Summary

The Formula Student competition is a very large international design competition in which universities and colleges from over the entire world compete with each other. The different teams all build their own formula type race car in the period of one year and participate in one of the eight competitions in different parts of the world.

The Delft Formula Student team (DUTRacing) first entered the competition in 2001 with their first car: the DUT01. The Delft team competes in the competitions in England and Germany. Since 2001 the Delft team has entered the competition every year and is since 2003 known for their lightweight cars. The Delft cars weigh in at around 130 kilograms, while the next car weighs in at 180 kilograms. This concept is known as the “Delft Concept”.

In literature several examples of project life cycles can be found; they describe the total cycle of a system from initiation to its retirement. This project life cycle can be “tailored” to suit a specific system. In this case a Formula Student race car at DUTRacing. This was first done by Pieter Commandeur, team manager in the 2003-2004 year. Two years later Machiel Den Ouden reviewed this life cycle.

A race car is a very complex product and a systematic design approach is necessary. In the previous years (before 2005-2006) the car was never finished on time and a short investigation traced the start of this delay back to the design phase. To prevent this delay the theory behind the design phase was better described. The design phase consists of two separate phases: The concept design phase and the detailed design phase.

In the concept design phase a requirements and functional analysis have to be performed. The next step is the generation of different concept and after that with the help of a trade study one concept will be chosen to be worked out. In the detailed design phase this chosen concept will be worked out to a complete working design. This theory was described in a better way to improve the design of the car.

This theory was only known by the management in the beginning of the 2005-2006 year, but still it was decided to implement it for the design of the DUT06. Thru a series of meetings and presentations this theory was transferred to the designers. And most of them were able to use this in the design of their part. For most designers it proved to be difficult to set proper requirements with verifiable values.

At the time of the design presentation (deadline of the design phase) still 2-3 percent of the parts were not totally designed. Although more parts were designed at the time of the design presentation than ever before in the DUTRacing history, the design of these last parts took until the end of January.

During the design of the DUT06 all the parts were noted in a large excel sheet, to so-called weight management, with their mass, coordinates, raw dimension, responsible person and other important properties. This weight management made it possible to closely monitor the design process and the weight of the car. It also helped with the ordering of the raw materials.

A lot of attention went into motivating and helping the designers document the design process for a certain part. A special standard document was created to make sure that all the documentation was in the same format and to provide the designers with a standard structure for their document. But unfortunately at the end of the 2005-2006 year it had to be concluded that most parts were not properly documented.

For the DUT06 the new design approach was introduced at the beginning of the year. This new theory worked fairly well; all the designers followed the steps as described and at the end of the design phase one integrated design emerged on the computer screen with no interfering or clashing parts. But the same theory could have been used even better if there was a document in the beginning of the year, describing this theory. This document should be made mandatory literature together with a lecture on systematic design.