Motorsport engineering and coventry university

Motorsport is the group of sports which primarily involve the use of motorized vehicles, whether for racing or non-racing competition. Motorsport refers to motorcycle specifically and includes off-road racing such as motocross and Moto GP [Web-ref 12]. Motorsport in Coventry was inaugurated in the year 2002 by Prof. Bernard Porter and others.

In general, Motorsports fan base embraces of upscale male and female youths from age of 20 to 45. These fans fall in the middle and high class income who have strong passionate towards motorsports and be associated with status and prestige. The fans are generally looking for spectacular circuit experience.

The main advantages and drawbacks of the motorsports teams in the university Enthusiasm, interest and lack of focus, motivation respectively. PEST and SWOT analysis identified the strengths and weakness in the motorsports and developments need to be done. Among the main findings the university has its strengths in Facilities and experienced faculty. The weakness there is no proper motivation for the students and the staffs that are working for the projects it also include lack of focus on the goal for the students. As a result, the University teams are facing threats from the competition among the motorsport organisations.

2. INTRODUCTION: Motorsports engineering provides an application focus for many aspects of modern engineering. It is more than mechanical, manufacturing or electronics engineering, as a integration of these technologies. Management and Business skills will help in developing the techniques for team building and organisation, learning, from practices of

successful teams in a range of disciplines. To study the motorsport enterprises, develop market research techniques, sponsoring programmes and comprehensive business plans. This course work presents the outcome by relevant interviews, reviews of evidence, achievements, results and it also covers the complete history of Motorsports Engineering in Coventry University. And also applying the relevant analysis to find out the critical areas for improvement and give some suggestions to be improved.

3. HISTORY OF MOTORSPORTS IN COVENTRY UNIVERSITY:

Coventry University has a long tradition as a provider of education. The roots go as far back as Coventry College of Design in 1843. It was in 1970 that Coventry College of Art amalgamated with Lanchester College of Technology and Rugby College of Engineering Technology. The resulting institution was called Lanchester Polytechnic: ‘ Lanchester’ after the Midlands automotive industry pioneer, Dr Frederick Lanchester, and ‘ Polytechnic’ meaning ‘ skilled in many sciences and arts’. In 1987 the name changed to Coventry Polytechnic and in 1992 it adopted the title Coventry University.

3. 1 ROOTS OF MOTORSPORTS:

The roots of motorsports in the university started in the year 1999 with the discussion of the two students to participate in any of the competition and proposed it to a tutor. This lead the Mechanical automotive department to think about competition and sent a team to NEC event to check the things that are needed to take care and difficulties, etc. to build a car and made a decision to participate.

3. 2 BUILDING THE CAR:

They started building the car with the CBR 600 engine in the same year (1999) with a team lead by Bernard porter and pousher to participate in the first race of the university. Formula student was the only car used to build from the scrap by the graduate and under graduate students with the help of staff. The research on the formula student is still going on and they are building news cars every year unlike other cars. [Porter, 2010]

3. 3 PRELIMINARY OF THE COURSE:

They has started to discuss about the starting of motorsports course in the university in the following year 2000 and made a decision to start it. It took two whole years to start the course; they started the course in the year 2002 with the main objectives to develop skills of the student in the field as well as the to develop the personal relations with the people and to market the university in a better way with a direction and scope of university over the long term to achieve the advantage for the organisation through its configuration of resources within a challenging environment. (tutor2u. net)

3. 4 COURSE DISCIPLINE & OBJECTIVES:

To create Engineering activity for the students

b) Positive profile to attract public

3. 5 BUDGET FOR MOTORSPORT:

Coventry University is the main sponsor for the races and course with a budget of 1200 pounds every year until 2004-05. The budget rose to 20, 000 pounds since 2005 and maintained the constant budget till now. They even

got the sponsors for the tyres and logistics and some other components. Early years the total budget where used spend on formula student only, but in the recent years the some of that money is allocated to Subaru, Peugeot, Nissan, and also motorcycle projects as well. The budget from last four to five year is about the same not changed till now. It is also not possible to give the budget to only one of the project and give more importance on research; this can effect on the objectives of the university and the department. Because the number of graduate and undergraduate students will miss their hands on experience of the projects which will lack the practical knowledge. in my view the better way to overcome with this problem is try to increase the number of races per year with a small dwell time where there should be some increase budget as well, so that there is no need to start the research from the beginning every time they go to race.

3. 6 FIRST RACE:

Entered the race with the CBR 600 engine with no experience, they received comments like no higher standards, pit crew is not fast enough, lack of focus. But they even received best compliment like friendly team, which boosted the team confidence a little. Here starts the ride of motorsport races of this team.

Formula student is only the race where they received the best results over all the races they have participated.

Formula student resulted in 13th place for first time out of 17 races. Third place in one of the event held in the year 2005, which even boosted the confidence and motivated the students to take part of the future projects.

3. 7 PERSONS INVOLVED IN MOTORSPORT BUSINESS:

David Williams

James

Rank calove

Scope

Jelft B

Saul-bastine 2years

3. 8 WORKSHOP (ALMA):

The work shop was shifted from old building to Alma building in the year 2008 September month in order to give the students with new facilities that will help the students to gain more practical knowledge with the lab facilities available and even to help the university and students to keep participating in the race events every year with some development in the vehicle.

Shaker rig, Engine Dyno and other new facilities gave students good practical knowledge and motivation. Which was the main objective of the university, this motivation worked not only for students but for staff as well which even boosts the confidence of the management to achieve their goal.

Later years more cars come in to the action one of it was Mitsubishi bought by the student from Ireland with his enthusiasm to take part in race. After his course he offered university the car and left. Then after car was destroyed in the race by careless driving, the car was replaced by Subaru, this was

chosen with the technical advantages in the motorsport races with its low centre of gravity and four wheel drive and better handling.

The Peugeot 206 was introduced with higher technology in data control system and also with well modified systems for a race car, the modification made to the vehicle dynamic system was replacing the all conventional systems like suspension, brakes, roll cage, tyres they replaced conventional suspension with KSW suspension [REF-David William, 2010] installed the operated dampers for better handling, AP disc braking in the front and GT 180 in the rear, tires from yokahama. The other modifications to car like engine, aerodynamics, data collection and safety are done to get the best of the vehicle. This car has been used as the basis of various final year projects. This is the third year that the car has entered the Tin Top series. Last year the car ran very well all season with a modified 2. 0 Litre engine. Through use of engineering software, the students had developed, built, tried, and tested their development designs. The result was an engine with excess of 200bhp, and a good wide spread of torque.

The Specifications of the developed engine are as follows:

High Compression Forged Pistons (Designed by students, manufactured by Accralite)

Knife Edged Crank (Crank assembly balanced by Vibration Free)

Lightweight Flywheel (Designed by students, manufactured by Arc Racing)

5 ½” Tilton Clutch Custom Designed cam-shaft (Designed by students, manufactured by Newman Cams)

Motorcycle Throttle Bodies

Tubular exhaust manifold (Designed & fabricated by students)

Race Specification Engine Mounts (Supplied by Vibra-technics)

The car has KW suspension fitted, Camber adjustable top mounts, and a High Ratio Steering rack, modified from a Ford Escort. The students have access to a rolling road and have mapped the engine using an Emerald Programmable ECU. The car is fitted with a Pi Research Data Logger, and is well equipped with various sensors. The students use the data to make improvements to the vehicle performance, and the performance of the driver.

3. 9 OULTON PARK RACE REPORT (AUG/11/08): Friday was spent testing at Oulton Park, the car ran well all day, and lap times from the previous year were reduced by 5 seconds a lap. The students worked well all day, recording data and making adjustments to chassis set up. Some of this year’s Formula Student team came along to gain some experience of testing.

The driver change was practiced at the end of every session which reduced from 45 seconds, to 24 seconds during the race on Saturday. This involves many members of the team as they give the ‘ Pit’ signal to the driver, bring the car to a stop in the correct pit position, and assist with the race harness.

A wet qualifying session put us 18th on the grid, other more experienced drivers made the most of the first 5 minutes of dry track time before the heavens opened, and put in some early quick qualifying times. Despite the rain continuing during the afternoon, a few places were made up during the

race, resulting in an overall position of 14th out of 22 entrants. A good result for the team, particularly for Richard Scott (recent Motorsport Graduate) who completed his first race since obtaining his race license. (cublogs. coventry. ac. uk, 2007)

3. 10 RACE REPORT SNETTERTON (OCT/20/08): The new MSc Motorsport students, and some of the new Final year Motorsport students, spent a day testing with the University Peugeot 206, at Snetterton on Friday . Through careful Data analysis; Lap times were reduced from 1: 31 to 1: 26. 5 to qualify us on 4th on the grid in a field of 21 cars for Sunday’s race. A good first stint by Williams put us in 3rd position prior to the pit-stop with a fastest lap of 1: 25. 5; Scott took over but lost one place in the pit-stop. With 1 minute to go still in 4th place, Scott lost power from a failing fuel-pump and pitted. James Jarvis (Development Officer), seeing the chequered flag, made a quick decision to send Scott back out with the failing car. Passing the chequered flag in the Pit lane, Scott finished the race, classifying us in 5th position. A Great result at the end of the season for all involved. (cublogs. coventry. ac. uk, 2007)

3. 11 A WET SILVERSTONE RACE (JUN/08/09): After a week of sunny weather, the rain descended on Silverstone! Not having the opportunity to complete any wet weather testing with the Subaru, we were pleased to qualify the car in 19th position within a grid of 32 cars. However the rain came down harder for the first race, the visibility became worse, and it was less of a race but more a test of who could stay on the track for longest. We finished the first race in 25th position, but made up 11 places in the second race finishing

14th. We even came away with a pot for 2nd in Class. (cublogs. coventry. ac. uk, 2007)

3. 12 OULTON PARK (JUN/13/09): The students worked in to the early hours, re fitting the engine in to the University's Peugeot 206, after the engine had been on the test bed to conduct an investigation in to alternative fuels. A few problems arose prior to the race due to the late installation that meant we missed our qualifying session. Fortunately the students diagnosed the problems and managed to get the car repaired and ready in time for the race. The penalty for missing qualifying is to start at the back of the grid, putting us in 23rdposition. Richard Scott made an excellent start, followed by several good laps, although there were a couple of moments that he did well not to spin out from pushing a little too hard. A lightning driver change pit-stop made up a couple more places, Williams had a good second stint, and took the chequered flag at the end of the forty minute race, finishing the team in 9th place. The Team of students worked well under pressure to rectify the problems, and finishing in 9th place after starting with such a penalty was a well-rewarded result. (cublogs. coventry. ac. uk, 2007)

3. 13 SILVERSTONE RACE REPORT OF PEUGEOT 206 (AUG/06/09): The Peugeot 206 was out at Silverstone for the latest round of the CSCC Tin Tops with a packed grid of 33 cars. The weather forecast held true and the team of students arrived at a rainy Silverstone circuit. With a damp qualifying session Richard Scott qualified the 206 in 17th place with a time of 1: 15. 988. Using the on board Pi Data System driver performance was analysed from the qualifying session to allow each driver to see where they were

gaining and losing time. With rain expected for the race setup changes were also made to the suspension to improve the cars performance in the wet.

James Jarvis experienced his first time starting in the 206, and made a clean getaway in tricky conditions. A good consistent performance from Jarvis saw him steadily work his way up the order with his fastest lap being a 1: 29. 789.

As always the team attracted attention in the garages practicing their ultra quick driver change pit stop routine. A faultless pit stop during the race by the team saw the car gain many places. With Scott now at the wheel and finding the wet conditions difficult, he began trying to defend his position as the quicker cars loomed. Unfortunately when caught up with back markers, an overcautious Scott lost a few places, resulting in a finishing position of 18th.

With 16 Class A entries (up to 2000cc multivalve engines) the result still proved a good one for the team, with the car still using the spare standard engine. With little wet weather experience, both drivers did a good job keeping the car on the track and pointing in the right direction! The benefit of the on board data system was also shown, as Jarvis had been 4 seconds off Scott’s pace in qualifying, but after analysis and feedback of the data he now had the confidence and proved the fastest of the drivers during the race. (cublogs. coventry. ac. uk, 2007)

3. 14 BRANDS HATCH – RACE REPORT (MAY/11/09): Richard Scott and James Jarvis were out in the University Peugeot 206 this weekend at a sunny Brands Hatch Despite a slight ‘ moment’ for Jarvis at Paddock Hill Bend

during Qualifying, the lads started 14th in a grid of 26 cars. Scott lost a few places as the lights turned Green, but soon made a few back up. Students from 2nd and 3rd year Motorsport completed a well-practiced pit-stop when the drivers changed places, in a lighting 15 seconds Jarvis swapped places with several cars during the final stint, bringing the car across the chequered flag in 13th place. The 206 had recently been fitted with the latest Pi Data acquisition upgrade; the students were able to use the data to see how lap-times could be reduced further through careful Data Analysis. (cublogs. coventry. ac. uk, 2007)

3. 15 MALLORY PARK – RACE REPORT (MAY/26/09): A sunny weekend at Mallory Park! Richard Scott and David Williams Qualified the Peugeot 206 in 14th position with a lap-time of 57. 3 seconds in a grid of 24 cars Williams drove a good first stint, making up a few places. Some minor damaged to the door was received whilst defending a position through the tight Mallory hairpin!

Scott took over and drove faultlessly making up further places. Lap-times were reduced by both drivers to 56. 8 seconds during the race. Scott crossed the Finish line in 8th place.

The Team of 1st, 2nd, 3rd year and MSc students were a credit to the University, worked well together as a team ensuring a smooth pit-stop. Pit lane signalling, driver change, and tyre pressure adjustments were carried out like clockwork. Data was analysed between the qualifying session and race, and information relayed to the drivers which assisted in reducing lap-times. The students not only gained valuable experience, but also took time

to speak to the general public who had taken an interest in the University’s involvement with the race series. (cublogs. coventry. ac. uk, 2007)

3. 16 FORMULA STUDENT 2009: In the Year 2009 Coventry entered two cars into the Formula Student competition at Silverstone. One car was built from scratch, entered in to Class 1 the other was last year’s car with some engineering modifications, entered in to Class 1-200. The cars completed many laps testing in the weeks leading to the competition, which highlighted some minor problems that were soon rectified. It also gave the drivers a chance to become familiar with the car, and make some suspension adjustments to improve the handling. Art & Design students had designed the bodywork for both cars, and spent the weeks prior to the competition creating their designs in time for the competition. Both cars passed all the Technical tests with relatively little problems, until the Class 1 car sheered a drive shaft during just after completing the Brake Test. The parts were quickly returned to the University where a repair was made. Due to the tight scheduling of the event, they were unable to get the car repaired in time for the Skidpan and 75m sprint. Both cars set reasonable times in the sprint event, but unfortunately the repair to the drive shaft failed again, and led to an early end to the Class 1 car during the Endurance event. The Class 200 car also suffered a drive shaft problem and had to retire from the endurance event on the last lap! Back to the drawing board for next year. (cublogs. coventry. ac. uk, 2009)

3. 17 SUBARU:

The students have prepared a Subaru Impreza STI that will be used for various projects such as Data Analysis, Power train performance, chassis analysis, and vehicle Dynamics.

The Car has entered the Subaru Cup, in order for the students to gain valuable Race Team Experience

Masters students are also used the car for Dynamics project they are worked on in partnership with Pro Drive. (cublogs. coventry. ac. uk, 2007)

Figure 1 (cublogs. coventry. ac. uk, 2007)

3. 18 NISSAN P35

The University has been kindly loaned a Nissan prototype P35 for students to use as the basis for Final year projects. The owners of Chassis No. 2 have been able to provide body moulds obtained from a sister car. Every attempt was made to acquire a Nissan V12 engine, but this proved to be impossibility, so a decision was made to install a Nissan V6 Engine, similar to those fitted to other Groups C Nissans of this period. Currently the engine is being installed naturally aspirated, with the intention of going twin turbo as the project develops. (cublogs. coventry. ac. uk, 2007)

Figure 2(cublogs. coventry. ac. uk, 2007)

3. 19 BIO ETHANOL AT MALLORY PARK – 5TH JULY

Another 40 minute 2 Driver race back at Mallory Park for the 206 provided a chance to run E85 Bio Ethanol for the first time, as students had recently

completed a project using the environmentally friendly fuel. The 206 qualified in 5th position, within a mixed grid of Cater hams, Jaguars, and a few other Makes & Models. Williams started the race, a fierce bumper to bumper battle with a Jaguar XJ Coupe, continued for many laps until finally a good exit out of Gerard’s Bend, gave the opportunity to out brake the Jaguar into the Cooper Esses. Jarvis took over and drove a solid race finishing the team 1st in Class, and 3rdoverall. (cublogs. coventry. ac. uk, 2007)

3. 20 THE BIKES:

The Motorsport Department currently have 2 x Track Bikes, a Honda CBR 600 and a Yamaha R6.

Figure 04 (cublogs. coventry. ac. uk, 2007)

The Bikes have been fitted with Pi Data Acquisition and are regularly used at track days for students to acquire and analyse Data.

Track maps are created from wheel speed, internal accelerometers and a Gyro. Below is a Track Map created of Mallory Park. (cublogs. coventry. ac. uk, 2007)

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Figure 05 (cublogs. coventry. ac. uk, 2007)

3. 21 MOTORSPORTS MANAGEMENT: The major objectives of Motorsports management

Research and Development in the technology

Management

Motivation

Sponsors

Rewards

Facilities and Resources

Logistic

3. 22 DEVELOPMENT AREA IN MOTORSPORTS: Research and development in the department of university used to be better in the early days where as now the development is very poor which is not helping the teams in technical requirements to win the races. The technical developments in the formula student are done only by the regulation given, so the development in this car is constant till now. But the cars like Peugeot 206 and Subaru don’t have any technical regulations which give good opportunity for students to get in to maximum power of the engine and other requirements the other technical advantage is that they got data acquisition system inside Peugeot 206, the only second team using this technology in the race. Peugeot 206 is the Hi technology car in the university teams which is more advantage and motivation for the students to do better and better developments.

The managerial developments

Aerodynamics

Drag

Down force/lift

Stability

Vehicle dynamics

Roll cage

Chassis

Suspension

Steering

Breaking

Tyres

Engine/Power train

Data collection

Safety

Cockpit

Manufacturing

These are the areas where the developments should be taken which will also help the students to gain the particle knowledge.

4. MANAGEMENT:

Management development is an effort that enhances the learner’s capacity to manage organizations. Very simply put, managing includes activities of planning, organizing, leading and coordinating resources .(McNamara)

The main objectives of management are:

Getting Maximum Results with Minimum Efforts – The main objective of management is to secure maximum outputs with minimum efforts & resources. Management is basically concerned with thinking & utilizing human, material & financial resources in such a manner that would result in best combination. This combination results in reduction of various costs.

Increasing the Efficiency of factors of Production – Through proper utilization of various factors of production, their efficiency can be increased to a great extent which can be obtained by reducing spoilage, wastages and breakage of all kinds, this in turn leads to saving of time, effort and money which is essential for the growth & prosperity of the enterprise.

Maximum Prosperity for Employer & Employees – Management ensures smooth and coordinated functioning of the enterprise. This in turn helps in providing maximum benefits to the employee in the shape of good working condition, suitable wage system, incentive plans on the one hand and higher profits to the employer on the other hand.

Human betterment & Social Justice – Management serves as a tool for the up liftment as well as betterment of the society. Through increased productivity & employment, management ensures better standards of living for the society. It provides justice through its uniform policies. (managementstudyguide. com, 1998-2011)

4. 1 PEST ANALYSIS: A scan of the external macro-environment in which the firm operates can be expressed in terms if the following factors

Political

Economic

Social

Technological

Figure 6 (provenmodels. com, 2005-2011)

Political: Strong Government support to the universities by conducting the competition and allowing the Organisations to conduct them as well.

Economical: support for the government in financial difficulties should be there. In which now the Coventry University facing it in the recent years due to budget cut by the government, which is effecting on the budget of motorsports department not to meet their values. The interest of the management in putting the more budget in this non-profitable investment is also low.

Social: Passion for speed/racing- In general the passion for the speed and racing for the people in UK in height. The evidence for this is history of motorsports and the number of teams. But the strength of spectators for support depends in the type of race for example visitors for Formula student will be around 1000[porter, 2010]. Where for other race its might be less.

The support from staff and the student is not good enough as per the results when compared to other university teams or other organisation not meeting the facilities that the University is having now.

Technology: The Automobile hub, technology and the facilities that are in the university are high enough to reach the target for a team when compared to other teams who are in the same level of achievement. Not only that university trying to expand the lab facilities by constructing new building for mechanical/automotive department which will be completed by 2011-12[porter, 2010]

5. SWOT: The following analysis captures the strength and weakness within the university and describes opportunities and threats facing it.

Strengths:

Facilities

Especially for the motorsports department which gives more advantage in the technology.

Engine dynamometer: This helps in calibrating the engine and its power to maximum extent with on wheel and off wheel facilities [Neil rayner, 2011]. It can also be used for testing the ECU as well.

Shaker rig: This helps the students off road testing experience to find the better vehicle dynamics in any whether condition no to wait for a good weather to do the testing on a track

Small scale wind tunnel: To do the aerodynamic testing for a scale models and implement the developments on the vehicle.

Data acquisition unit: This helps in collecting the required data from the entire vehicle and the driver. This data used in research and development mode as well as in the pit area to do the required adjustments.

Faculty: with the great experience in all the sectors for motorsports filed and automotive

b) Weakness:

Lack of focus and motivation for the students: The result of the team with facilities and strength of different organisation are able to stand in the races but the teams from the Coventry University is not up to the mark in the level of focus, motivation, knowledge, experience.

c) Opportunities:

Jaguar land rover: students from the under graduations and post-graduation have a great opportunity to be placed from the university from the graduate program.

Local motorsport teams: Students have the opportunity to be a member of local team with the help of University and tutors relationship with the local teams

d) Threats:

Threats can be from anywhere like competition from the other university in the research department and in the competition.

It can be financial budget

Lack of team coordination

Experience

Negative news on internet or media

5. 1 STRATEGIC MANAGEMENT:

Strategic management refers to the art of planning your business at the highest possible level. It is the duty of the company’s leader (or leaders). Strategic management focuses on building a solid underlying structure to your business that will subsequently be fleshed out through the combined efforts of every individual you employ. Today’s dynamic and complex environment requires a more sophisticated view of strategy. (tutor2u. net)

Strategic management hinges upon answering three key questions:

What are my business’s objectives?

What are the best ways to achieve those objectives?

What resources are required to make that happen?

Answering the first question requires serious thought about what your ultimate goals are for the business. What are you trying to make happen? What are you attempting to facilitate or enable? What is the best possible outcome your company can aspire to?

Drilling down to uncover a company’s core objectives can have several phases:

Assessing the landscape within which the company will operate, and formulating how the company sees its role within that landscape. This is commonly known as a mission statement.

Establishing objectives to answer some of the unmet needs, taking both a long- and short-term view of what the company can offer. This is commonly known as a vision statement.

Stipulating the goals the company has for itself, both in terms of financial and strategic objectives. (allbusiness. com, 1999-2011)

Quality function deployment:

QFD is used in some of the designs in my knowledge in recent years qfd has not done the word be use full for all the they this for as the mass.

To help the students to develop skill as a graduate engineering.

To generate progress team profile of the university so if you do the qfd that would be the objective for us these are important key

5. 2 FUNDING:

Total budget each year is same about 20, 000 the financial department make a decision about how to allot that budget that was running. Every year the budget is done in the month of August-September for the upcoming year. The budget left after spending will not be transferred to the next year’s department it is sent back to the Dean [Porter, 2010]

5. 3 FINANCIAL RECORDS:

The maximum spend in a year is 25, 000£ and minimum is 3000£ and the average is about 8000£.

6. THE CRITICAL AREAS FOR IMPROVEMENT:

Lack of focus in the students of their goal

No strategic planning

Not using the facilities that are available up to the mark

Not enough research done in the motorsports department(Missing practical opportunities for the students)

Lack of experience in the teams

Lack of focus in the students of their goal: The students are motivated well by the faculty but the problem is with the students who don’t have the focus on their goals.

No strategic planning: The strategic planning for the motorsports department is not good enough. And also the marketing strategies for the department are not implementing well with the reason of Budget and the Budget cut by the government.

Not using facilities: The facilities that are available in the university are only used by the formula student team