



TRAXELEATION

DESIGN PORTFOLIO





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"A single idea from the human mind can build cities. An idea can transform the world and rewrite all the rules" - Cobb, Inception

Bold Inception

What We Stand For

Goal

- To leave a **mark** on F1 in schools history, not only as a collection of talented and hardworking individuals, but also as a **successful**, competent and innovative team.
- To resemble an actual Formula One team in all aspects.
- To have **meaningful fun** along the journey, together.

Mission

- To **achieve victory** at the competition itself.
- To emerge as more **learned individuals** than we were yesterday.
- To look back upon the event with fond memories of having **worked together** as a team much like a well oiled machine.
- To incorporate the **modern skills** gained during the course of the project in our future careers.

Vision

- To provide a **sophisticated** professional look, that still presents individuality as a team.
- To leave a **lasting impression** upon the future generations of our school, to embolden them to take up the challenge.



A portfolio of **legendary** proportions

The Legacy of Our Own High School

Ever since two of our members did the **first ever reaction race** in our school, a passion welled in all of us to excell at this technological challenge. Our school has a great track record of winning in the past competitions and as the top position team in our school, we aim to uphold that legacy.

Team adrenaline won the best portfolio award in the 2014 National Finals while **Team Pistonari** participated for both 2013 and 2014 National Finals and placed fourth in both. As one of the first teams in school, Pistonari provided invaluable information and shared their **experience**.



Team 21m/s placed third overall in the 2014 Nationals and scored the best portfolio award in the Nationals 2013. They had also received the amazing chance of being able to participate in the **F1 in Schools World Finals 2015** held at Singapore. They provided a lot of **inspiration** and became a goal that we aimed to top.



The school faculty have also always been there to assist us. For that, we express heartfelt gratitude and hope to make them proud in the National finals.



BERNIE ECCLESTONE

The **F1 Supremo** who commercialized Formula One Racing and changed it forever, can be compared to our zeal of changing the perception of F1 in schools forever.

Enigmatic Team



MICHAEL SCHUMACHER

The most successful driver in Formula One history won his laurels because of active teamwork, which is what we as a team aim to do, to produce a successful car.

Paravally



Overlapping of Roles - Role Interactions

This specific characteristic of our project plan adheres to a very important ideal that Traxceleration follows - **expression of opinion**. Even though Traxceleration is internally divided into smaller sections, for ease of project management, each member is free and most welcome to **express his thoughts** on the work which another department is in charge of. For example, it was one of our design engineer's idea to contact a newspaper agency to facilitate our marketing campaign.



Team Organization

To ensure that Team Traxceleration functions in the most **fluid and smooth manner** possible the following **internalized departments** were setup within the team who were responsible for project elements coming under their respective jurisdictions. Each and every team member was expected to give his **full dedication and sincerity** towards the job undertaken by him. He is expected to make critical contributions to justify his role.



Enigmatic Team

*ROHAN RAJAN - Team Manager

He is in charge of the smooth functioning of the team. He is also in charge of effective division of labour and meeting deadlines. He gives his best to ensure that the team maintains a competitive edge.

Critical Contributions

- Portfolio Content
- Pit Concept
- Project Management Strategies
- Risk Aversion Strategies

*KARTHICK SHANKAR - Graphic Designer

He can be adjudged as the most creative member of the team. His unparalleled imagination forms the very core of Traxceleration - its identity. He is in charge of effectively using the plethora of available computer software for giving a bold and elegant look for Traxceleration.

Critical Contributions

- Team Identity
- Portfolio Designs
- Verbal Presentation
- Pit Banners and Brochures

*DEV KHARE - Design/Manufacturing Engineer

With cutting-edge software, technology and machinery at his fingertips, he is in charge of making the most aerodynamically advanced car possible. He works closely with Gautam to design a masterpiece.

Critical Contributions

- Design of Final Car
- CAM Analysis
- Wheel System
- Painting

*GAUTAM RAM - Design/Manufacturing Engineer

He is a member with very keen insight on manufactured cars as well as an uncanny ability to predict how a car will actually perform once manufactured. He meticulously sticks to the regulations and works along with Dev to deliver an astounding car.

Critical Contributions

- CFD Analysis
- Research Concepts and Ideas
- Assembly Process
- Post-Manufacture

*AHSAN FUZAIL - Resource Manager

He is in charge of planning and taking care of the team's budget. He looks for ways to spend as little as possible while still maintaining required quality and performance standards.

Critical Contributions

- Budget Control Protocol
- Sponsorship Algorithms
- Indomie as a sponsor
- Controlled expenditure

*ALAN ALEXANDER - Marketing Manager

Exposure and publicity is his area of work. He tries to promote the team as much as possible by means of social media or through promotion campaigns.

Critical Contributions

- Marketing Brochure
- #Prepares Campaign
- Gulf News Collaboration
- ANTA Collaboration



Intrinsic Identity

Team Name

The first speck of identity of anything in the universe, be it living or inanimate, is a name. Rightly so, it requires attention and care as that will turn out to be the face of whatever it does. Traxeleration was the result of **long drawn discussions**. After plenty of suggestions and team polls, we finalized **Traxeleration**. It symbolizes what really happens during the race - **Acceleration on the Track**. Traxeleration is based on practical observation of what F1 in Schools is really all about.

TRAXELERATION

Team Colours

The team took **utmost care** in choosing its colours. Since the colours are quintessential in deciding the identity of the team, all the members were required to give valuable and notable contributions in this aspect. **Orange, Black and White** have been selected as our team colours. Such is the case as we wanted originality from the more conventional schemes such as Red and Black, Blue and White, etc. The **Nike Hyper-venom** football shoes were the source of inspiration.

Orange represents energy'

Black represents 'perception and depth'

White represents perfection



Team Slogan

The slogan is what we want the people outside F1 to gain from the team. We want to show others how **exhilarating and enthralling** it is to be a part of F1 in schools. It represents **INGENUITY AND CREATIVITY**.

**BE DIFFERENT.
BE SPEED.**

Team Logo

The team logo is the **convergence of multiple ideas** and themes that we want to convey to the public. It is based on vivid symbolism and has a rich meaning. Another professional concept to the logo is the fact that it doesn't have a **single colour**. Most teams make one logo and keep it the same throughout. But, we have made a vector image so that the colour can be changed according to the situation it is used in. The main purpose of this logo is to show that **we are Traxeleration**. Nothing More. Nothing Less.



Logo Development

The logo was developed through a **number of phases**. We tried any and all types of logos and continually improved the designs over the years to get to the current artistic beauty.

Original Designs



Original Concepts



This was the first logo that we made back in 2013. It started out as a means to experiment different concepts of logos. This one in particular symbolizes the direction along with aerodynamic wings.



Due to the complexity of the previous logo, we changed it to a more conventional type of logo that people will easily be able to recall.



In 2014, we were competing at the internats yet again and thus needed a more professional face which looked more mature than the rather childish logo that we had.



New season of 2015 demanded improvement and innovation. As such, we came up with the concept of intertwining paths and designed something elegant.



ALAIN
PROST

His smooth and relaxed nature behind the wheels translates into his sleek identity. The helmet that he used had the three colours of the French flag, signifying the importance of the colour scheme in F1.



Nascent Graphics



JUAN MANUEL
FANGIO

The characteristic way in which he drove his car built his spectacular identity which is the way in which we aim to build our identity by being different.

Parisically



Resources



Marketing



Identity



Design



Manufacturing

The Element of TRAX

The element of TRAX has been something that has been inherent in our identity ever since the inception of Traxeleration. It underlines the four objectives of our identity. These 4 simple, but meaningful words have helped us exceed our capabilities.

Think
Reach
Amaze
Xcite

Over time, the word TRAX has also become a sort of a nickname which people use to fondly refer to us.

The Essence of TRAX Graphics

A transistor is a semiconductor device used to amplify and switch electronic signals and electrical power. It is composed of semiconductor material with at least three terminals for connection to an external circuit. The three terminals stand for key aspects of graphics which are:-

- Simplistic
- Encaptivating
- Inspiring

These three terminals, when connected to a creative mind as the power source, can amplify the capabilities of the graphic segment of the team and deliver exhilarating and fantasizing results.

Graphics Consistency

To ensure consistent branding across all aspects of the competition, the team set out the elements that should be incorporated into all the team's products, from posters and brochures to the portfolio and the car. We made sure that all formal documents related to sponsorship and marketing had a watermark with our team logo to symbolize professionalism. Even our logo is not confined to the limit of having one colour as explained before. This intertwines with our goal of not having limits and the graphics section certainly adheres to that.



Competition Uniform

Our competition uniforms were designed around three main factors - eye-catching looks, comfort, and climate. Traxeleration Racing's goal with uniform was to emulate a Formula 1 team but also still wanting to be set apart from all the other teams. After some extensive research, we collaborated with our sponsor ANTA Sports, to decide that sports clothing was the best option for such a scenario. This helped us to strike a vibrant, yet elegant image.



Posters and Propaganda

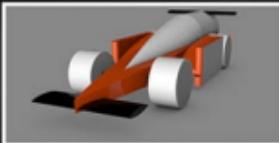
Propaganda is essential for any F1 in schools team. We pride ourselves in having some of the best designed posters which show off just how skilled Traxeleration is - while counting for the hard work and effort put in by the members.

The variety of posters that are shown, explicitly identifies us as a team that loves to connect with the masses.



Car Graphics

How the team is represented and virtually marketed is through our car. Therefore the presentation of this is key to promote and impact the eye and interest of our supporters.



The exquisite symbolism of graphics and its unique language.



Generating Potential

We at Traxeleration believe in **continuous project management** and evaluation to keep track of our progress and to **assess our flaws**. We thereby have incorporated many strategies into our team structure to keep its functioning **smooth and fluid**.

Phase 1: Stockpile and Research

The first phase of our project is all about **raising funds** and acquiring knowledge for phase 2. Accumulation of resources is imperative for any successful project. We have recognized this requirement and hence have taken great pain in ensuring that this phase succeeded. It was therefore decided that a **systematic and effective strategy** was required to approach various companies for sponsorship. We have therefore devised **algorithmic approaches** to achieve this.



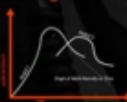
Research about various project elements is necessary to ensure project success. While research about design, manufacture and post manufacture is considered an integral part of our of this phase, we have also recognized its need for other areas such as graphics and marketing strategies.

Phase 1 was allowed to exceed into the time frame of phase 2 to ensure optimum results. For communication, we mainly used a program called TeamViewer and Google Hangouts along with conventional means like telephone and SMS.



Phase 2 : Execution

The second phase of our project is all about **making use of our resources** and knowledge to obtain the desired end product. Execution was spread over all aspects of the project-design, manufacture, graphics, promotion and documentation. In this phase also, effective use of available funds and **time management** was imperative.



Execution of each project element was undertaken by the respective department who would initially **present proposals** to the entire team, which on authorization was subsequently put into action.

Phase 3 : Inspection

The third phase of our project can be considered as the least time consuming. Yet the final end product of our project will be lacking its **X Factor** without this third phase. This phase can also be considered as an **'inspection phase'** where went through all our projects and made sure that they were in perfect order. We also did our verbal presentation practice and tweaking during this phase as well as the **Competition Build Up Marketing** via our social media platforms. It was at this time that we approached our **Diamond sponsor Gulf News** and started our **#PREPARES campaign** during our National Finals preparation.

Risk Management

Every project has its **inherent risks**, but what's important is how the team **comes up with solutions** to those risks to ensure smooth functioning. Given below are few of the highlighted risks of our project:

*The Academics Scenario

This has been considered as the **single most inherent risk** within our project. We as students in our **Final year of schooling** have a range of priorities related to our higher education.

These include imminent **school examinations**, **SATs**, etc. which clash with our working routine for F1 in Schools, thus creating **imbalances in our flow of work**. To ensure that this does not happen, we have decided that **time (the major deciding factor)** needs to be **heavily conserved**. More about this is given in how we dealt with the risk of lack of time.



*The Time Scenario

Time, if managed properly, could propel a team to greatness. If managed poorly, it will have doing last minute jobs and ultimately, not letting you showcase a team's true talent and ability. Time Management is thereby quite important.

The risk of time is also **intertwined with financial risks** and **'academic responsibilities' risks**. For instance, if we do not get enough funding when we need it the most, then when we do actually receive that funding, it will be too late to get any good us from the resources accumulated.

Also, **academic responsibilities** do swallow up a lot of our time and hence suitable measures of compensations also need to be taken up. We thereby **devised a plan** which was **full proof** at not affecting our academics. This included the **'1 hour a day', '30 min in school'** schedules we adopted to make maximum use of time. (See page 10)

$$\sum_{i=A}^Z \text{PLAN}_i$$

*The Financial Scenario

Regular funding and sponsorship can well be considered as the backbone of **any teams functioning**. We thereby categorised this as a potential project risk, as we have seen many **teams fail despite having a wealth of technical ability and talent**. The team deemed it necessary to find ways in which this risk could be averted. One possible way was to have a **strong culture of obtaining in-kind sponsorships**, which is much more easier to obtain than monetary sponsorships.



JEAN
TODT

The unique way in which he managed his team ensured that Ferrari was one of the most sought after team, especially during the Schumacher era. We follow his example by managing with diligence and resourcefulness.



Move Moving...

Traversing Obstacles



CHRISTIAN
HORNER

As one of the people responsible for Red Bull's incredible success, his brilliant man management and tactics ensured that his team won 4 championships. This shows the type of project management that we aim to employ to win the National Finals.

Particularly



Quality Control

Central to any team's management is **quality control**. We as a team believe that quality needs to be upheld in all aspects of our project, be it design, manufacture, marketing, etc. However, quality is a criteria that plays along with **time and cost factors as well**. For example, one of our earlier nose cone designs showed great results on CFD and hence we decided to 3D print it for our final car, but the cost and time that was required was astronomical.

We still persisted with the design, and had it printed in a material that would be cheaper and hence stay within our budget (quality compromised). This nose cone ultimately resulted in breakage on the final race of the Qualifying rounds which taught us a **valuable lesson**. Quality was especially upheld in the following areas:

- >Design
- >Manufacture
- >Verbal Presentation
- >Design Portfolio

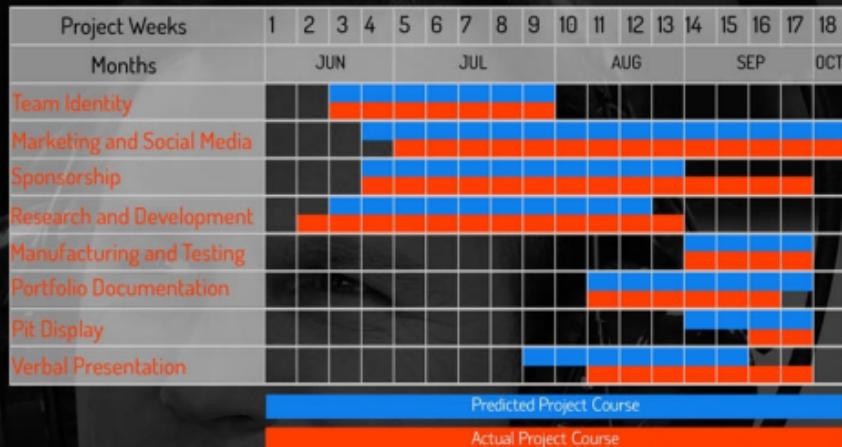


Project Management Evaluation

The timeline given represents the **entire course** of our project since initial preparations in late June.

As noticed from the timeline, we **deviated a lot** from our projected plan and thus our overall plan required **continuous revisions** to keep up with the teams current status.

The raising of sufficient funds required for the competition took much longer than anticipated. The strategy of contacting **large corporations** was **not as successful** as anticipated due to the time taken to process our request. A revised strategy enabled the team to target local businesses successfully and the team was better able to connect and collaborate with businesses who wanted **local exposure** in Dubai. (See Page 6)



Predicted Project Course

Actual Project Course

Project Revision Strategies

The fundamental plan revision strategy we employed for the most fundamental variable in our project was our **Budget Control Protocol (BCP)**. This was an **innovative scheme** which was headed by our team's Resource Manager the results of which was continuously scrutinised by the entire team.

This was for obvious reasons as changes in budget would affect every department of the team. This program was basically to keep our **budget flexible** and adaptable to the changing **financial situation** of the team (in terms of funds raised).

This was conducted every 2 weeks, which not only kept us updated on our financial status, but also indirectly on our overall progress as well.

The Working rule of this protocol is:

- >Information to be obtained from team departments regarding potential **immediate expenses** as per progress on the project
- >Compilation of total expenditure as per data from team departments
- >Comparison of this expected **total expenditure** with total funds currently available.
- >Follow up on **potential sponsors** with which talks have had great progress.
- >Calculation of revised budget based on data collected
- >Submission of **revised budget** to team for review

The BCP was in itself a revision strategy as it affected all the departments of the team which results in changes being made to adhere to the revised budget.



Headstrong Marketing

Without clever marketing people won't know that you exist. This is the reason why we made marketing a **key focus** for the team. Our aim was to have our team identity become **recognised** in our local communities, our regions, our states and across UAE. We also took our marketing one step further by **placing ourselves on the worldwide stage** and linking our team to the global community. **Team brand awareness and Return of Investment** forms the backbone of any F1 in Schools team's marketing strategy. We also thereby paid close attention to these two elements. **Effective team branding** was required to ensure that the public knows what Traxeleration is all about. We thereby conducted the **following activities** in order to build up our brand image as well as ensure effective Return of Investment.

Phases of Marketing

*Phase 1 : The Startup

We started our campaign by **spreading awareness** about Traxeleration via our **facebook page**. We were quickly able to amass **over 500 likes**, thus ensuring that the public was in the loop. We simultaneously moved on to **twitter** and gathered a mass following there as well.

*Phase 2 : Full Fledged Campaign

- After the team got the initial publicity that we needed, we began to routinely bring people **up to date with posts**.
- We also gave away **customised Traxeleration merchandise**. This included key-chains, t-shirts, arm bands, caps etc. This generated not only a good fan following, but also developed a sense of reliability.
- Publicity in school was of no issue as we put up a **plethora of posters/brochures** before any event and thus let the community know that we are all in it to win it.

Branding and Return on Investment

*Cookery Competition

Three of our members participated in a **cookery competition** just as the season of preparation started. This was an innovative way to get the name of the team out to the students of the school.



*Badges



*Social Media



*School Football Team Jerseys

We also sponsored our **school's football team** before they participated in the CBSE clusters tournament. This further helped the outreach of the team brand. They also distributed **brochures at the event**.



*Competition Day Marketing

The traditional competition items such as the **car portfolio, pit display etc. carried big logos** and provided maximum publicity to both the team and the sponsors.



*Gulf News Report

Gulf News published a **full team picture** as well as a **report** on 9th October 2015. The report included details about the team and our plans for the national finals.



*Radio Appearance

Two of our members were lucky enough to be **invited on air on City 101.6** for an hour! They spread the name of Traxeleration far and wide on that show.



*Parisvally Perfume Sale

As part of the sponsorship deal with Parisvally, we agreed to sell some of **their own products** to ensure they return a profit by sponsoring our team.

*The Fragrance of Speed

Our sponsor, Parisvally perfumes designed a **customized perfume line** for Traxeleration. We sold this at an event in school and it was sold out within a matter of hours!



*Gulf News Advertisement

To further increase marketing outreach and sponsor exposure, we planned to air a series of **2 advertisements**, one of which aired on 10th October 2015. We plan to air the second one after the competition.



BlackBerry

*Nikon Camera Sale

To assist us with our funding, we collaborated with Nikon and agreed to **sell 6 cameras**. This benefited both parties. (See Page 9)

*Miscellaneous ROI

- > Advertisements of sponsors on the pit display on the **LCD screens** on **loop**.
- > Company Logo on pages of the **Portfolio**.
- > Active links to **sponsors website** on our facebook page, twitter etc.
- > Company Logo in preferred spots on the **Uniform**.



TOTO
WOLF

Being one of the eminent marketing personalities of Mercedes Benz ensured that Mercedes reached out to the world and everyone knew what the three-spoked logo was all about. Following his example, we wish to skyrocket our marketing sector so that everyone knows about Traxeleration



Keep Moving...



Encaptivating Collaborations



Throughout the course of this competition, we've had the chance to collaborate with the biggest establishments in their respective industries. This sharpened many of our skills and exposed us to the professional world.

Gulf News

Gulf News is almost synonymous with information in the United Arab Emirates, being one of the most reputed newspapers. It has over a million subscribers which makes it one of the most biggest platforms for marketing. We thereby collaborated with Gulf News, with Gulf News being our Marketing Partners. They gave us huge publicity by publishing a report on the team. They also sponsored us two advertisements (one of which is already out) which not just gave the team further publicity but also proved to be a huge benefit to our sponsors in terms of ROI.



ANTA Sports

Anta Sports is amongst the world's reputed sportswear companies, being the 4th largest sportswear company in the world. Their apparel range is revered all around the world. The team was thus ecstatic when we came to hear that ANTA had decided to collaborate with us and become our uniform partners. We were provided with T-shirts, jackets, shoes and track pants.

Anta's marketing manager also advised us on what type of uniforms we should select for effective publicity, which we adhered to while selecting our uniforms.



Keep Moving...



Fotokad

Fotokad is a reputed company in the UAE in the field of advertising. They are also well known in the high quality merchandise they produce. We consider ourselves privileged to have gotten an opportunity to collaborate with fotokad. Fotokad became our merchandise partners and provided us with high quality merchandise which was a great boost to our team identity and team marketing philosophy.



Resources



Marketing



Identity



Design



Manufacturing

Nikon

When photography and cameras go through your mind, you automatically think of Nikon. That's how much of an image they have across the globe in the sphere of photography and videography. We were quite elated to hear that Nikon had agreed to collaborate with us by agreeing to print our banners. They advised us on the best material to choose for maximum durability of the banners. In addition to this, they also gave us 6 of their CoolPax series of cameras which were of great use in our marketing campaign.



Parisvally Perfumes

We also collaborated with Parisvally Perfumes, a reputed perfume establishment in the UAE. They have supported us in our innovative marketing strategy which was to introduce the public to the 'Fragrance of Speed' - Traxeleration's own exclusive perfume. We worked closely with the designers at Parisvally who advised us on matters considering the different types of fragrances as well as the overall design of the perfume bottle. We are very grateful to Parisvally Perfumes for their support in their support towards this unique marketing concept.



Celebration of scents

Verbal Skills with Hani Mashnouk

A Toastmasters champion and an expert in the field of public speaking. Mr. Hani Mashnouk had mentored us for our verbal presentation. Being a former World Finals verbal presentation judge, Mr. Mashnouk had immense experience which he shared with us, during our session with him. We're extremely grateful to Mr. Mashnouk for all the support he had given us to sharpen our verbal presentation skills.



Driving Resources

F1 in schools can be considered as an **playground of resources** and hence if a team doesn't have the ability to conduct resource management effectively, expected end results will not become a reality. We have recognised this need and hence paid special attention to this.

Time as a Resource

A very important factor which all team members adhered to was deadlines. This required **adequate use of time**. However as grade 12 students academics take up a lot of our time which makes it imperative to have a systematic way to maximise the utilisation of time while not compromising on our academics. We did this in mainly two ways:

1 Hour a Day

The scheme is exactly what the title is. The main idea of this strategy was to **expend just an hour a day** for the needs of F1 in schools. This ensured slow but regular progress towards our goal.

*30 Minutes in School

Our school has a 20 min break time and a 15 minute gap between student arrival time and the first period. The main objective is to use atleast 20 minutes of this time for the purpose of F1 in schools, thus ensuring a minimum of 100 minutes of extra time every week.

Resource Control

One of the most important concerns in the minds of all resource managers is the **unwanted scenario of having to overspend**. Such a situation arises in cases where there are no background checks conducted before purchasing. This leads to:

- Time constraints which caused a **hasty purchase** without checking the price tag.
- Unwanted and **unexpected expenditure**.

We considered the variables involved in the issues above and realized that this problem could be tackled by implementing the following strategies.

->**Product research was made mandatory**. Before a product was purchased, the concerned team member was required to show all the different product price ranges he has researched before authorization is given by the resource manager.

->Purchases were to be made within **time constraints** so as to ensure that if a product is not available, due to time constraints, a hasty purchase was made. This was again regulated by the Resource Manager.

->The team's resource manager had informally put forth a list of items which are not part of team expenditure. This ensured that team members do not spend for items other than those of relevance for F1 in Schools.

Sponsorship Packages

For the purpose of approaching corporate establishments for sponsorships, we have designed a **marketing brochure** which has everything of relevance to do the competition and all **information about various sponsorship packages**, which are:



Sponsorship Acquirement Algorithm

The majority of resources that we obtain, if not all, are from our valuable sponsors. It was therefore decided that a **systematic and effective strategy** was required to approach various companies for sponsorship. We have therefore **devised 2 algorithmic approaches** to achieve this.

1. Email
2. Call-follow up
3. First Meeting
4. Post-meeting follow up
5. Final Meeting

Algorithm 1

1. Walk in to the company
2. On the spot meeting, which if not possible, relevant contact details are obtained
3. Call-follow up
4. First Meeting/ Follow up meeting
5. Post-meeting follow up
6. Final Meeting

Algorithm 2



COLIN CHAPMAN

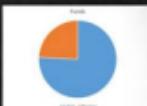
He was an influential design engineer, inventor, and builder in the automotive industry, and founder of Lotus Cars. His radical research ideas fueled Lotus F1's rise to success. We are aiming to employ this kind of innovative strategies to ensure that our resource management will always remain a plus point for us.

Budget

As explained on page 7, our budget went through a series of revisions owing to changing financial status of the team. The difference between the projected budget and the actual budget was quite substantial due to **increased economy of the team's spending policy** whilst not compromising on quality.

Funds (Sources)

The funds raised by the team were acquired through a variety of sources. However, these did not account for the team's entire budget as many project elements were given to us through **in kind sponsorship**. This ensured that our dependence on monetary funds remained to a minimum.



Innumerable Prototypes

TX16 - Codename : Glepnir

As our understanding of flaws in design grew, we experimented with the front of the CO₂ canister and the nose. We decided to make a plastic nose cone which could withstand the heavy impact endured during launch. This model was quite simplistic, but its full potential was yet to be discovered.

"To all great designs there lies a failure that helps shape them"

TX17 - Codename : Zephyr

Our innovated wing system is shown here. The car however, was quite bulky and needed to be toned down. Another major innovation was the height of the canister holder, which was minimized so as to be able to impact the whole car evenly and ensure a smooth run.

"Recreation is more important than change. Who knows what you might end up making!"

TX22 - Codename : Comet

Modeled for more than speed and stability, our final car is truly a masterpiece. The efficient usage of thrust provided by the canister is what makes this car our final decision. After building on the T-19 we created a nose that was defined, more stable and innovative. The design is simplistic, powerful, elegant, and mind-numbingly fast.

"Perfection is not attainable, but if we chase perfection we can catch excellence."

TX19 - Codename : Mustang

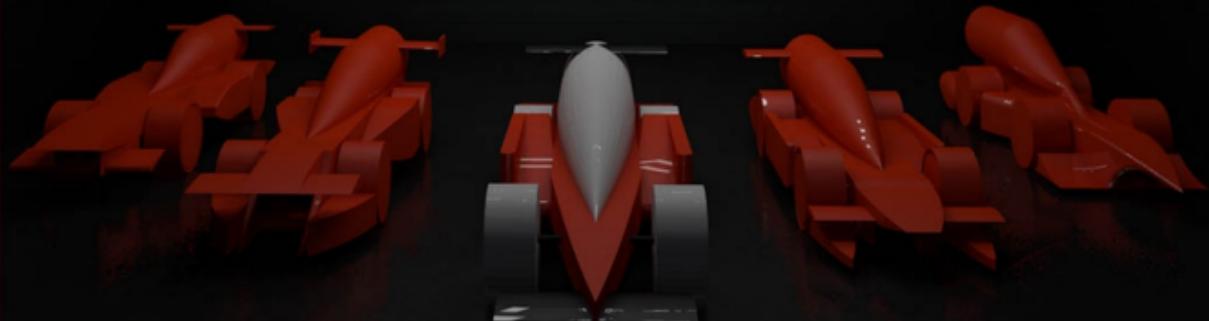
Our regional's car which was the 5th fastest car at the event inherently had flaws owing to breakages of the front wing system and wheel system. Even though its nose was aerodynamic, it ended up being fragile and it was thus decided that improvements were to be made.

"It is easy to complicate a design, but it is excruciatingly difficult to facilitate it"

TX08 - Codename : Stingray

To follow up previous failures, we created a car with a very sleek finish. This car performed much better but we ended up not using it as this was also quite complex. An innovation we had here was the structure in front of the wing which was built upon to achieve perfection.

"An idea is truly utilized when executed perfectly"



Resources



Marketing



Mobility



Design



Manufacturing

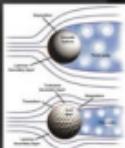


ADRIAN NEWAY

His revolution car design ideas ensured that Red Bull driver Sebastian Vettel went on to win 4 championships, netting Newey 4 constructor's award on the way. Design ideas like his are what we aim for to win the National Finals.

Coanda Effect

To reduce low pressure drag behind the car, we want the **smallest low pressure zone possible**. Therefore, aside from increasing boat tailing, we want the air to stick to the body for as long as possible before separating and reducing the low pressure wake. The best air type for this is semi turbulent, as it sticks to a body much longer than laminar airflow. Therefore, to make the airflow semi turbulent, we should incorporate small dimples or a rough surface finish so that the boundary layer will hold the body for longer, reducing the wake, reducing the low pressure zone consequently reducing formed drag. However, it should be noted that excess roughness will create drag due to skin friction.



Upthrust vs. Downthrust

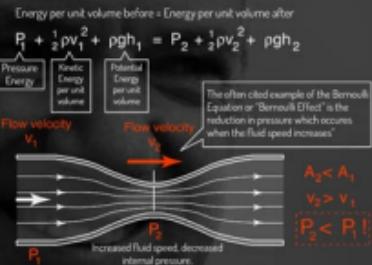
Upthrust is the force that acts under the car to make it leave the ground. Downthrust (or downforce) however, is the exact opposite. **It helps the car stay on the track. Upthrust reduces the weight of the car.**

According to the Laws of Static Friction, force of friction is directly proportional to normal reaction. By providing upthrust, normal reaction is reduced, which thus provides lesser force of friction. The canister holder was designed to provide upthrust.



Bernoulli's Theorem

The Bernoulli Equation can be considered to be a statement of the conservation of energy principle appropriate for flowing fluids. In the high velocity flow through the constriction, kinetic energy must increase at the expense of pressure energy.



Skin Friction

The friction caused by the surface of the body due to interaction with flowing air is called skin friction. It forms one of the most important aspects of reactant forces on thrust. In order to reduce such a force, it is necessary to use smooth painting texture, along with additional glossy layers on the car if necessary.



Rolling Resistance

Rolling resistance is a function of the weight of the car, friction between the wheels and the track and bearing resistance. For the running surface of the wheels, it is necessary to choose the smoothest and lightest material for both the wheels as well as the ball bearings.

Thrust

Whilst there is a degree of variability between canisters, the amount of thrust is not a variable that can be controlled by the team. The lighter the car, the greater its acceleration and the greater its terminal velocity when the canister expires to propel it to the finish line. To convert the full thrust into forward motion, the thrust must be directed through the car's centre of gravity. If the thrust is applied above the centre of gravity of the car, a moment is created which would result in a down-force on the front wheels or up-force on the rear wheels. The further the thrust is away from the centre of gravity, the less efficient the transfer of thrust into forward motion. This is why the canister holder of the car is placed lower than normal.

$$a = \frac{F}{m}$$

Since F is constant,

$$a \propto \frac{1}{m}$$

Drag Force

Drag force is the **single most reactive force that resists forward motion** in an F1 car. Drag force is a function of air density and the car's drag coefficient, cross sectional area and its velocity. Car drag coefficient is highly dependable on the aerodynamics of the car. How the car performs on the track depends on how the car is shaped. Through research, we have found out the drag force is not the main factor affecting the performance of the car.

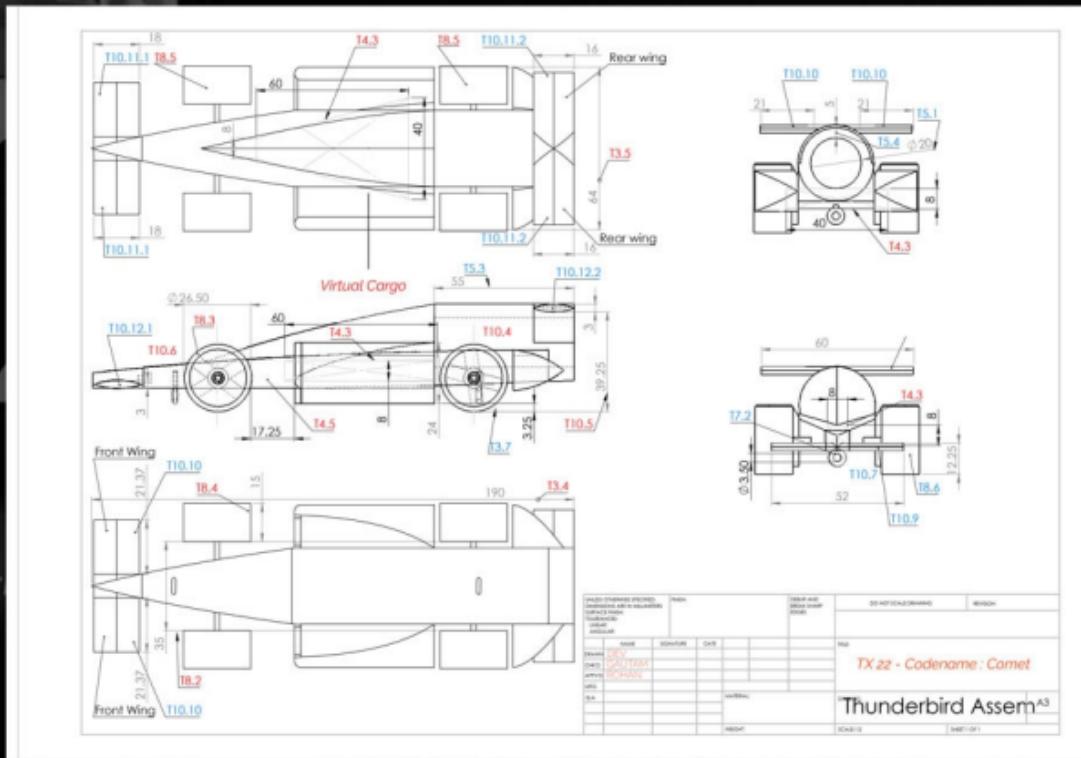


Power Marketing

Flawless Drawings



The Nikon logo, which consists of the word "Nikon" in a bold, italicized, black serif font, set against a yellow square background with diagonal white stripes.



Orthographic drawings with Flawless markings.



Experimenting Ideas

Component Testing

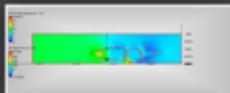
*Side-Pods

The side pods use a more **streamlined shape** compared to standard designs. To accommodate the side sticker, the side pods has a **side plate**, which itself is aerodynamic.

a) Trial side-pod 1

It has a less aerodynamic shape and does not cover the back wheel to a great extent and thus has highest drag value.

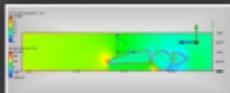
DRAG : 0.071 N



b) Trial side-pod 2

It has a very aerodynamic shape, but does not cover the wheels at the bottom, and thus, not used.

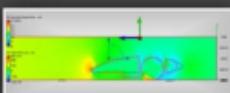
DRAG : 0.054 N



c) Final side-pod

Rather than the standard block, the canister has a side plate like feature for the F1 in schools logo and is connected to the main car body by a aerofoil like feature for superior aerodynamics. The bottom has an extrusion to direct air away from the back wheels and directs it to the center of the car.

DRAG : 0.050 N

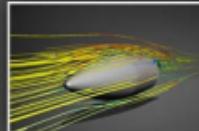


*Canister Holder

After running stringent tests on numerous canister holder shapes, we analyzed that the designs presented below **performed the best**. The final one is more aerodynamically viable, it is more streamlined and has a **lesser drag coefficient**. It is also incorporated at a **lower height**, which reduces moment of force over the car. Finally, it **provides up-thrust**, which reduces weight of car on track.

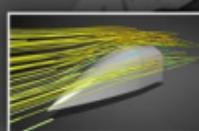
a) Trial Canister Holder

It has the shape of a bullet, but it isn't aerodynamically viable. Also, the height of the holder leads to more drag concentrated at the front.



b) Final Canister Holder

Its lower height and ability to provide up-thrust, makes this canister holder our final pick.



*Front Nose

Conventionally, F1 in Schools teams use the angle of attack of the wings to ensure that the wind flows over wheel. In our opinion however, this can be considered as a misconception because tests conducted to arrive at such a conclusion means that the car has to remain stagnant. This is not the case with an actual F1 car. The car is not stagnant and the wheels are moving, which creates a low pressure zone behind the front wing due to skin friction between the wheels and the air. Winds thus tend to get sucked under the wheel due to the low pressure zone.

This is a fact irrespective of whether the front nose has an angle of attack or not. Hence, having a lower angle of attack for the wing is desired as high angle of attack results in higher drag.



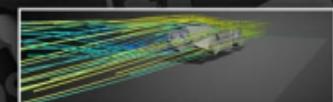
SEBASTIAN VETTEL

A four time world champion, Sebastian Vettel is a person who likes to see his car being tested right in front of his eyes before taking it out on the track. This underlines our testing philosophy. Everything needs to be cross checked if we are to achieve success.

Virtual Car Testing

For the constant improvement of F1 in schools cars, testing is absolutely necessary. We had a good amount of balsa blocks, so manufacturing cars for testing was not really a concern. But, due to the **huge number of models** designed by our 2 eminent design engineers, we had to narrow down our selections to the best ones. Thus, before manufacturing began, we ran **stringent tests on our cars virtually**.

Since our models were designed on both Autodesk Inventor and SolidWorks, we had the advantage of being able to **test with both the software**. The more one is able to test something, the better. Systematically following this principle, we were able to get **splendid results** - some that one of the programs showed and the other didn't.



Kang Sheng...

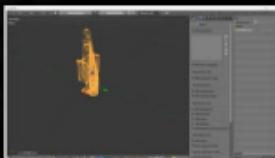


Relentless Testing



G-Code Generation

A **machining assembly was created** consisting of all the required parts of the car body. This was then saved as an STL file and opened in BlenderCAM. **Blender CAM** is an open source solution for artistic CAM - Computer aided machining - a g-code generation tool. Blender CAM is an extension for the free open-source Blender 3D package. This provides an interface to generate the G-code.



ARYTON
SENNA

The Late Ayrton Senna is well known for his analysis of the track before he drove his car on it. In a similar fashion we believe that we a team needs to analyse the manufacturing process thoroughly before going ahead with it. This will ensure success, just like Senna's world

Partially

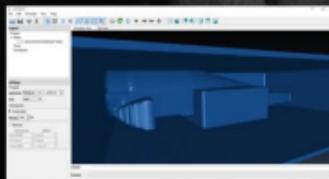
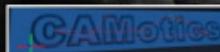


CAM Analysis

Since, we gave our files to a company named Trinity Holdings for manufacturing, we initially thought we didn't require CAM software or CAM testing. But, we soon realized that **manufacturing required a whole array of commands and sequences**. On further inspections, we came to understand that one of our prototypes was not manufacturable.



The canister holder extruded out in a very aerodynamic shape, but the result was that it became very thin in certain areas which made it prone to breakages. Thus, we stopped development for that car. Since then, we've tried to analyze every prototype using two software - **CAMotics** and **CNC Simulator Pro**. This gave us a good picture of whether manufacturing was possible or easy for a car and thus we didn't have to waste time in sending cars back and forth for machining.



A Sample of the Final Car's G-Code

[GCode created using the HeeksCNC Mach3 post processor]
[Fin_Ball_30_Block.tap]

[G-code generated with BlenderCAM and NC library]

N10 G07 G21 G90

(Tool change)

N20 G43 H1

N30 T1 M06

N40 G00 X0 Y0 Z9.999 S12000 M03

N50 G00 X133.731 Y160.099

N50 G01 Z-31.611 F600

N70 G01 Y268.05 Z-11 F2000

N80 G01 X133.831 Y268

N90 G01 X133.799 Y159.95 Z-31.663

N10 G01 X133.581 Z-31.655

N10 G01 Y268.2 Z-11.011

N12 G00 X133.981 Y268.199 Z-11.006

N13 G01 Y159.8 Z-31.704

N14 G01 X133.431 Z-11.715

N15 G01 Y268.35 Z-11.023

N16 G01 X134.131 Z-11.012

N17 G01 Y159.649 Z-31.765

N18 G01 X133.281 Z-31.792

N19 G01 Y268.5 Z-11.036

N20 G01 X134.281 Z-11.018

N21 G01 Y159.5 Z-31.843

N22 G01 X133.131 Z-31.88

N23 G01 Y268.849 Z-11.048

N24 G01 X134.431 Y268.599 Z-11.03

N25 G01 X134.399 Y159.35 Z-31.922

N26 G01 X133.199 Z-31.914

N27 G01 X132.981 Z-31.98

N28 G01 Y268.799 Z-11.061

N29 G01 X134.581 Z-11.054

N30 G01 Y159.199 Z-32.031

N31 G01 X133.399 Z-31.922

N32 G01 X132.831 Z-32.092

N33 G01 Y268.95 Z-11.073

N34 G01 X134.731 Z-11.071

N35 G01 Y159.05 Z-32.146





Effective Construction

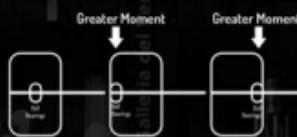
Throughout our journey to the Qualifinals we have considered the manufacturing stage as one of the most important components of the project. We pride ourselves on having the best looking car and the **most accurate car** at the event; which is why we take the manufacturing process so seriously. Many processes and specification checks have been administered throughout the entire process to ensure the **highest final quality** of our car.

Machining and 3D Printing

For the machining of our car we have decided to use a **5 axis CNC machine** to reduce cutting time. Unlike the usual 3 axis one, it had many **more features**, distinct capabilities and was more precise. Taxeleration has utilized the **5 axis contour feature** to allow the cars to be machined continuously rather than with an index. The primary advantage in continuous machining is the **precision and advance machining** of the more complex parts our car design. We used a 3D printer to manufacture our front and rear wings; and our wheels. These were designed using CAD software and converted to STereo Lithography (STL) Files for the 3D printer. We selected the printing orientation to minimise any support structures and achieve a better quality finish.



The wheel was made as light as possible to **reduce rolling inertia**. The placement of ball bearings along depth of wheel was something we paid careful attention to. The bearings are connected to the wheel at the **center of wheel's depth** to reduce moments along either of its sides. This will lead to a more **uniform distribution of load**. The car was then checked according to the specifications to ensure overall accuracy within the competition rules.



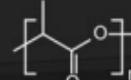
Wheel System

We took a different approach to the wheels for the National Finals by having a double bearing system.



Materials Chosen

Plastic Parts (Except Wheels): PLA for non wheel plastic components: (Poly lactic acid)



*Prepared from vegetable waste and eco-friendly.

*Non toxic due to natural source.

*Easier to be manufactured as it requires low temperature and requires *No heated bed unlike ABS plastic.

*Temperature range (180 - 200 C)

*High strength of material

*Fine features possible

Wheels: Nylon was used as PLA has higher density(130g/cc) whereas nylon has density of 115g/cc making it more suitable to make lighter wheels

Axes: Axles are made of carbon fibre due to its high strength and extremely low weight. Having the hexagonal structure similar to that of graphite leads to very high strength.

Ball Bearings: Stainless steel was chosen as it had good spinning results and was more economically viable. We had a double ball bearing system which had greater stability and ensured that kinetic energy was not lost due to the wobble of the wheels.

Why Lighter Wheels?

Lighter wheels would have lesser moment of inertia and thus, less rolling energy would be needed. Thus, more canister thrust would convert to kinetic energy of the car rather than the rolling motion of the wheel.

$$\begin{aligned} K_{\text{rolling}} &= \frac{1}{2} I_{\text{rotational}} \omega^2 \\ &= \frac{1}{2} m r^2 \omega^2 + \frac{1}{2} I_{\text{canister}} \omega^2 \\ &= \frac{1}{2} m (r \omega)^2 + \frac{1}{2} I_{\text{canister}} \omega^2 \\ &= \frac{1}{2} m s_{\text{canister}}^2 + \frac{1}{2} I_{\text{canister}} \omega^2 \\ &= K_{\text{translation}} + K_{\text{rotation}} \end{aligned}$$

Since, angular velocity is constant, the KE only due to rolling almost stays the same.



FERRARI
FACTORY

Ferrari's factory is revered all around the world as one of the most intricate assembling establishments. They have built a reputation of bringing cars which are manufactured to absolute precision. We at Taxeleration similarly believe that effective manufacturing and assembly is key to our success.



Many thanks...



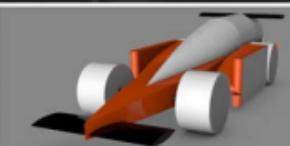
Newtonian Renders



MERCEDES FACTORY

Mercedes Benz is known for its spectacular colouring schemes and realistic car renders which is one of the reasons why it receives a lot of attraction to its concept cars.

We follow a similar ideology at Traxleration. We believe that having spectacular renders could give us spectacular attention.



These Photorealistic Renders were rendered using the technologies of Cinema 4D

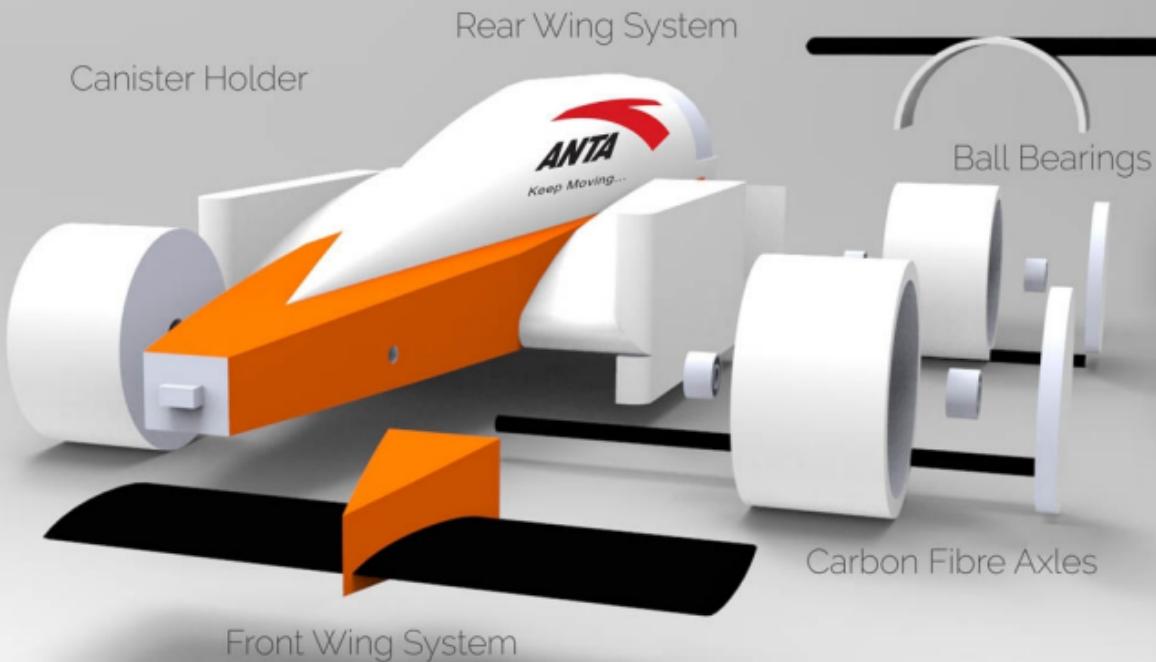


Pavosuly



Witness a masterpiece... From multiple angles!

Calculated Views



Exuberant Experiences



ANDREW
DENFORD

He is the founder and initiator of F1 in Schools, the competition we know and love. Initiating such a brilliant competition that tested all the skills of a student requires ample experience in the field, which is what we have gained through this.

Particularly



Adventure comes from the Latin word **adventure**, which means "to happen" "to come". It is something that happens everyday. It is what comes when we open the door. But if we do so when we think about adventure, where is all the emphasis if the meaning points towards such a quotidian event? Where are all those fears that we usually attach to that word? And what about the excitement? This competition has **taught us so much** with the core fact being that the experience and adventure of F1 in Schools is indeed **endless**. The members of **Traxeleration** have picked up a really unique skill set in all respects.

Team Work

The core concept of this astounding competition is team work. Rome wasn't made in a day and it certainly wasn't made by one man. Every core concept of F1 requires a whole team to fulfill to the fullest and we're proud to say that **Traxeleration** has excelled at team work. We learn to depend on teammates and complete our tasks and also ensure the efficiency of every individual. We were always there for our team mates and backed them up at every fork or turn in the road. This truly helped in unlocking the innate potential that everyone had and stay true to the genius inside of them.

Role Interactions

Even in certain segments such as design, completely inexperienced members of the team were able to contribute critical and valuable ideas for development. Role overlaps are pretty common and we used that to the best of our advantage. Everyone pitched in, no matter what the scenario. Though certain members may not be into a particular field, the vision of the brain is endless. The possibilities that can be conjured up by one member is truly infinite. Now what if we used that, multiplied by 6 super genius brains? It gives birth to a skill-set of excellence, individuals work with diligence and, in their own diverging paths, converge into one unimaginable team - **Traxeleration**.

Elegant, Minimalistic Designs

Team **Traxeleration** is a strong supporter of minimalism, as seen evidently in the design portfolio. Really harsh and bright designs may seem exciting first, but they gradually lose professionalism - something that our team lives by. Our designs are meant to inspire people and instill in them a passion for F1 in Schools. Through countless number of failures and infinitely many trial runs, we have perfected our art and skills so that we can deliver the best among the best.

Citizens of the Future

This competition inspires the every single team to use IT, to learn about physics, aerodynamics, design, manufacture, branding, graphics, sponsorship, marketing, leadership/team-work, media skills and financial strategy, and apply them in a practical, imaginative, competitive and exciting way. We are going to be the future doctors, engineers, racers, leaders etc. and this competitor acts as a stepping stone to propel us toward a great future. Team **Traxeleration** strives to stand out of the ordinary and be the difference that the world wants to be.

Corporate Professionalism

One doesn't survive in the modern world if he doesn't have good corporate standards. The competition enables us to do just that. We make business plans and adhere to budgets to ensure the maximum smoothness of our work. We learn how to meet sponsors and to 'sell' our brand. We learn various ways by which we can convince the sponsors that we are worth their money. We can truly say that **Traxeleration** is a brand that has excelled beyond expectations.

Afterword

Nearing the end of the portfolio which symbolizes the end of our old journey and the beginning of our new, non-stop adventure, we would like to salute every single person who has supported the team through this magnificent journey. It's been a long and tough one, but definitely one that we would remember for the rest of our lives. We would like to thank the F1 in Schools organization and our Our Own High School Al Warqa'a for providing the opportunity for sitting in this amazing roller coaster ride. With that, Traxeleration signs off from its journey to reach the Qualifying and hopes to participate in the National Finals. Let us all try to live by our morals and ideals so that we can emerge as better citizens of the world.

BE DIFFERENT >< BE SPEED



An experience which is going to last a lifetime

Part Speed. Part Elegance. Part Innovation.
All TRAX.



TRAXCELERATION
BE DIFFERENT × BE SPEED