



UNIVERSITAT POLITÈCNICA DE CATALUNYA
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Bachelor Degree in Informatics Engineering
Computer Engineering Specialization
Degree Final Project
Thesis management course

Performance analysis and optimization of a combustion simulation

Third assignment: Budget and sustainability

Author

GUILLEM RAMÍREZ MIRANDA

Director

MARTA GARCIA GASULLA

Co-director

DAVID VICENTE DORCA

Tutor

JULIAN DAVID MORILLO POZO

GEP Tutor

JOAN SARDÀ FERRER

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1 Budget

1.1 Staff

The following roles are considered for developing the tasks described in the Gantt diagram.

- Junior researcher. **Cost per hour:** 10 €/ h
- Project manager. **Cost per hour:** 20.24 €/ h

Table 1 shows given the tasks and the time to complete defined in the Gantt the hours each role focus on and the cost.

Task	Junior Researcher	Project manager
Project managment	20 h	90 h
Hands-on	30 h	10 h
Performance analysis	80 h	10 h
Optimization	150 h	50 h
Final Milestone	65 h	20 h
Total (€)	3450	3643
Total aggregated (€)	7093	

Table 1: Cost estimate for each role in the project. Own compilation

1.2 Material resources

The estimate cost of the material resources are detailed in table 2. Mind that:

- Cost and amortization of MareNostrum4 machine is not included as some of the data needed to calculate that must remain confidential.
- Some of the software used in the machine it is not free, neither as in freedom and as in beer. This cost is not included as it is also confidential.
- The office costs are illustrative as the project is developed in the K2M building in Campus Nord.
- Lifetimes are calculated by considering a 8 hours per day use during 5 years for electronic devices and 10 years for the furniture. Usage time may differ from real usage due to COVID-19 global pandemic.

Table 3 shows the fixed monthly expenses. A final calculation on the part of the costs that are related to the project is added in a column. For example, if is a cost related to all the office users is divided by the number of the workers in the office.

Resource	Cost (€)	Lifetime (h)	Usage (h)	Amortization (€)
Dell latitude 7490	2500	9600	525	136.72
Generic display	300	9600	525	16.4
Generic keyboard	20	9600	525	1.09
Generic mouse	10	9600	525	0.54
Office furniture	1000	19200	525	27.34
Total	3830	-	-	182.03

Table 2: Amortization estimate for material resources. Own compilation

Resource	Monthly cost (€)	Total cost (€)	Project cost (€)
Office rent	5000	25000	250
Office supplies	100	500	5
Water and electricity	1000	5000	50
Total	6100	30500	305

Table 3: Fixed costs and total for project. Own compilation

1.3 Contingencies

It is estimated a 15% of the total of the amortizations and the staff costs for any contingency we could encounter during the project development.

$$Cont = (Amort + Staff) * 0.15 = (7093 + 182.03) * 0.15 = 1091.2545 \text{ €}$$

1.4 Incidentals

In the previous chapter we commented the possible incidentals. Table 4 shows how the incidentals affect the budget.

Incident	Extra staff time (h)	Material costs (€)	Total (€)
MareNostrum 4 unavailable	16.5	0	165
Machine change	20	0	200
Incorrect runs	2	0	20
Total	28.5	0	385

Table 4: Cost prediction of incidentals during the project. Own compilation.

1.5 Total

Table 5 shows the grouped predicted budget of the whole project. Notice that from this cost we have omitted software licenses and compute hours costs which are confidential.

Concept	Cost (€)
Staff	7093
Amortizations	182.03
Fixed costs	305
Contingencies	1091.25
Incidentals	385
Total	9056.28

Table 5: Total costs of the project. Own compilation

2 Sustainability report

2.1 Self-assessment of the current domain of sustainability competition

The sustainability is a field where I was not conscious to think about but indeed I did.

I'm always thinking on the social and economical aspects of my projects as I'm interested on this fields. A common question I use to ask myself is how this project will affect the society? This is obviously thinking about the social and the economical aspects. Non-ethical technological products are becoming a tendency, changing people vote intention, governments tracking its citizens are examples of this and examples of developers that not thought about the social and economical aspects of their projects.

I have been ignoring or keeping apart thinking on the environmental aspects of my projects. This is usually because my projects don't use to impact on this aspect but now that I think that is the most important topic to think about it. At least on High-performance computing field that aims to solve or to find faster the solution to the problem.

I have also the concern to use and promote the free (as in freedom) software and hardware to avoid companies to be able to modify lifetime of products and therefore, generate more e-waste.

2.2 Economic Dimension

2.2.1 Reflection on the cost estimated

The cost estimated it is not precise as some parts are omitted for confidentiality. The estimations I made try to be realistic with the current price standard in Barcelona, Spain but I'm almost sure I miss predicted some estimations as I'm not experienced on this also not in charge of making the expenses.

2.2.2 Useful Life

My project aims to improve the computation time of a simulation. Hopefully if we improve the simulation the computation times will be lesser, therefore, scientists will have to invest less money on computational resources or will reach faster to conclusion which leads to scientific progress.

2.3 Environmental Dimension

2.3.1 Environmental impact of the project development

The environmental impact estimation has not been done. It is a very complex calculation as it involves the MareNostrum4 fabrication and electrical consumption and it is used by a lot of users. Scoping this in the project means making a lot of estimations which is not possible.

2.3.2 Minimize environmental impact

This is not possible in the project. The machine is already built. The only way we can act is in being conscious the electricity that consumes the machine and the laptop and try to use efficient the resources. This implies performing the appropriate number of runs.

2.3.3 Environmental impact of the project

The project will have a positive environmental impact. This research will be useful in order to make programs more efficient and reduce the running time of the applications which implies less power consumption.

2.4 Social Dimension

2.4.1 Personal growth

This project will make me grow on my young research career and will make me improve my technical and social skills. Contacting and explaining the project to the application developers, analysing, thinking and developing an optimal solution, discussing with my project manager all the aspects of the project, writing technical reports are things that will make me grow as a professional and as person.

2.4.2 Social improvement

This project aims to accelerate the combustion research as its objective is to make the scientific simulation to go faster. This can impact the society in many ways, from making less pollute motors to making faster planes. We cannot predict what research we will accelerate.

2.4.3 Is there a real need for the project?

There is a need to improve this simulations because they are really slow. A solution is needed and we can provide a step towards this.