# Requirements of a Diploma Project Report

The idea of the final project is to put the knowledge gained in the modules studied to good use in solving a maintenance business problem. The preferred outcome will be one that has been implemented, but if that is not possible a suggested solution might also do. It must be understood however that this will weaken the project report's status considerably.

The student thinks about his/her study in the context of his/her work situation and then decide on a subject for the project, as well as a project approach. The student the writes a project proposal and submit that to the study leader for evaluation. The study leader might then make certain recommendations regarding the adjustment of the proposed project. In such a way the project proposal might be sent to and forth between the student and the study leader more than once to finalise the document. When the proposal has been approved, the student can start with the actual project.

This may sound difficult, but is is in reality not. Mostly the student sends the project proposal and the study leader makes some suggestions and send it back to the student with the comment that he/she can proceed, just taking into account the study leader's comments.

One thing that must be clear is that this is the final outcome of the diploma and wants to achieve more than just a report in the same vein as the assignments that you handed in up to now. The work done in this project and the project report must both be of an outstanding quality. Our objective here is to prove that you are a maintenance professional by issuing you with the Terotechnica Diploma.

To simplify the proposal process and the communication to Project students, the following framework for the project proposal is proposed:

**Project Proposal:**

**Title of project:**

*The title of the project comes here: it should not contain any company names and should reflect the investigative/solution nature of the proposal.*

| | |
|---|---|
| Student: | A.B. Student |
| ID number: | xxxxxxxxxx |
| Study Leader: | Mr Chris Loedolff (or other designated study leader) |
| Starting date: | Month 20xx |

**Purpose/Description of problem**

A short description (a few paragraphs) of the problem to be studied/solved, identifying the purpose of the study. This must be so complete that the study leader can approve the study or suggest alternatives.

The communication structure and language used must be conducive to good understanding. Both in this document and in the actual project report, students must ensure that the language, sentence structure, spelling, etc are representative of good English (spell checker set to S.A. English or U.K. English). For this purpose it is suggested that the material is checked by a language service prior to sending it to the study leader. If the study leader has to revise more than two spelling/grammatical errors on a specific page of text, the document will be sent back summarily. The same goes for documents with grievous thought structure. It is the task of the study leader to assist the student in the business/technology of Maintenance Engineering, not in logical thought structure and language use.

**Project Strategy**

**a. Program**

The steps that are going to make out the body of the research project. The following general program steps are proposed for consideration:

- Detailed development of the purpose of the research or the detailed definition of the problem.
- Literature study - a fairly low-key literature study into the problem area. This is to see what information/solutions other people might have had in this area. This step should take up about 10% of the time allotted for the project (typically 16 hours) – for students that are not used to study this might take longer, as you want to dig up the gold in your area of study.
- Development of the solution to the problem studied from basic principles, taking into account the knowledge gained through the literature study (and the study notes encountered throughout the course). This will include a proper investigations into the composition and validity of each of the proposed components of the solution.
- Testing of the solution - this is typically done using an example equipment and/or component from industry or an example management area on which the proposed solution can be tested. The results will preferably have to be measured/verified as best as one could realise within the constraints of practical applications.

## b. Project Report

The report for such diploma finalisation project will typically take about 70% of the time (including literature consultation time and testing the implemented solution). The practical time spent on implementation should then be in the order of 20% (it is assumed that the actual implementation work will be done by the maintenance staff of your business):

- Literature study 10% (± 16 hours)
- Project report 70% (± 112 hours)
- Implementation 20% (± 32 hours)

These times are for a very productive student. Many students, like the writer of this document, will take longer either due to difficulties to get your arms around the project, or because you are a perfectionist and only the best will do.

The proposed table of contents has to be developed in some detail. A typical structure is the following, but does not have to be followed, as long as the important elements are present:

1. Introduction/Summary: This chapter is mostly written last as it is a lead-in to the final report and is thus best produced after the other chapters are complete.
2. Problem definition: This is the first chapter to be produced (together with first step under a) above). This chapter is the one that leads the student towards the right avenues of thought (next chapter) and helps the study leader to understand the problem area well enough to lead the student effectively. There are typically two versions of this chapter: the first prior to the next (literature study) chapter and the second following it - the study done (more insight gained) normally affects this chapter considerably.
3. Literature survey: The literature review chapter should be submitted second. To a certain extent, this is an ongoing activity throughout the project as new insights can be developed, but it has to be finalised as far as possible at this stage, otherwise the remainder of the project will keep on changing as new insights are discovered from newly discovered literature. It is thus important for success to spend enough time and effort on the literature review (expectation 16 hours or more) at this stage – this can sometimes be frustrating, but is well worth the effort. Typical research areas here include:
    a. History
    b. Trends
    c. Survey of related areas/techniques
    d. Critical evaluation of the scientific foundation of the various solutions to the problem found in the literature.
    e. Critical evaluation of the ease of use/practical application of the various solutions to the problem as found in the literature.

4. Solution development: Typical subheadings here can include (these are very dependant on the specific problem area, so the following are only provided in the interest of communicating the concepts better):
    a. A conceptual framework
    b. Solution development
    c. Validity of solution
    d. Application structure and methods
    e. Organisational issues
5. Solution testing: Typical subheadings here can include (these are again dependant on the specific problem area, although less so than the previous case):
    a. Description of test situation
    b. Actual test results
    c. Comparison of results
    d. Results verification
6. Conclusion
    a. Critical assessment of results
    b. Recommendations
    c. Further project possibilities in this area

The above structure should of course be developed in much more detail than that given above.

**c. Schedule**

The objective of the schedule should be to do most of the foundational work during the first month of the project (i.e. problem statement, literature research and development of the proposed solution), and just round off the product during the second month, leaving enough time for rework to ensure timeous submission - of course you can work over a period longer that two months, but the above is based on the assumtion that you complete all the study work in one calendar year (1 February year 1 to 31 January year 2, or 1 August year 1 to 31 August year 2). The project will then be done in December & January or July & August respectively.

It is important when planning the schedule to allow enough time for the time input of the study leader and the subsequent rework. Most students completely underestimate the work and learning curve involved in such work, leading to an inevitable lengthening of the time frame. Most of the report should be sent to the study leader after the first month for proper feedback (it might help to make an appointment with the study leader for this purpose, after giving him/her a day or two to scan your work).

**Important note on literature study (not a part of the project framework, but nevertheless of high importance as most students underestimate this important step):**

A large component of proper literature study comprises the study of the work of a similar nature done by maintainers and others over the world. A very important part of proper literature study is thus to find the gems in the literature, which will enhance the value of your own work, as it will not only be based on own ideas, but also tried and tested principles.

A typical project report for our subject area will have around twenty to twenty-five pages (excluding appendices) and will be supported by around ten[1] valid literature references. Remember that each reference has to be referred to in the report's text.

The literature should include quite a few substantial internet or journal articles - in the case of internet articles add them under a seperately properly indexed file, or add them as appendices if there are not too many pages. There is a tendency amongst students to rely on the few textbooks on their own bookshelf (the study leader knows the student are mostly using these as 'fillers') and articles from commercial magazines (which are mostly very commercial).

This is not a postgraduate dissertation. The following comes from the recommendations for the Masters Degree in Maintenance Engineering at the University of Johannesburg, and is just provided here for the sake of information and clarity.

The order of the worth of literature sources (from high to low) is as follows:

1. High-class references:
    - High quality journals (best) – typically U.S./European journals;
    - Journals (2nd) – typically S.A., Australia, etc refereed academic journals,
    - Conference papers by internationally recognised refereed speakers,
    - Good quality textbooks by recognised academics with a high number of refereed articles (e.g. Blanchard),
2. Medium-class references:
    - Regular textbooks (like my own), typically by recognised industrial leaders and/or academics in the field,
    - Reports by recognised research organisations, such as EPRI, CSIR, etc.
3. Low-class references:
    - Popular books (like that of say Bill Gates on Business at the speed of light) [just as clarification: in my opinion the book of Moubray falls somewhere between these last two categories – parts (most) of it being good (regular textbook), parts of it (e.g. chapter on failure analysis) being very bad, non-defendable],

[1] This is not a fixed number, but serves as a benchmark. It will depend on the subject chosen for the dissertation and the quality of literature searches done.

- Conference papers by general industry, etc.,
- Articles in popular magazines (like SA Mechanical Engineer, Electron – depends on standing of person writing article as well).
- Company reports.
- Internet articles.

It all really depends on the 'testing of knowledge/truth' by internationally recognised authorities. So an Internet article might be rated much higher if written by a recognised expert, etc. The ratio should be at least something like 50% High-class references: to 30% Medium-class references: to 20% Low-class references. So low class references must really only confirm what was stated in high and medium class references.