Process report

Introduction

This report gives a brief overview of how we were able to realize our solar car project. The report contains description of the various processes that led to the realization of our final goal, how we have worked together as a team and the problems we encountered during the course of this project.

Jet solar team is made up of eight students from different parts of the globe. The countries represented in the group are Belgium, Cambodia, Nigeria and Thailand. Each of these countries has different culture and norms which are incorporated in the group.

There is a good understanding among the team members. Everyone in the team is given the opportunity to make contributions or suggestion. Everyone's idea is welcome and although we have a leader, no one is superior to other team members.

The team has a unique way of approaching problem which is a result of difference in ethnicity and culture. This cultural diversity gave the group a sense of completeness and more comparative advantage over other teams.

Cultural differences in the team have positive impact on the team's discussion and making progress when we are confronted with problems that need urgent solution.

Planning

Generally, we were able to finish our solar car according to the plan. Some of the tasks were more time demanding than what we predicted in our Gantt chat initially. There are some smaller tasks which were not included in the Gantt chart because we did not foresee them, for example the drilling of holes through the car frames to reduce the total weight of the car and the continuous update of our process report.

We are open to criticism and correction from other teams thus our final result becomes much better.

Organisation

The group is organized in such a way that everybody is useful and busy with some tasks. We have a leader whose responsibility is to assign tasks to each member of the team he also ensures that each team member is working hard enough in other to meet deadlines.

We have a good and transparent leadership; the leader takes everyone along and listens to the team. We have a secretary whose responsibility is to take note all ideas and point during meetings. The secretary prepares the meeting report of the previous meeting and comes with it to the next meeting.

At the beginning of the project, one of the most difficult problems in team work was communication because we have eight members coming from four different countries in total. Fortunately we made a great agreement on this problem and solved it quickly by clear plans and regular meetings. As a result, everyone knew what he or she was expected and tried his/her best to make contribution to the group. We manage to another manner of working to improve work efficiency. It means dividing the team into 3 to 4 small groups, instead of working individually or in a big eight-person team. Besides, we use Dropbox to exchange files online which is really convenient.

As for the contact with the coach, we meet with Mr. Tan Ye almost every week and get advices from him. When facing problems we will first try to find the solution by ourselves and if we are stuck with something we will turn to our coach. He guides us which part we should focus at and reminded us all the deadlines. Of course he gave us advice about our working, such as the calculations we finished.

Skills & Problems

This project was successful because of the skills and contribution of each team member of our team. Throughout this project one skill has been present in the team, which is the ability to work together in one spirit. This has helped us tremendously in this project because we never had any misunderstanding among our self.

EE4 project have helped us develop our individual skills like ability to be a leader, ability to organize a project, how to understand and being patient with people from different cultural background. It also expanded our knowledge we acquire from divers disciplines such as mechanics, electricity, material technology, technical drawing and some software. At first we really did not know what we should do and how to start. A lot of formulas about mechanical calculation and complex software Matlab confused us. We assumed some parameters only by guessing, such as the mass of the vehicle and the diameter of wheels and the gear ratio.

There were no skills that caused problems for the team. We only encounter challenges in some of our calculations which we rectified with our coach Tan Ye, these mistakes actually improved our knowledge at the end. There are some skills which were also lacking in the team, we had no one who knows how to use Simulink that was one of our biggest challenge.

One of the main problems we had was when testing the car, we discovered that it cannot start except it is given an initial push. It could also not pass the ramp. When we thought about the problem, we discovered that due to missing bearings between the shaft and the body of the car. The high static frictional force between the axle and the body prevented the car from starting. We bought some bearings and fixed it on the axle. Together with the loss of weight and removing the rubber from our tires, we could solve this important problem.

Cooperation

Every member of the team has been allocated several tasks within a given deadline. The tasks are redistributed during the project.

Tasks are done by using the principle of division of labor. The entire team is divided in each group of two or three students with a specific task and a deadline. Each group can also split into subgroups where individuals are given their personal task, also with deadlines. The task division is based on the work breakdown structure (WBS). Together with the estimated time to be spent on the different tasks, a Gantt chart is made to have a planning with task division per team member. Each individual has a logbook where he or she writes down the amount of time he spends working on a particular task. This information can be used in the Gantt chart. This enables us to know how much time is used to complete a task and how much work is done by each team member. In particular it gives a good view of the evolution of the project. We can also be used to have a fair division between the members.

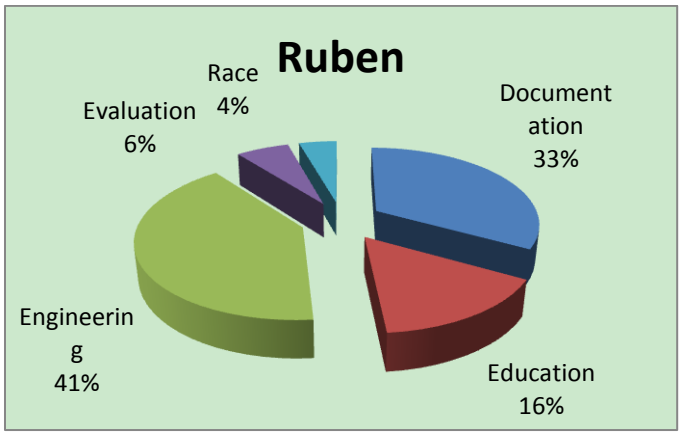
Tasks are distributed equally among all team members. If a group is having some difficulties, they can ask for assistance from other groups or can demand for an extra person to join them to make their job much easier.

The tasks of the second engineering part for example were distributed as follows. Ruben and Liu did the draft of Sankey diagram of the Umicar solar car, Joe and Jeroen did the marketing part (4P), Qi and Sokna designed the car length and Thomas, Hans and Jeroen built our car. The calculations of the shaft were made by Thomas and Ruben. We did our very best on each task and we communicated through mail during Easter holiday. Ruben and Qi went to Fablab in order to cut and remove some parts of our car to make it lighter because our car was quite heavy.

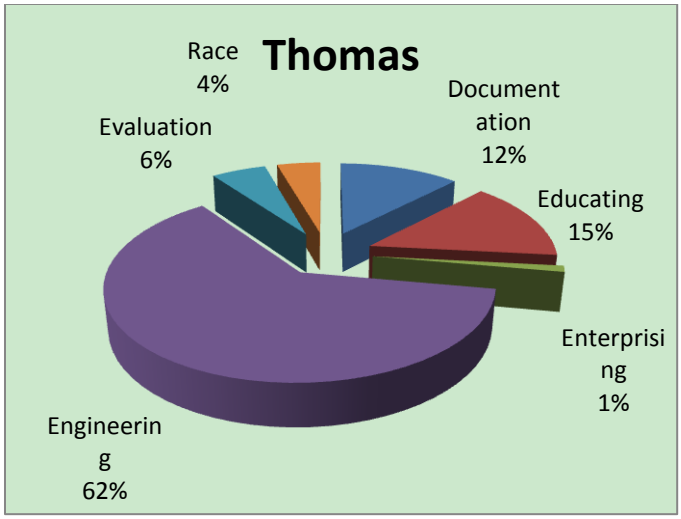
The contribution and task assignment to each member of the team and the number of hours spent on each task is given in the table below. The graph also shows in percentage the aspect of the project that an individual spent more time in during the project.

The tasks are divided into six major groups and each group is subdivided into subgroups as follows.

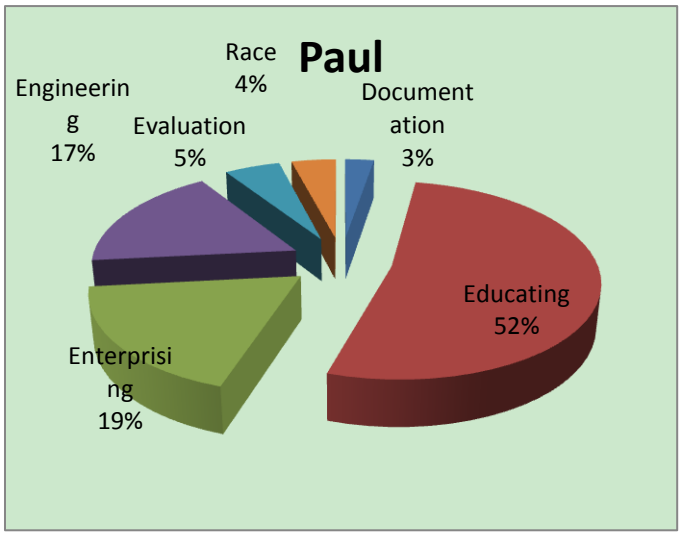
Group	**Subgroup**
Documentation	POA, Gantt chart, wiki, WBS, contract, administration, meeting
Enterprising	Marketing, logo & name, website, budget control
Educating	Research, seminars, process report, solution report
Engineering	Design, calculation, Sankey diagram, prediction, building, ransmission ratio
Evaluation	Peer Assessment



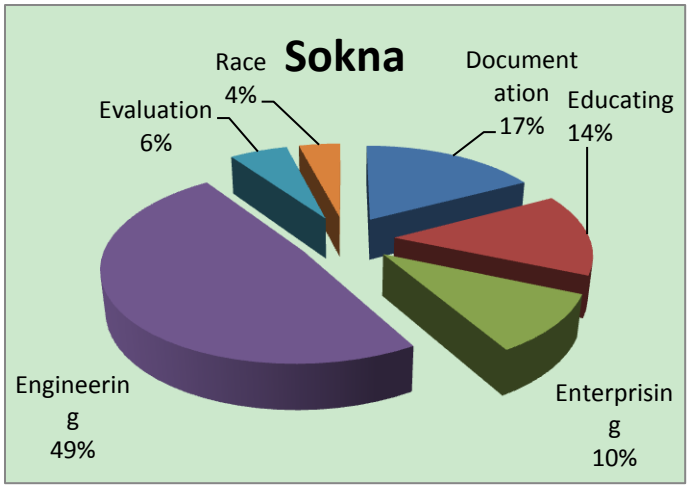
Task	Hours
Documentation	15
Education	7
Engineering	18,5
Evaluation	2,8
Race	2



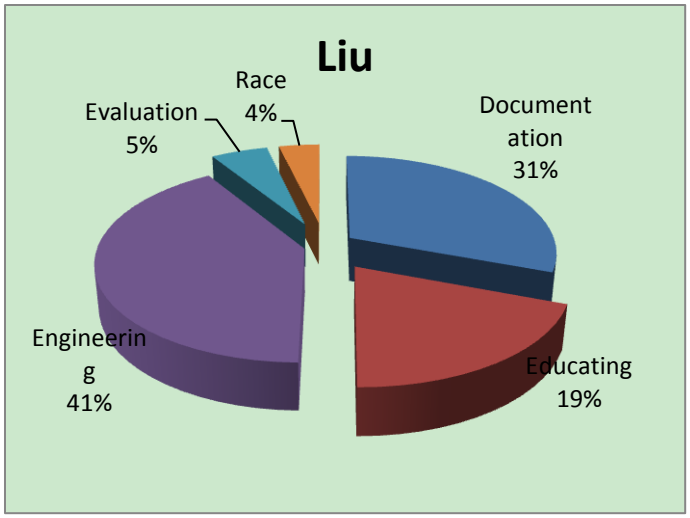
Tasks	Hours
Documentation	5,5
Educating	6,5
Enterprising	0,5
Engineering	28
Evaluation	2,5
Race	2



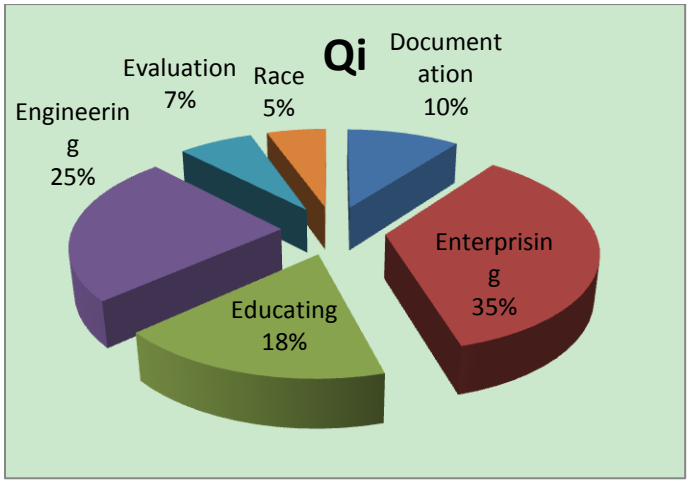
Tasks	Hours
Documentation	1,3
Educating	25,5
Enterprising	9
Engineering	8
Evaluation	2,5
Race	2



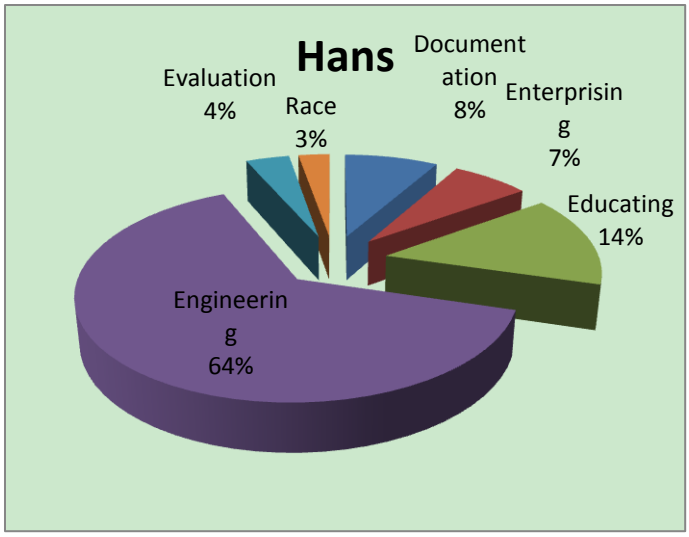
Tasks	Hours
Documentation	8,5
Educating	7
Enterprising	5
Engineering	24
Evaluation	2,8
Race	2



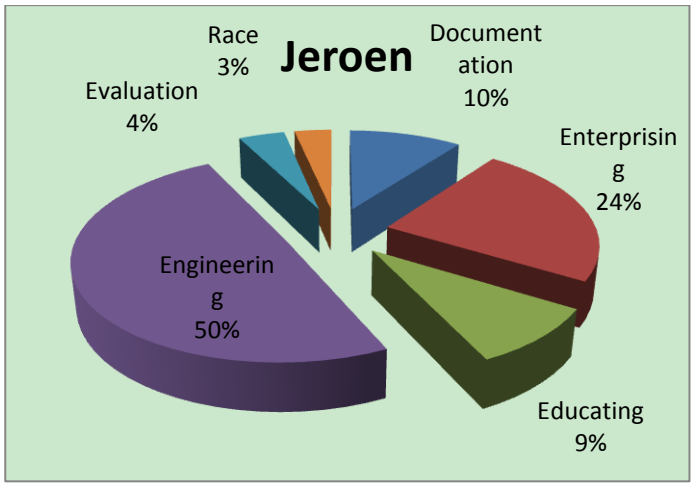
Tasks	Hours
Documentation	16,5
Educating	10,5
Engineering	22
Evaluation	2,8
Race	2



Tasks	Hours
Documentation	3,8
Enterprising	13
Educating	6,5
Engineering	9
Evaluation	2,5
Race	2



Tasks	Hours
Documentation	6
Enterprising	5
Educating	10,5
Engineering	46,5
Evaluation	2,8
Race	2



Tasks	Hours
Documentation	6,1
Enterprising	14
Educating	5,5
Engineering	29,5
Evaluation	2,5
Race	2

Conclusion

At first we thought we would encounter especially problems in building and designing the car, but we rather had problems with our simulation with Simulink. We found that our car functioned better than we simulated.

When working as a team, we noticed that solving problems together is much more efficient. Since we have different view angles, we can solve the problem eventually, even it looks so unachievable at first.

If this team should embark on this kind of project in future, we will improve our organization and assign a lot of people to the task with simulation because we believed that the reasons why we had problem with our simulation was because only two people were working on this aspect of the project.

The most interesting experience for us is to work in a mixed-culture team. We have Nigerian, Belgian, Cambodian and Chinese persons. While working together we sometimes experienced some culture gaps, which was actually not surprising. For example Belgian persons can speak Dutch to each other while the rest does not understand it, and so for the Chinese.

Literature

We got a lot of information from documents posted on Toledo and through researches we made on the Internet and the series of seminars which we had also helped us tremendously.