SHORT COURSE ON TECHNO-COMMERCIAL PROFESSIONAL

ABSTRACT

This is short course on young Engineers to plan their career in Automotive domain right from their first job as Engineer. Let them be in any job, this book will help them to guide on how to start their journey from Engineer to Techno-Commercial Professional.

Dhirendra Kumar Srivastava

dhirendra.srivastava@mozopsysconsulting.com

dhirendra@techno-commercials.com

Please visit www.techno-commercials.com

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CONTENT:

WHO IS A TECHNO-COMMERCIAL PROFESSIONAL?

The role of a Techno-Commercial Professional is very important in the manufacturing industry, especially in the automotive domain. Automotive manufacturing is high price sensitive. Any Solution which we are going to implement to improve the organization's efficiency has to be validated both technically and commercially. Any additional amount incurred on improving the organizational efficiency should be calculated in terms of ROI(Return on Investment) and should be recovered in terms of the profit from the product sold. Hence the Engineers who are decision-makers on such initiatives should have technical as well as commercial knowledge and Such Professionals are called Techno-Commercial Professionals.

Techno-Commercial Professionals are like Commandos who are multiple skill people and should make intuitive decisions when their company is in crisis. Before understanding the role of the Techno-Commercial Professional, it’s important to understand how the automotive companies were working 15 years ago in India. They were smaller in size and they were located in one city only. As all the staff were located in one place only so the communication was very easy and it was easy to interact from one department to another and all the different

department representatives can gather in one meeting room, discuss among themselves and can take decisions. Such decisions were based on individual experience, mutual understanding, operating at the same location and limited customers. Now the same companies have grown 15 times. Department size has increased and this increase has given rise to the need for many Techno-Commercial Professionals. We can understand the complexity of the communication with the formula proposed by PMI i.e. n(n-1)/2 where n is no of people/Stakeholders, When no of people increases then no of communication channel also increases so we can understand the complexities, hence role of Techno-Commercial Professionals is very important.

There is no formal technical in the manufacturing Industry. It is up to the Engineer in our Industries to gain Technical knowledge as it is not mandatory and generally assumed that Engineer will learn its own his interest. Some companies give formal Training to the Engineers, but it's always limited to the Product Development Department only. As an example, if some company is manufacturing connecting rods then there is no formal training available on the working of the Connecting Rod, which should be there as such understanding can help to improve quality, better design etc. Similarly, if an Engineer is working on the shop floor then he is exposed to many different problems related to the fixtures and such people if given formal training on various concepts of Fixtures can be groomed in a successful Fixture design Engineers and commercial knowledge can help in design the cost-effective fixture considering the various aspects of the low-cost process. Such Techno-Commercial Professionals can take the role of Business Development of Fixture Design Company and they can be well fitted in many other suitable roles.

There is no formal training for Commercials also similar to Technical Training. Once again it is up to the interest of the Engineer or if he is part of the Commercial department then he needs to learn only and only commercials. Engineers lack Soft skills also which is an important part of People Management. Evolution of a Techno-Commercial Professional is a step by step journey rather it's a step by step thinking. For exp Lets an Engineer has to negotiate a price of a Motor then he needs to understand the working of the motor, existing customers of Motor Supplier, Some Market Research on competition, Child parts used inside the motor and of course he should be able to drive the different cost drivers in the manufacturing of the motor, labour rate, overheads etc to negotiate the price effectively.

Techno-Commercial Professionals are an intangible asset for a company, They take intuitive decisions with all the backup data, as they understand the technical and commercially the aspects of a particular project. He should be groomed as a leader who with his techno-commercial skills along with his soft skills solves the problem and takes decisions in the interest of the company rather than the department or individual and takes a lead irrespective of any position within his defined role. Such Techno-Commercial professionals are an asset for any organization who negotiates better costs, makes an efficient supply chain, brings business to the company and leads a project to achieve success.

CAREER OPPORTUNITIES FOR TECHNO-COMMERCIAL PROFESSIONALS?

We have understood the meaning and role of Techno-Commercial Professionals. We have come to know that there is no formal training for Techno-Commercial Professionals. You will realize the benefits of being a Techno-Commercial Professionals after spending 10 years in the Industry. The journey of Techno-Commercial Professionals is as tough as that of a Commando. First of all, he has to be mentally prepared and Prepare his career plan, He may get or not get the opportunities but he needs to be determined to go on that path. Our Industry decides based on your resume and the budget what have to decide if that candidate is suitable or not but to identify a Techno-Commercial Professional it needs much more than that.

We recommend that first, an Engineer should start his career in the Manufacturing Industry, He should learn all the technical details like how the product is being made, how to see the drawing, different types of machines available, and the Challenges of the shop floor in the

manufacturing etc. He can start this by learning the process behind Forging, Casting, Rubber or Plastic Parts. He can learn how these parts are assembled in the Engine or Vehicle and the role of different surfaces. For exp, the surface which will carry a high load should be better in the surface finish. Once you understand the process, you can propose a lot of multipurpose machines which can reduce 9 to 10 operation operations into one machine thus saving a lot of space and labour and ultimately time as there will be fewer movements. Later you are in any role such knowledge will be helpful in decision making and you as a techno-commercial professional can initiate such thoughts in the mind of young Engineers.

Quality plays a very important role once you finished learning technically. Quality is just a mindset which starts with discipline. Japanese are experts in that, once they have decided the rule to follow on the shop floor they follow and don't deviate unless it is mandatory. However, I have learned only one point i.e. to penalize the company or the people who don't adhere to the mindset of Quality. Here also we need to adhere to the process and always identify the root cause of the Quality deviation and fix the responsibility, however, if still, the problem persists then the penalty is the only option. Many times the logic given by the company that makes defective products is that they have to invest to make a better Quality and such arguments are baseless. It is up to the management to decide what solution they need to adopt when they need to manufacture the part as per the specification. Techno-Commercial professionals are the best people to take decisions on such issues and it becomes very important to understand and learn the Quality.

Once you learnt Quality and you got an understanding of how to build quality in a product, you have to understand the overall Supply Chain. In Today's world scope of the Supply chain is very big and it starts from procuring the raw material and manufacturing the product till delivery of it to the customer location. This completes the cycle of the Supply chain and final payment is also done here. We may wonder why there is technical knowledge required in the Supply chain, but it's required because in the supply chain there is the concept of Value Added and Non-Value added activity. Value added time has a lot to do with machining time, its axis travel time, obtaining the finish time of the product etc. We have to even think of fixture design to reduce the overall machining time, loading time, unloading time, ergonomics etc. The innovative machine design has been built on the concepts of value-added time and non-value added time only. There are a lot of other tools also like Value Stream Mapping, Takt time, Demand Management, and Inventory Management which help in identifying the supply chain bottleneck and of course if. you understand a bit about IT tools and the above tools then you can help the company in achieving the objectives of the company's added time via automation. Supply Chain Management is very important in today's world and it's becoming complex day by day. The backbone of Exports is Supply Chain Management only because India's challenge is Logistics cost only and our understanding is that there are a lot of Non-Value added activities which need to be addressed.

Another important area is Procurement, and this department is key in the companies who do the assembly of components.OEMs and Technology based companies that make motors, controllers etc should have an efficient Procurement department. In today's world Procurement department has to take care of not only direct costs but also hidden indirect costs so that they can keep the overall spend value in control. There are a lot of areas in Procurement like Strategic Sourcing, and Category Management which need to understand to have efficient buying and should keep the cost in control. There is a lot of Planning involved in Procurement right from Supplier Identification, Supplier selection. Components manufacturers are diversified in today's world which is the need of the business also where they are manufacturing for Aerospace also, Automotive also and other areas. The Quality and Factor of Safety requirements are different for different domains and considering all the factors QDCF of the supplier needs to be identified. Nowadays Digital Procurement is also becoming popular as Procurement has become a 24/7 business and work should not be stopped.

In Automotive one more very important department is Marketing which plays a very important role in securing the business of Technology component manufacturers. This role has different names in different companies. In some companies, he is known as Business Development Manager and In Multinational companies, he is known as Key Account Manager. This job role demands that a person should know Technical and Commercial both. If a company is making forging parts then this person should have complete knowledge of the forging process, and machines used in his organization so that he can promote his product and should confidently able to explain how is the company can give a better product in terms of QDCF. Nowadays Technology is the key and a lot of solutions are being proposed on how the efficiency of the vehicle can be increased. So there are a lot of new components being added and Turbocharger is one such part which has wide application. Let's Imagine a company which is making a Turbocharger and then we can understand how strong technical the marketing manager should be for that company. Most of the companies take an easy approach where after some years they put Product Development Engineer into marketing and such experiments are a failure, Instead, we recommend that Marketing Engineer should be groomed as Techno-Commercial Professional. Marketing Managers submits Quotation and he knows the mindset of their customer and accordingly negotiates and wins the business his technical knowledge on the Turbocharger will always help them to win the business. One more area where Marketing Manager should be very strong is Market Research, He should always do the SWOT analysis of his business and keep himself updated on this.

One more area where Techno-Commercial professionals are very much in demand is Project Management. We realized when any activity we are doing in a focused way that works is being done. There are a lot of tools in Project Management which help to do the activities in a focused way. Project Management starts with defining the scope and objectives of any project with monetary benefits, ROI and preparation of the overall Time Plan. Projects are of

different types, some projects have positive Business cases and some have negative Business cases but we need to take them p because of Legal regulations. In any case success of the Project always depends how the technical commercial knowledge of the Project Manager. In addition to that Fundamental Knowledge of Techno-Commercial professionals should be very strong, for exp a Techno-Commercial Professional should be able to understand the difference between Part Quality and Quality maintained during mass production. In this regard, he should be able to understand the tools required for Part Quality and what needs to be done to maintain the Quality of the Audit before the start of the mass production. In today's world integration of different knowledge is becoming important and Project Management is also such management which integrated the activities of different departments to achieve the end objective in a much more efficient way. Traditionally our organization are Functional and there is a need to shift to a Matrix organization where Project Management plays an important role. We recommend that after 10-15 years of experience professionals should take up the role of Project Manager or Project Director instead of Department head and in this way, they will be able to contribute more to the organization.

SKILL SETS OF TECHNO-COMMERCIAL PROFESSIONALS?

We understood who is a Techno-Commercial Professional and once you become a Techno-Commercial Professional then what are the different career options you have. Now it's important to understand your transitional journey from an Engineer to a Techno-Commercial Professional. Once you graduate you have tons of technical knowledge which normally we don't utilize as the company will divert you to different locations. In Automotive there is need of all types of Engineers now like Mechanical, Electrical, Electronics and Computers. The machines used in the components manufacturing are no longer a manual one, The forging dies used also is no longer manual. So first of all we need to identify the area as per the Technical knowledge gained during our graduation. There are a lot of activities in the Automotive domain like design and manufacturing of special purpose machines, We need Engineers who should know different design concepts like Degrees of Freedom, and

Geometric dimensions and Tolerance we have studied this in our Engineering course and manufacturing we studied about the orthogonal and oblique cutting and the understanding of this is the backbone of fixture design. The motor plays an important role in machines and no one than the Electrical Engineer is an expert here who understands all the concepts of Motor, its types etc. Design of circuit and Fresh Electronic Engineer is an expert who understands the input and output functions of any component. Similarly, if some Engineer is working in OEM, he also will experience many areas mentioned above and you should brush up on your Theoretical knowledge once again. Your observation you can write on a notebook, or your mobile and later you can refer your books or you can carry your book near your workplace and whenever you have free time you can refresh your knowledge.

We need to have a lot of patience in the manufacturing industry as a lot of departments compete with each other to fulfil the end objectives. It depends many times on the organization structure also and your Top Management's focuses also. However, we as an Individual should clearly understand our department objectives w.r.t company objectives and accordingly carry out the task. For example, in Manufacturing Industry all the departments and Engineers should work leaving all other work if there is a line stoppage and should work on a long term plan also so that such issues should not arise. Our Techno-Commercials skills will help us to speak logically and give long term solutions instead of depending upon the management and our primary focus should be to give solution solutions and let management take decisions. We should keep our focus on inter-personal development, and communication skills, we should keep everyone informed either through message or mail so that panic is not created. We should respect others and should not bow down if someone is threatening, however, we should keep informing others logically rather than aggressively. We should be aware of short term and long term solutions or should seek advice from experts and seniors also. In a summary, Patience is very much required to be successful in Manufacturing Industry.

As a skill set a Techno-Commercial professional should have a clear understanding of Core Departments and Service Departments in a typical manufacturing Industry. Let’s understand this with an example, we can assume a company which machines a component, it means they already have designed from the customer and they need to manufacture the parts as per the print and deliver to the customer. We can think of two departments which will be core departments i.e. Design(Product Development) and manufacturing There can be different names in different companies, in this example, it refers to Process Design. Business flow is like this, We received the design from the customer, the Product Development department does all the activity related to part manufacturing and finally, the Manufacturing department does the machining and then parts are dispatched to the customer’s end. There can be a lot of departments or resources that can support fulfilling the end objective i.e. to dispatch a Quality product to the Customer. The quality team ensure that the right product is being delivered to the customer and in this regard, they support the core team to Plan Quality and

later maintain quality till the dispatch to the customer. So a Techno-Commercial Professional should have a thorough understanding of the role of different departments for exp to design the process we should know the raw materials were forging to be done or the machined parts which need to be made from bar route. After going through the surface finish mentioned on the drawing we should know which operation like grinding, honing etc needs to be done and of course, we should know the concept of special purpose machines and should understand the requirements of fixture design as well. We should know the different tools required for Quality Planning and should be aware of Quality Tools required during machining of the components such components can be used during any process even during packaging also. We have to adopt a continuous learning methodology and to learn commercials we need to identify the different cost drivers on the shop floor and such initiatives will help us to smoothen our journey of Techno-Commercial Professionals.

Once we have an understanding of the functioning of different departments, we should proceed further to understand the different management tools. The manufacturing industry is highly cost sensitive and this industry runs 24/7 and performance of man, material and machines are very important, the health of mainly these three parameters decides the health of the company also. As techno-Commercial professionals, we should know first the data collection process, how to analyse the data and later make performance monitoring indicators. We should clearly understand the value added and non-value added process in the manufacturing it can be any department. These value-added and Non-Value added times should be in the form of cycle time and on that basis all the calculations should be made. We should note down the details in the overall time of 8 hours, how much time has been consumed in the actual production and the gap between input received and output produced. We can build different indicators like this fulfilling the objectives of the company. Such activity will take us on our journey as Commercial Professionals.

One of the biggest challenges in the Manufacturing Industry is working in a focused way. Departments or Management don’t have any scope defined and no documented end objectives in their overall deliverables. A lot of good projects are started but it fails because management loose focus after some time and the investment made is a loss. The reason behind that is we are always in a crisis mode due to communication gaps. In many instances logistics team/manufacturing will escalate the part shortage issue to the Procurement department without providing the right information and Procurement Engineers start working on improving the communication gaps only as a solution and it becomes a never-ending storey resulting from the company's inefficient organizations. Project Management is an important area which helps us in a focused way, the scope of Project Management is very large and an expert and a Techno-Commercial Professional only can reap the benefits of Project Management tools in an organization. Normally it's being practised in the Western countries but India needs it very badly and we need to move quickly from a Functional Organization to Matrix Organization.

In our journey to a techno-commercial professional strategic role is very important, In our country strategic role is not given much importance. We may see that people with the role of Vice President may solve the day to day problems, instead, they should be focussing on strategic roles or mentoring. If you will follow the steps in the Techno-Commercial Professional journey then you will understand the importance of a strategic role. Normally people follow the Business Strategy but the Strategic role has importance in every department. Strategic roles define and prepare for the Long term strategy for a company in the overall benefits. It can be either related to cost saving, efficient organization or acquiring new customers. Once you learned better Planning as a Techno-Commercial Professional, you can be the best fit for a strategic role.

Our vision of an efficient organization and company is very different. We believe that an Engineer should acquire Technical till 10-15 years and then he should move on full-fledged Project Manager or Program Manager Role and later on he or she should move on to Sa strategic role. In our Indian companies, there is no Project Manager or Strategic role and all the employees end up solving crises only on daily basis.

BRIEF OVERVIEW OF THE AUTOMOTIVE INDUSTRY IN TERMS OF VEHICLE, POWERTRAIN AND COMPONENTS

Let's understand the Automotive Industry in terms of Vehicle, Powertrain and the components which are used at the inlet and exhaust side. The powertrain or Engine is the heart of any Vehicle. Traditionally in the Engine the middle portion where the cylinder block is there and a lot of other components are being fitted is almost the name from the past many decades. There are no major technological changes and only the change in terms of volume depending upon the size of the engine. Input and Output parts of the engine which have a relationship with the overall performance of the engine is a focus area of Engineers where a lot of technological advancement has taken place and some new components have been introduced which we will discuss in detail. At present we will focus on the overall Vehicle. The main focus of Vehicle design Engineers as per our understanding is mainly on four points, Safety, comfort, driving pleasure and cost of ownership. This is the reason Suzuki has a major market share in India mainly in the low-cost segment. Let's understand some technical stuff regarding vehicles and before starting we should know the difference between Power and Torque. It's very important in designing a vehicle, Torque is nothing but twisting force and movement in a clockwise direction. The design of connecting rod and cylinder block depends upon how much torque you need to produce in a vehicle and of course, the power which we get in the form of combustion depends upon the cc of the engine which is nothing but the

capacity of the Engine. You must have heard of 1 litre,2 litres, 3-litre engine and especially in the Truck segment now there is Engine which is of 5 litres and 8 litres and in foreign countries, we have 11 litres,13 litres engine also. It is nothing but the cc of the engine which is cubic cm or cm3. If the cm3 or cc you will divide by 1000 you will get a litre as the relationship is 1000 cc =1 litre. You will see the connecting rod design of a motorcycle and a truck will be entirely different and of course, the engine block because different Torque they produce. More and more air-fuel mixture in the high cc engine will give power because of combustion. There are a lot of parts being added to increase power which we will discuss later.

Let's understand the overall vehicle design needs that have evolved.

Let's take an example some years back, especially in India, we use to keep motorcycles for daily commuting to our office which was within a city radius of 40 km. Our focus was more on mileage, so we can say that cost was the major factor. Nowadays when people want to have fun driving because of better road infrastructure, They want speed, comfort, stability and less shock during driving. Now Engineers are using engineer coolers used in the cars for motorcycles also. We as techno-Commercial Professionals should know the need of the market or customer and accordingly fine-tune the design of the vehicle in the segment we are operating. Normally in a Vehicle broadly we have Cabin, Chassis Assembly, Suspension, Steering, Transmission and Axle assembly and of course Engine also. There will be more components inside this assembly depending upon the car or Truck. Car is broadly classified as Hatchback, Sedan and SUV. So Hatchback is a low segment car for city drive with a maximum it can carry 5 people, and good for city drive. The sedan is considered a luxury vehicle and can be used for city and highway drive both but carry only 5 people. The Centre of Gravity is less in this vehicle which gives stability, SUV, on the other hand, is known as Sports Utility Vehicle and is purchased by people who carry their big families, though seating capacity can be either 7 or 9 in most the cases. Most SUVs use diesel as fuel. The driver is at a height so that he gets a better view of the road and is mostly used for the Highway Application. However smart Techno-Commercial Professionals nowadays are making various combinations of these vehicles and creating new variants.

The vehicle being chosen either by customer or market is based on many factors which we will understand step by step. The engine can be classified based on cc, as the Power of the engine has some relationship with that, similarly, it's important to know if you're engine is 4 cylinder or 3 cylinders or its DOHC or SOHC which is known as Dual overhead camshaft or Single overhead camshaft as it has the relationship with the Engine power of the Vehicle. We have already discussed the Power and Torque in the vehicle and depending upon your driving pleasure need you can go with the vehicle. If you are cost conscious then you can check the mileage of the vehicle depending on your daily needs. Of course, you can choose manual or Automatic Transmission as per your comfort. Dimension and Weight of the Vehicle are also very important in terms of cost and Safety which you need to take care of while choosing the

type of vehicle you need. Some customers need more Boot space and more Fuel tank capacity so that they can drive the vehicle long distances and carry more luggage. Apart from this, we have different designs of Suspension systems, normally we have McPherson strut for Front Suspension and Torsion Beam for Rear Suspension, we need to take care of the carbon case depth and diameter depending upon the usage of vehicles on rough roads, especially in India. Brakes also play an important role in the overall vehicle and it directly related to our safety to avoid accidents. Brakes are mainly classified as Front Brakes and Rear Brakes. Based on performance, we have ventilated discs and non-ventilated discs. Ventilated discs provide the better stopping power and it also works in hot conditions. Normally we have drum brakes which are cost-effective, however disc brakes are also being used on the rear side as now cars are being designed to run at higher speeds which is increasing the cost. Steering systems have assistance to help them park them better at low speeds which can be hydraulic, electro-hydraulic or electric. We have seen the struggle of some drives in our childhood while rotating the steering at low speeds. Now steel rim and aluminium alloys are being discussed in terms of Vehicle stability. Dimensions of tyres play an important role in providing the stability of the Vehicle. There are a lot of safety products and system which has been added electronically into the system like seat belt warning, child safety lock, speed sensing door lock, central locking, tyre pressure monitoring system, Airbags, Overspeed warning system and such system are electronically controlled and if you have the understanding of the working of such system combined with manufacturing knowledge then you will be considered as the best Techno-commercial Professional and you are eligible to work as Project Manager, Business Development Manager, Procurement Manager etc in case you will decide to choose other than Product Development roles. In Brakes which have a very important connection with the safety of the people, a lot of other systems have been developed like ABS, TC/TCS, ES, and BA explanation of which is beyond the scope of this E-Book. I will like to highlight one important point here, There is a basic difference between an NCAP rating and an Airbag, NCAP rating tells the chances of vehicle survival in case of an accident, and Airbag will save you from any kind of impact on the vehicle, so Airbag will save your life even if you're vehicle NCAP rating is very less and this is the reason Government has made putting Airbags mandatory in all the vehicles. We need to put Batteries which is mainly lead acid battery for Headlights and other electronic related products. Nowadays the use of sensors is also increasing in vehicles so it’s important to understand the different types and working of these sensors. Sensor plays a very important role in the safety of the vehicle. Telematic is also gaining popularity which is nothing, but the technology of sending, receiving and storing information using telecommunication devices to control remote objects. Many companies are using this to track the mileage of different vehicles and accordingly take a call to design the vehicle. Connecting your mobile via Bluetooth with the car speaker is also an example of Telematics. Nowadays companies are taking care of Ergonomics design of the seating arrangement where you can move the seat in different directions. There is a small heater attached to the seats so that you can drive the vehicle comfortably in the cold conditions as well. Driverless cars becoming

reality is also giving scope for better seating arrangements where four members of a company can have a small meeting while travelling to meet their vendor or customer and thus utilize their time in a better way. The instrument cluster is also becoming modern where regular software updates are being done which is a clear shift from the traditional way where mostly manual components were being used. Steering mounted control are the latest examples of ergonomic design in a vehicle.

Let's understand the use of electronics in a vehicle, There are a lot of new electronics products which have been added to the vehicle however it makes the vehicle expensive. If we speak in terms of cameras there are different cameras like Front view Camera System, Night vision/Surround view camera, Cross traffic assist, Emergency brake system, Drive monitor camera, and Blind spot detection. All these new products aid in enhancing the safety of the vehicle. All these systems have been integrated as ADAS vehicle systems, however, testing is going on in many countries. The investigation is going on how much electronic systems can be helpful in connected vehicles.ECU which is also known as Electronic Control Unit is gaining importance and different ECUs are made for different systems like Rear blowers, Tracking system systems, overhead consoles, radio navigation systems, electronically adjustable steering wheels etc.

There are a lot of changes being done in the Automotive world and our objective is to just summarize the overall scope depending upon your interest you can plan you're journey by knowing one system each for exp first you can understand the mechanical system, then electronics and electrical system. Once you have an understanding of this system you can learn the manufacturing part which is broadly classified into Forging, Casting, Sheet metal, Plastics, Machining and Electronics component manufacturing.

Technology in Engines is also not left behind and here the major up-gradation is from the input and output of the engines as discussed earlier. However the technology up-gradation driver is a different regulation, We must have heard of BS6 regulation mainly for diesel and petrol vehicles and this drives the technology. Nowadays there is a lot of discussion being done on alternate fuels and we must understand that once you will know the functioning of diesel and petrol engines, it's very easy for you to understand. The concept is very simple ambition will be the key everywhere. The government is putting a lot of focus on using Green Hydrogen as a fuel and the reference is always a CNG Engine, if you understand CNG engines it's easy for you to contribute to the development of vehicles using Green Hydrogen as a fuel. There is a lot of discussion on Electrical Vehicles but it will be very difficult to fulfil the needs of the 135 crore population of Indians, of course, cars will be a big challenge. I will recommend you to understand the diesel and petrol engines first and other technology will be very easy for you to understand.

After Engines, Let's understand the evolution of different components which have been useful for the safety of the vehicle and Engine performance of the Vehicle.BS4 and BS6

regulations have given rise to many other components. The turbocharger as a component is very useful in the boost of overall combustion and we have seen that vehicle attains high speed in very less time. It's being used in Diesel vehicles and discussions are going to use it in Petrol Vehicles also. We hope that the development of engines running on alternate fuels will give rise to cheap fuel costs, till the economy is not fully being shifted to alternate fuels.BS6 regulation has made actuation mandatory by motors which have given rise to small BLDC and DC motors.EGR valve whose full form is Exhaust Gas Recirculation helps to recirculate the exhaust gases to the inlet valve and combustion takes place once again thus giving overall savings, Technology helps to refine the exhaust gas which is treated in the muffler and exhaust gases which is coming out are less toxic and good for the environment and human beings. As a techno-commercial professional once you have understood the Working Principle of these components, Technical specifications as per the Engine Design which in turn is based on the customer requirement then it's very easy for you to make a business case. Once the design of these components is ready, so mask makes them suitable as per the Engine Specifications. For example, Turbocharger Assembly is nothing but an assembly of small components only which you can further categorize into Sheet metal, Casting, Forging, plastic, rubber etc. Depending upon the Business case you may outsource the child parts or you can manufacture them in house. In this decision also, being a Techno-Commercial role plays ana very important role and if you are a Procurement Manager who knows Technical and Commercial both the aspects will do a very good job in keeping the cost in control. In case we need to set up

MANUFACTURING IN THE AUTOMOTIVE WORLD

We have understood different technological advancements in the vehicle and Powertrain and now it's time to understand how the manufacturing is being done in the Automotive World.
We will understand the different manufacturing being done in the Automotive world in a nutshell.
There is a complete chain of manufacturers for an OEM (Original Equipment Manufacturer). Let's understand the manufacturing for OEMs, it will not be appropriate for OEMs to say that they are manufacturers but they are assemblers. They assemble different components and make an Engine, Similarly, they assemble different parts of the vehicle. In the beginning, most of the companies were manufacturing highly complex parts within their premises to control all the quality features within their premises but later the trend was to outsource the manufacturing parts to different companies. There were certain strategic advantages and disadvantages also due to this. Normally companies make a Business case if it is viable for them to outsource, for example outsourcing a sheet metal part is always beneficial instead of doing it in-house on the other hand if the sheet metal factory is far away from the OEM location then it becomes complicated and cost increases. One of the biggest disadvantages is that Quality control and part availability on time is a big challenge as the vendor has a lot of other priorities, however, a lot of solutions are under development but still not to be done on this.

We need to understand one manufacturing aspect where Assembly of Vehicle is done, it's very complex in nature, depending upon the type of vehicle we need to identify the nature of resources, area and technologies to run the factory because of delay in assembly of vehicle results in the losses. The assembly of the two-wheeler industry will be different compared to the car industry and the Truck industry will be entirely different. The supply chain model used in the Two wheeler Industry will be different and in the car, it will be different. However broadly we can categorize that there will be a body shop, a Paint shop Assembly shop and finally testing.

Companies call it by a different name, but in the body shop the main framework of the vehicle is made ready where the body frame is assembled, There are a lot of fixtures being used and welding is the main process which is being used In the paint shop the entire body paint is being done where colour is being chosen depending upon the customer's interest and finally, in the Assembly shop for exp in cars chassis, brackets, brake, suspension system, steering system etc is being assembled. In the end, there is testing just to ensure everything is fine. For exp in Cars one test is where all the door glass is put on and from all the side water is sprayed just to check that there is no leakage inside the car.

The powertrain which is the engine is also being assembled in the same way but it's not so complex.

There is a conveyor on the line on which operators assemble the part one by one. However, depending upon the volume there can be some alterations here and here also at the end Engine testing is being done just to check if everything is fine. There can be various components of forgings, casting, Plastics and Rubber. In Engine, there are a lot of parts which come under the category where supplier takes end to end implementations of design and manufacturing and with different regulations coming in there is an increase in the number of parts.

Let's understand the manufacturing of the part some parts like connecting rods, crankshaft, rocker arm etc are made through forging parts where the raw material is being heated to a certain temperature and then pressed under a hammer. The forged parts are being taken to machining where soft machining is done first and then heat treatment. After heat treatment, final machining is done and then parts are dispatched to the customer. We need investment in machines as per the process required and depending upon the parts there may be some investment in the fixture also.

SUPPLY CHAIN MODEL

We understood the manufacturing aspect in an Automotive Domain and understood the manufacturing complexity from OEM to the Part manufacturer. Imagine you are Supply Chain In-Charge in an OEM company and think if someone has the deep knowledge of what has been explained above and someone who does not have. If you have technical and commercial knowledge then you will be in a better position to take decisions and do the improvement also in the supply chain. We will discuss in the next section how IT helps you to do this. Before starting a full fledge Supply Chain In-charge we should have an understanding of the Planning of the logistics. It starts from the customer asking rate which is nothing but the rate at which the customer is asking for the product. In the case of OEMs, it's on the forecasting basis and their market research regarding their product fits in the market. Once they have the forecasting volumes, they decide the capacity of the plant and if they can produce those volumes. Generally, such studies are done by Multinational companies as they don't want

hue and cry. I am also interested to inform the planning as done by experts. Once Forecasted volumes are available then as a next step companies perform the overall number of days to run their plant and parallelly decide the no of shifts they require to produce those volumes. Companies take care of the inventory at their dealers and how much inventory they will keep at their manufacturing plant. They plan their assembly stations based on cycle time and accordingly plan to deliver the parts either from the supermarket or keep inventories from local or international suppliers. The procurement team based on their localization plan can support the reduction of inventories. A Supply chain engineer should be aware of the latest technologies available in the market for the logistics equipment's so that they can reduce the loading time and unloading time from the supermarket to the shopfloor, You should be able to know the design of fixtures so that loading and unloading time is very less so that only process time is being counted. Your planning with Incoming and Outgoing Truck should be in such a way that not a single minute is wasted and proper communication is there. So logistics from OEM plant to customer premises is known as Outbound Transportation and the logistics from Supplier plant to the OEM Manufacturing plant is Inbound Transportation. Packaging also plays an important role and we should carefully design the Packaging in such a way that loading and unloading are negligible and chances of damage are also very less. Based on Packaging the storage areas are calculated and for the cost-saving, more and more Vertical Racks are being designed, of course, we need to have Very Narrow AISLE Fork lifters which are expensive but if you will make a positive business case based on the initial cost vs saving in terms of space utilization and new technology Fork lifters which are more energy efficient.

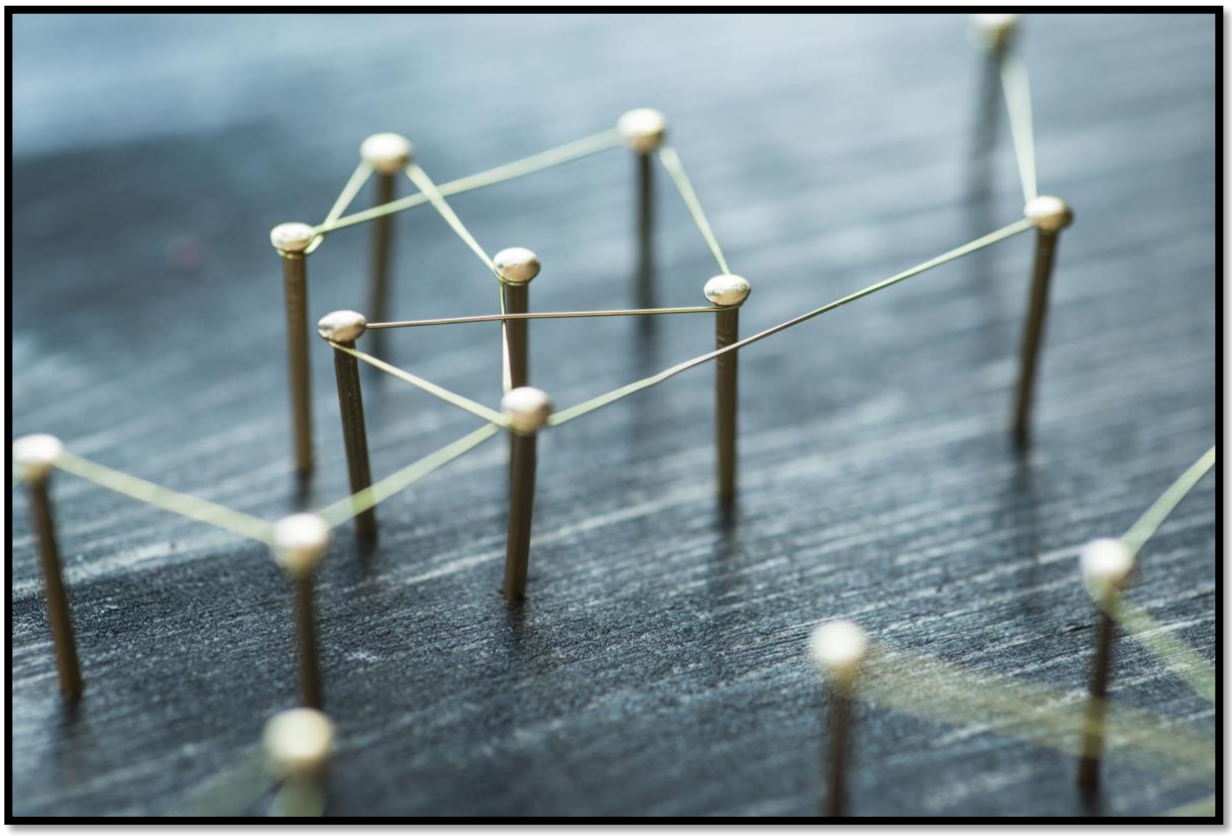
Similarly, we need to make a supply chain model for Tier 1 companies, that supply parts to OEMs. The volume asked by OEMs here is based on the actual no of cars or trucks which they are going to produce. So based on Takt time, Tier 1 companies have to plan their supply chain. The process should have a cycle time less than the Takt time otherwise you can't produce the time and you need to keep a lot of inventories, so you need to work on the machines to reduce the cycle time to match the takt time or you need to invest into a new machine which will be expensive, Moreover, you need to run your machine additionally to produce inventories which is also a cost. You need to develop a lot of measurable to track the value-added time while running the machine. We need to understand here that the customer pays only for Value-added costs and not for non-value-added costs, so you need to eliminate the non-value added activities for an efficient supply chain. The supplier has to submit the PPAP Document and if you are smart enough, you can easily identify the value added vs non-value added time in those PPAP Documents. You need to conduct a time Study throughout your shop floor along with a Productivity improvement plan. Your Top management support is very critical here and in case they are not providing this support you can inform them why you are not able to perform. If your company doesn't have data, then have your data based on the above guidelines and don't be at the receiving end.

NEED FOR AUTOMATION IN THE SUPPLY CHAIN

We just understood the complexity in the supply chain, so many people and so many different departments where communication is key. In the modern world where supply chain management has become so complex that we made inbound transportation, manufacturing and outbound transportation we see that parts are not reaching on time. There can be many communication gaps which can't be addressed. Any one problem in the whole supply chain can impact the overall delivery of the parts on time. Automation is one area which can help us in smoothing the overall supply chain management. Once again this needs to be addressed properly as we need hardware and software solutions both. A techno-commercial professional who knows the problem and parallelly he should know the different hardware and software solutions. We have a concept called Process mapping of the manufacturing of the parts which normally we find in the PPAP Documents as mentioned above and similarly we need to do an IT Process mapping in which we focus on how the information will flow from one process to another and we need to ensure that how the information to be captured, how the information to be processed and how the information will be passed on to the next process. This needs the knowledge of management and IT tools both and a Techno-Commercial professional should be able to do it. We should have the information between

department to department, company to company, involvement of many different stakeholders and course KPI of individuals related to the departmental KPIs. The challenge in such kind of solution is that the people who have to take such decisions are not capable enough to decide because they are not techno-commercial professionals. Moreover, the companies or individuals who offer such solutions don't provide the integrated approach due their solution doesn't provide the overall improvement and the customer feels that their problem has increased with such solutions. We should utilize the concepts of Project Management to deal with such Projects but we need to ensure that the Project Manager should have Techno-Commercial skills. Generally, the Project Manager concept is coming from the Western World where a Project Manager is always an Engineer who has worked in Product Development Department. Such Engineers view every problem technically whereas always it's not the case, In India, we can develop Project Managers from any department and it will be successful. PMO(Project Management Office) should consist of Project Managers from different backgrounds and experiences so that accordingly projects can be allocated to them. A techno-commercial professional can lead a project in a very efficient way as heunderstandsds the technical and commercial aspects in a very good way. There are a lot of hardware devices which can collect information from the machines and can distribute it over the network to various other people and departments. For exp In the initial days of my career, we had some production engineers on the shop floor whose job was just to count the no of components produced and later inform the Production Manager about the progress. There was physical counting also been done on that. Some simple solutions were developed at that time, like once the operator is away from the machine then the machine is used to ask the reason and after entering the reason the operator was able to switch on the machine. Such simple solutions improved productivity as operators were afraid to go away from the machines. Similarly, there is the problem of small parts being missing from the shop floor and for that, we have a solution where the antenna-like device can monitor the parts in a particular area and a person sitting in a remote location can monitor this and he can generate a report.

DIFFERENT DEPARTMENTS AND THEIR ROLES



We understood how the Automotive Industry is organized, So let's understand the different departments and their roles in how this industry is being run by people from different departments. We will start with OEMs as discussed earlier OEMs do the assembly of vehicles which includes engine assembly as well.OEMs have a very big manufacturing plant where you will find a bunch of Manufacturing Engineering Department, Their job is to ensure that the required number of Vehicle being produced in a given period and they take care of the training of the operators till smooth functioning and maintenance of the machine and this department are spread across Body Shop, Paint shop and Assembly shop. They have another division of inbound and outbound transportation which takes care of logistics from supplier to manufacturing plan, storage etc and similarly logistics of fully built vehicles to dealers or customer locations. OEMs have a finance department which takes care of all the finance activities. They have a product development department which consists of Design Engineers, testing Engineers etc and they are responsible for all the design work related to 3D Modelling etc. There are multi subdepartments focused on cab design, suspension design, steering design etc. In a similar

fashion in Powertrain also design of casting, forging, and electrical and electronic parts are taken care of by different sub-departments. Apart from this, OEMs have a testing department which has their testing equipment, own lab and different tracks where testing of the vehicle is being done. The Product Development Department is mainly responsible for the product features and they are answerable for the part failures from a design point of view in the Aftermarket. Procurement is another big department who are responsible for all the product features and commercials for the parts coming from the supplier end. However, there is always an argument between the Procurement and Product Development Department regarding the parts produced in terms of product features, Quality, Cost and Delivery on time. Nowadays Supplier Quality Assurance Department is gaining popularity and just takes care of Supplier Quality, Their job is to the Quality Planning, Quality Audit etc at the supplier end. There is one big department Marketing in the OEM's their job is to identify the product fit as per the market needs. They do market research and identify customers for their vehicles. In addition to that, they do market research to identify the new product features that the vehicles have and do the competitor analysis to identify the threat to their company.

As far as Tier1 Suppliers are concerned they also have a similar set-up except for one marketing Department. They are basically in touch with the Procurement department of OEMs. They also do the market research but are specific to their product. For example, if a company is making a turbocharger then their research is to understand the need of the market for the turbocharger for the next few years. In case they are serving the Automotive clients then their research is on the competitor for the need of Turbocharger on the aircraft as well. They make marketing strategies but unfortunately, most of the company's marketing departments' job is to just do the coordination with different departments. In case OEM's Product Development department needs to understand about their product, they will arrange a meeting, if there is a parts supply shortage then they are the single point of contact and there is a lot of non-value added activities they do which they are not supposed to do. However, it all depends on the company's management on how to make these people a full fledge techno-commercial professional so that they can bring business to the company and do a value addition job.

COMMERCIAL ASPECT OF AN AUTOMOTIVE COMPANY

The commercial and financial aspect is everywhere in the automotive industry**.** In India there is cutthroat competition among OEMs, so professionals having techno-commercials skills are in demand. Let's take an example if an OEM company wants to launch a new product or a motorcycle with new improved features as per the market need then first they will approach the procurement department who will make the list of new products added and their specifications, depending upon the situation they can approach Product Development Engineers and put the approximate prices in front of the product and give their overall estimate. Based on this information, the marketing department will make a survey and decide to launch the product at a specific price and accordingly new product development kick start will happen. We understood how important is the decision of a techno-commercial professional. Image if a Techno-commercial professional will keep wrong information then whole company business is at stake. Nowadays we hear a lot about making positive business cases or returns on investments all the terms are related to Techno-Commercial professionals. A Techno-commercial Professional has to make a Business case if any new product needs to be developed then what will be the company's upfront cost once the customer is found then how much should be the pricing and how many years it will take to recover the upfront

cost. Similarly, a marketing executive, if he is a techno-commercial professional, will make a quotation of the product and he will keep his competitor's product specification and prices under analysis and accordingly negotiate with the customer. So he is aware of his overheads, his company expenses, his labour cost, and his packaging and he knows how much discount he can give the customer to win the business. Similarly, a Procurement Manager who should be a Techno-Commercial in today's competitive world should have a complete negotiation strategy in his mind before negotiating with the supplier. He should be aware of the product's technical specifications and should have a complete breakdown of the cost. He should be skilled enough to take make his estimate before negotiation. When a company is in crisis, the Procurement Manager takes lead and reduces the cost of the product through various means. Similarly, nowadays Project Manager role is also gaining popularity. A project manager also has a lot of strategic advantages if he is a Techno-Commercial Professional. He drives the project on time and within the approved budget because being a Techno-commercial he knows where to control the cost escalation. He gives an amicable solution during the conflict between the stakeholders by knowing the different ways to address the problem.

We should know even how to estimate the product cost also by calculating the product's raw material weight and prices. We should be able to calculate the process cost by knowing the Machine Hour rate and should know all the subcomponents which go to mining the Machines per hour cost. We should be able to know how much should be the cycle time of producing one part and what are the ways to eliminate the Non-Value Added cost. We should know the formula for calculating the overheads and should know the percentage of the profit margins calculated. We should also know the cost of Quality and in case Build in Quality or First-time Quality Product is not made then what are the consequences for that. We should know the different packaging required and should be able to calculate the cost of Packaging suitable for the part and the distance where it is being transported. We should be able to calculate the transportation cost and should be aware of the Government Taxes. Thus we can say that Commercial Aspect is everywhere in the Automotive Industry and if we want to be successful in this industry then we need to gain Technical and Commercial Knowledge both. In addition to this, we should be aware of the latest technologies available in the market so that we can make a positive Business case wherever possible.

SUMMARY:

We understood in the E-book who is a Techno-Commercial Professional and what are the different Career Opportunities you have as Techno-Commercial Professional. Please start acquiring those skills right from the first job as Engineer. We understood briefly about different Vehicles and what are the different parts and components used in the Vehicle and similar fashion we learned about the different parts used in the Powertrain as well. Manufacturing in the Automotive world is the most critical one and there is no need for different types of machines, gauges and fixtures. Engineers are kept on adding new components, and new parts to make the vehicle's environment friendly. The supply chain model is also very crucial in the automotive world and there are a lot of challenges and bottlenecks in that. I hope you must have got some understanding of our supply chain network and challenges and definitely, there is a need for Automation for the supply chain in our country because engineers are taking a lot of the stress in the supply chain and end up doing non-value added activities.

We got some understanding of Different departments in OEMs and Tier1 companies, their role and how improvement can be done in those departments. The commercial plays a very important role in Automotive World and every Engineer should gear up for the role of Techno-Commercial Professional.

ABOUT ME:

My Name is Dhirendra Srivastava and I have done my Engineering in Mechanical stream. I started my career learning C, C++ and Java but circumstances forced me to join the Automotive Industry where I started my job as a Product Development Engineer and learned d a lot of Technical Skills and found my Programming knowledge useful in the running of the CNC Machines. After 2 years I got the opportunity to learn management skills in the Industrial Engineering Department and contributed to the improvement of the company's productivity and this is how I started my first Techno-Commercial Professional Journey.4 years spend on the shop floor as Techno-Commercial Professional gave me a break in OEM where I was supposed to improve the Design through Reverse Engineering and various implementing various techniques on Quality Management thus saving a lot of cost for the company through various means. I was not satisfied with the job and interested in doing Negotiations and discussing with my existing company and they told me to continue the same job as Procurement as per them was a very complicated job. I gave e a couple of interviews and informed them that I am looking for a Buyer job and I have all the necessary skills but at present, I am working as Supply Quality Engineer. They just told me that they will keep my resume in their database and contact me when they have a Supplier Quality Assurance job. I decided to say in the interviews that at present I am doing a buyer job and requested them to ask them any questions about that and finally selected for the buyer job, though I had to put a lot of effort into that. I did my job successfully and later did a dual

job of Project Management and Buying. After spending 9 years in the Automotive, I had a wish if there is no support then how I can take a project and complete it successfully and later handled many projects. I decided to quit my job to take up strategic roles and that also did successfully. The success behind all this was that I learned technical and commercial skills. I had dreamed of becoming a design Engineer but unfortunately, I couldn't go in that field still, a passion for learning technical was always there in mind even though mainly I worked as Commercial Manager.

In my experience on the shop floor where I kept on learning about machines, and different fixture designs, In OEM I learned about the working of different components in the vehicle or engine helped me to understand the technical concept and of course, the commercial was part of my job. The purpose of writing this book is to guide all those youngsters who are in the early stage of their careers on how to build their careers step by step. Please have patience and follow the guidelines and definitely, and you will get your dream job.

We will help you to build your career and I will request you all the subscribe to our website you can always reach me at dhirendra@techno-commercials.com for any query regarding your career advancement and I will be happy to help you all with my knowledge and experience. You will find different blogs on our website www.techno-commercials.com, So Please provide your comments, so that we can improve it and bring the material related to your interest in the Automotive World.