration of actual environmental factors and energy efficiency of the project.
- All parts of the project need to have similar life span.

**Social:**

- Designs using software/hardware developed under public funding.
- Products that profile negative sides of a specific race or gender.
- Products that are physically and/or mentally destructive for people.
- Designs in favor of certain people but against others.