CRITICAL FACTORS INFLUENCING SATISFACTION OF CUSTOMERS FOR INDUSTRIAL CHEMICAL PRODUCTS

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BY

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"No one who achieves success does so without acknowledging the help of others. The wise and confident acknowledge this help with gratitude."

Alfred North Whitehead

ABSTRACT

The present study is undertaken to identify the factors which can satisfy the customers of carbon black and other selected industrial chemical products. The study further tries to determine the order for dealing with these factors according to their relative importance as per opinion of the customers of these selected industrial chemical products.

Customer centricity is considered as a strategic business development tool, which ultimately leads to loyal customers and more profitable business. It is imperative to ensure customer satisfaction for the development of a sustainable business. Vital area critical for failure or success in manufacturing can be standardized, but it is very difficult to standardize the procedure of improving Customer Satisfaction. While various standards have been laid down time to time for improving customer satisfaction, these differ from one industry to another industry. Whatever literatures are available on satisfaction of industrial customers, appear to be sketchy and there is lack of focus, as industry specific questions were hardly addressed. Moreover, some of the studies were conducted on a few common factors to satisfy industrial customers but the relative importance of these factors for the specific industry was not analyzed. Thus, it is felt necessary to sensitize the suppliers of industrial chemical products with the identification of major variables along with their relative importance that ought to be considered while seeking to improve customer satisfaction and thereby to increase the market share and profitability.

The current study seeks to gain information from the views of customers of industrial chemical products in India on the factors influencing their satisfaction. It concentrates on and around identification of the factors which can influence satisfaction of Carbon Black customers in two major industries i.e., Tyre manufacturing industries and Automotive Rubber Component (ARC) manufacturing industries and evaluation of the relative importance of these factors on overall satisfaction of customers. The opinion of respondents from different functions of Tyre manufacturing industries and ARC manufacturing industries were captured through the questionnaire on the relative importance of the identified factors and a correlation study of the ranking of these factors for these two sectors were done. An effort has also been made to study

the applicability of these factors in influencing satisfaction of customers for other industrial chemical products. Various industrial chemical products which have been chosen under the scope of this study apart from Carbon Black are Sulphuric Acid, Hydrochloric Acid, Sodium Hydroxide, Sodium Silicate, Sulphur, Zinc Oxide, Stearic Acid, Rubber Process Oil, Potassium Carbonate, Potassium Nitrate. Market size of all the selected industrial chemical products is very big. These chemical products play a vital role in the manufacturing of various products which are essential in our daily life.

Based on the review of existing literatures and the experience gained by the research scholar during interaction with several customers and marketing personnel in his professional field, the factors which can influence satisfaction of customers of industrial chemical products are identified as follows: Price of the Product, Incentives offered to customers, QMS ensuring Quality of the Product, Packaging of the Product, Order Execution and Delivery of the Product, Customer Service of the Supplier, Suppliers' Sustainability Performance, Company Image of the Supplier, Product Stewardship of the Supplier.

The instruments of data collection involved administering pre-tested structured questionnaires and conducting face to face or telephonic interviews, as deemed convenient, with the respondents to clarify the questions and capture additional insights. Given the resource constraint and time limitation on the part of the researcher, questionnaire was also sent via email to the customers of the different business segments of the industry. The sampling size consisted of 298 respondents from different manufacturing companies of India who procure different industrial chemical products for the use as raw material in their respective manufacturing process. The respondents were chosen from a) Major Tyre manufacturing companies across India b) Major Automotive Rubber Component (ARC) manufacturing companies across India c) Lead–Acid Battery manufacturing company d) Precipitated Silica manufacturing company e) Steam Power plants f) Carbon Black manufacturing company.

Target respondents were chosen by using non-probability purposive sampling method in which samples are chosen arbitrarily by the researcher based on the experience of the respondents in working with industrial chemical product manufacturing companies. Participants are mostly the customers of industrial chemical products who could easily be reached. The inclusion

criterion for the participants were minimum qualification of graduation and industrial working experience of at least two years so that they are better placed to identify business factors that might have boosted their satisfaction levels and shaped their buying behavior.

In the process of analyzing data, descriptive and inferential statistics were used to pave the way for the presentation of the results in the form of statistical tables, graphs, and charts. After analyzing the data, hypotheses formulated earlier were tested through various statistical tools using SPSS and MS-excel.

From the results, it is evident that 'QMS ensuring Quality of the Product' comes at the top in influencing the satisfaction of customers for both Tyre manufacturing companies and ARC manufacturing companies. However, the degree of significance of rest of the factors investigated was found to vary from one group of customers (Tyre) to another group of customers (ARC). 'Order Execution and Delivery of the Product' comes second in case of Tyre manufacturing company, but it comes fifth in case of ARC manufacturing company. 'Packaging of the Product' is coming third in case of Tyre manufacturing companies whereas this factor occupies the eighth rank in ARC manufacturing companies. 'Product Stewardship of the Supplier' comes fourth in case of Tyre manufacturing companies whereas this factor comes sixth in ARC manufacturing companies. Ranking of 'Customer Service of the Supplier' is very close for these two sectors. It comes fifth for Tyre manufacturing companies and fourth for ARC manufacturing companies. 'Suppliers' Sustainability Performance' also occupies closer ranking for these two sectors. This factor occupies sixth rank in case of Tyre manufacturing companies and seventh rank in ARC manufacturing companies. There is wide gap in the ranking of 'Price of the Product', which occupies the seventh rank in case of Tyre manufacturing companies and second rank in ARC manufacturing companies. 'Company Image of the Supplier' comes eighth in case of Tyre manufacturing companies whereas this factor occupies the ninth rank in ARC manufacturing companies. 'Incentives Offered to Customers' comes last in case of Tyre manufacturing companies whereas this factor comes third in ARC manufacturing companies. Thus, there is significant difference in the prioritization of factors influencing satisfaction of customers in Tyre manufacturing companies and ARC manufacturing companies as evident from the spearman correlation coefficient. However, there is no significant difference in the ranking of customer satisfaction factors for

carbon black as per opinion of respondents from different functions of Tyre manufacturing companies as well as ARC manufacturing companies.

On comparison of customer satisfaction factors for carbon black and selected non-carbon black industrial chemical products, it is found that there is resemblance in prioritization of satisfaction factors among customers for different industrial chemical products. From the results, it is also evident that factors which can influence the satisfaction of customers of industrial chemical products are same for all the chemical products, only the degree of significance of these factors is found to vary from one customer to another customer to some extent.

The factor which was found to play the most significant role in shaping customer satisfaction is the 'Quality Management System (QMS) ensuring Quality of Product'. Whereas the factor which is least significant as per opinion of majority of the respondents is 'Incentives offered to customers'. No other factor apart from the aforesaid ones, which can influence their satisfaction, was suggested by the respondents.

Top ranking of the factor 'QMS ensuring Quality of the Product' indicates that customers are also of the opinion that Quality cannot be compromised for any other factor and consistent quality can be ensured through the development of system. Quality requirement for a chemical product may vary from one customer to another customer. So, companies need to work meticulously to develop and implement QMS in fulfilling the specific requirement of their customers on the quality of product consistently.

'Order Execution and Delivery of the Product' is considered as the second or third priority for the customers as any deviation from the agreed delivery schedule (quantity and time) may impact production at customer end which may result in failure in delivery schedule for their customers; thus, suppliers need to ensure On Time in Full (OTIF) quantity of delivery.

'Customer Service of the Supplier' which includes resolution of complaints, response time, technical support in improvement of product performance at customer end etc. is also considered with the higher ranking (3rd or 4th) as usual to shape customer satisfaction; so, the

suppliers should ensure salespeople are knowledgeable enough to capture the specific requirements of customers by interacting with the customers and respond on time.

Higher ranking (5th rank) of 'Product Stewardship of the Supplier in the Chemical Product' as per opinion of most of the customers reflects rising concern about the safety aspects of the product; Substances of Very High Concern (SVHC), PAH etc. in the industrial chemical product is a matter of global concern from Environment (one of the pillar of ESG) point of view and so, the restriction of these hazardous substances in the chemical product by working on the use of environment friendly raw material and improvement in manufacturing technology must be in the priority list of suppliers.

'Packaging of the Product' is also considered in the list of important factors (6th for carbon black and 4th for other chemicals) influencing satisfaction of customers which necessitates suppliers to ensure the basic requirements of cleanliness and zero leakage at the time of receipt of product at customer end, weight of each bag within the acceptable limit and identification visibility.

'Price of the Product' occupy comparatively lower ranks than 'QMS Ensuring Quality of the Product' as per opinion of most of the customers indicating that customers are not interested in compromising Quality for Price; however, there are some customers who opined for higher ranking (2nd for carbon black and 6th for other chemicals) of 'Price of the Product' as they look for lower price of raw material to reduce the cost of production which ultimately impact the bottom line of their business.

'Suppliers' Sustainability Performance' which fulfils the criteria of 'Sustainable Procurement' for the customers, occupies 7th rank as per opinion of the customers. Sustainability performance is gaining momentum with the disruption in the usual balance of nature and the worsening effect of our activities on the climate change. All the manufacturing industries are being encouraged to adopt the practice of reduce, reuse and recycle non-biodegradable materials and natural resources, implement Water, Energy, Solid Waste and Green House Gas management systems and disclose the status in their sustainability report (e.g. GRI based reporting), implement robust Environment Management Systems and Occupational Health and Safety Management Systems, and to take actions for mitigating Environmental, Social and

Governance (ESG) related risks.

'Company Image of the Supplier' which describes industry leadership of the supplier, competency in meeting specific requirements of customers consistently, having loyal customer base, having speed and agility in responding to market needs etc., occupy comparatively lower rank as per opinion of most of the customers indicating that these parameters may be attractive for the new customers, but the existing customers are more interested in fulfilling the requirements as described earlier. Most of the customers are least interested in favorable credit terms, discount, rewards etc. which is reflected by the lowest ranking of 'Incentives Offered to Customers' as per opinion of most of the customers.

The above findings of the research survey were validated through the expert interview.

By understanding the relative importance of different factors in influencing the customers' satisfaction and the preference in procurement of industrial chemical products, the supplier can frame their strategy to develop and implement a standardized customer satisfaction process across their class of markets and geography (countries) and thereby can achieve the status of 'preferred supplier'.

Keywords: Customer satisfaction; Industrial Chemical Products; Industrial Customers.

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CHAPTER -1

INTRODUCTION

Introduction

Success of any business depends on the understanding of what makes a customer satisfied enough to come back. Perception of customers about their supplier, if positive, can range from satisfaction to delight. This perception generally results from the degree to which customer's expectation of the product or service is met or exceeded. In this competitive business world, the need for customer-centeredness has accrued from the critical role that satisfaction plays in enhancing company image and customer loyalty. Satisfaction encourages customer towards loyalty. Loyal customers do not have any other choice than the particular supplier to whom they are loyal. Loyalty is demonstrated by their repeated purchases despite the effort of competitor to lure them away. This in turn increases customer lifetime values and decreases customer acquisition costs. These customers are more likely to resolve issues with the supplier directly instead of complaining publicly about any issue related to product or service. Loyal customers give their valuable feedback, if any, for improving the quality of products or services and more likely to spread message about their good experience. They can even engage themselves collaboratively in search of innovative solutions, new product launch and cost reduction. According to Rust et al. (1999), it is more expensive to win new customers than to retain current customers and longer-term customers are likely to purchase more. Customer satisfaction enables companies to stretch beyond retaining the existing customer bases and attract new customer groups from marketplaces or niches that might not have been exploited before.

Given the importance of customer satisfaction for a firm's long-term business survival and growth, monitoring customer satisfaction and diagnosing what factors drive customer'

satisfaction should be an essential activity of every firm (Chakraborty et al., 2007). Also, the imperativeness of focusing on the needs and preferences of customers has arisen from the need for competitive advantage, a trend coming in the wake of stiffening competition among product and service providers. Companies need to work meticulously and persistently with existing and potential customers in order to understand their needs and preferences as customer segment, market necessities and expectations change dynamically.

1.1 Research Overview

The central purpose of current study is to identify the factors which can influence satisfaction of customers in business-to-business context, particularly the satisfaction of carbon black customers in two major industries i.e. Tyre manufacturing and Automotive Rubber Component (Non-Tyre) manufacturing industries and to evaluate the relative importance of identified dimensions of customer satisfaction on overall satisfaction. This is also to study the applicability of these factors to influence satisfaction of customers for other industrial chemical products.

1.1.1 Business to Business Market

In business-to-business (B2B) market, as opposed to business-to-consumer (B2C) market, transaction happens between the businesses. It may be between a manufacturer and a wholesaler, or between a wholesaler and a retailer. In the supply chain, B2B transactions happen when one company purchases raw materials from another and use in the manufacturing process. B2B transactions are also common for automobile manufacturing companies, as well as Tyre manufacturing companies, Automotive Rubber Component manufacturing companies,

Lead Acid Battery manufacturing companies, Precipitated Silica manufacturing companies, Carbon Black manufacturing companies, housekeeping and industrial cleanup companies etc.

B2B transactions are the backbone of the automobile industry where many vehicle components are used to assemble automobiles. Components like tyres, tubes, hoses, seals, batteries, electronics, door locks etc. are manufactured by various companies and these components are sold to automobile manufacturers through B2B transactions.

Industrial Customers

Industrial customers purchase products for the use in the production of other products in their industry. Such industries include manufacturing, construction, communication, transportation, agriculture etc.

According to Grayson et al. (2020), industrial customers differ from consumers in several respects. Because the customers are organizations, the market tends to have fewer and larger buyers than consumer markets. This often results in closer buyer-seller relationships, because those who operate in a market must depend more significantly on one another for supply and revenue. Business customers also are more concentrated. Demand for business goods is derived demand, which means it is driven by a demand for consumer goods. Therefore, demand for business goods is more volatile because variations in consumer demand can have a significant impact on business-goods demand. Business markets are also distinctive in that buyers are professional purchasers who are highly skilled in negotiating contracts and maximizing efficiency. In addition, several individuals within the business usually have direct or indirect influence on the purchasing process.

Grayson et al. (2020) explained also that industrial customers are influenced by economic environment i.e. primary demand, economic forecast, political and regulatory developments and the type of competition in the market. There are organizational factors viz. objectives, policies, procedures, structures and systems which can influence industrial customers. Interpersonal factors are more salient among business customers, because the participants in the buying process, perhaps representing several departments within a company, often have different interests, authority, and persuasiveness. Furthermore, the factors that affect an individual in the business buying process are related to the participant's role in the organization. Business purchase decisions require accountability and are often closely analyzed according to cost and efficiency, the process is more systematic than consumer buying and often involves significant documentation. Typically, a purchasing agent for a business buyer will generate documentation regarding product specifications, preferred supplier lists, requests for bids from suppliers and performance reviews.

1.1.2 Industrial Chemical Products

Industrial chemical products are those chemicals which are produced for an industrial use. According to Jilcha et al. (2014) chemical manufacturing industries is defined as 'process industries that involve chemical and/or physical transformation of raw materials to produce chemical and chemical related useful products'. Some industrial chemicals are used only in industrial production processes while many other chemicals are used as ingredients in the commercial products that appear in consumer markets. The range of industrial chemicals is broad which includes fillers, reactants, lubricants, solvents, coatings, dyes, colorants, inks, mastics, stabilizers, plasticizers, fragrances, flame retardants, conductors and insulators.

With the advancement of human civilization and industry, the usage and variety of industrial chemicals have increased greatly over the past few decades. Needless to mention, these chemicals are indispensable to industrial production and greatly support our daily life.

Market size of industrial chemicals

Chemical industry of India is extremely diversified and can be broadly classified into bulk chemicals, specialty chemicals, agrochemicals, petrochemicals, polymers and fertilizers.

As reported by All India Association of Industries, Indian chemicals industry with more than 80,000 commercial products, stood at US$ 178 billion in 2019 and is expected to reach US$ 304 billion by 2025 registering a CAGR of 9.3% (https://aiaiindia.com/chemicals/#:~:text=The%20Indian%20chemicals%20industry%20stood,to%20India's%20GDP%20by%202025). The demand for chemicals is expected to increase by 9% per annum by 2025. The chemical industry in India is expected to contribute US$ 300 billion to its GDP by 2025. The production of key chemicals in October 2020 was 880,569 MT and the production of petrochemicals was 1,808,997 MT.

Description of few industrial chemical products, which are under the scope of this study, is given in subsequent sections.

Carbon black [CAS# 1333-86-4]

Carbon black refers to a group of industrial products which are powdery in nature and black in color. Carbon black essentially consists of elemental carbon in the form of near spherical particles of colloidal size coalesced into particle aggregates and agglomerates.

**Figure 1.01 Physical Appearance of Carbon Black and
Colour Difference of Various Grades**

Source: https://pentacarbon.de/en/wiki/

As per International Carbon Black Association (ICBA), Carbon black is in the top fifty industrial chemicals manufactured worldwide, based on quantity. The characteristics of carbon black vary depending on manufacturing process, and therefore carbon black is classified as Furnace Black, Channel Black, Thermal Black, Acetylene Black etc. Carbon black production by the furnace process is the most commonly used method now. In this process carbon black is produced by the partial combustion or thermal decomposition of gaseous or liquid hydrocarbons under controlled conditions.

Carbon black may form an explosible dust-air mixture if dispersed. Carbon black can burn or smolder at temperatures greater than 400ºC (>752ºF) releasing hazardous products such as carbon monoxide, carbon dioxide, and oxides of sulfur. Effective engineering practices, good housekeeping practices, and effective dust removal systems are necessary to minimize carbon black emissions and resultant build-up on horizontal and vertical surfaces. Fugitive carbon black emissions should be minimized, and housekeeping practices should be instituted. Appropriate local exhaust should be provided to minimize dust formation. Carbon Black is not

classified for any toxicological or eco-toxicological endpoint according to the criteria in OSHA HCS (2012) for classifying hazardous substances (https://cancarb.com/wp-content/uploads/Cancarb_SDS_English-EUROPE.pdf). Contact with eye may cause reversible mechanical irritation, contact with skin may cause mechanical irritation, soiling, and drying of skin. Inhalation of dust may be irritating to the respiratory tract. Carbon black poses no significant environmental hazards. As a matter of good practice, contamination of sewage water, soil, groundwater, drainage systems, or bodies of water should be minimized.

As per Fortune Business Insights, the global carbon black market size was USD12639.2 million in 2019 and is projected to reach USD17027.1 million by 2027, exhibiting a CAGR of 4.4% during the forecast period. According to a report by EMR titled, 'Global Carbon Black Market Report and Forecast 2021-2026', the global carbon black market reached a production volume of around 14 million metric tons in 2020. It is further projected to grow at a CAGR of 4.4% between 2021 and 2026 to reach a volume of 18 million metric tons by 2026.

Approximately 93% of CB demand linked with Tyre and Non-Tyre rubber industry. Application wise carbon black demand (approx.) is shown in the following figure.

Figure 1.02   Demand Split by Application of Carbon Black
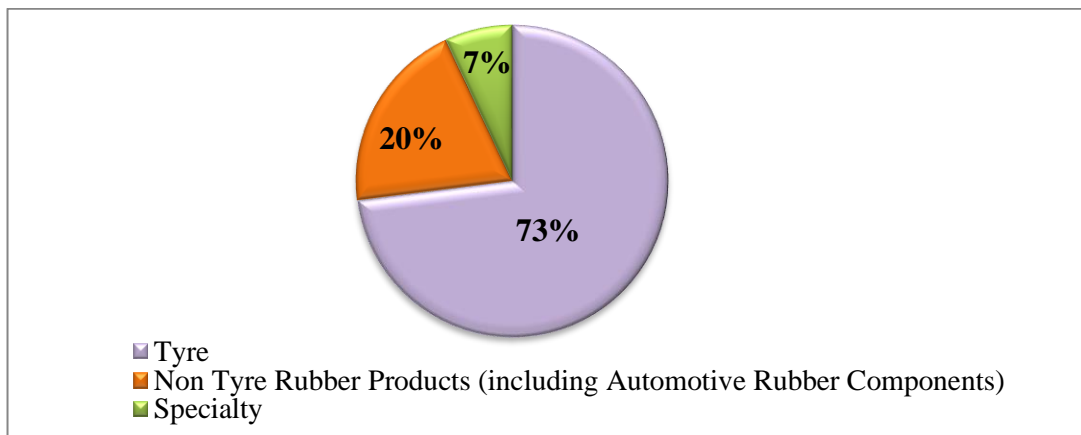
Source: Televisory's Research (2018 November 19)

Carbon Black is primarily composed of 95% to 99% elemental carbon. Primary non- carbon elements found on analyzing a Carbon Black include oxygen, hydrogen and sulfur. Depending upon the manufacturing process used and the raw materials sources, small quantity of material classified as ash is also found. Typically, these materials are water salts and catalyst fines from hydrocarbon processing. Trace quantities of metal, usually the result of process equipment corrosion or wear, may also be found in certain Carbon Blacks.

Usage of Carbon Black:

Carbon black, because of its unique properties, is used today in a variety of applications. Tyre industry is the largest consumer of carbon black, followed by Industrial Rubber Products and Specialty. The use of carbon black in Tyres, other rubber products, plastic products, printing inks and coatings depends on its' various properties such as surface area, particle size, structure, conductivity, colour etc.

- **Tyres:**

Carbon black is added to rubber both as a filler and as a strengthening or reinforcing agent. The early automobile Tyres, which did not contain Carbon Black, were not at all reliable. The addition of Carbon Black has significantly improved rubber properties (like abrasion resistance, tensile properties) and helped modern Tyre makers to guarantee their products for 80,000 kilometers or more. In different parts of Tyre viz. Tread, Inner liner, Carcass, Sidewall etc. different grades of carbon black is used based on specific performance requirements. Carbon black used in a Tyre is approximately 25% by weight.

Figure 1.03   Typical Tyre Parts in which different grades of carbon black are used

Source: https://tireworks.net/resources/tire-terminology/
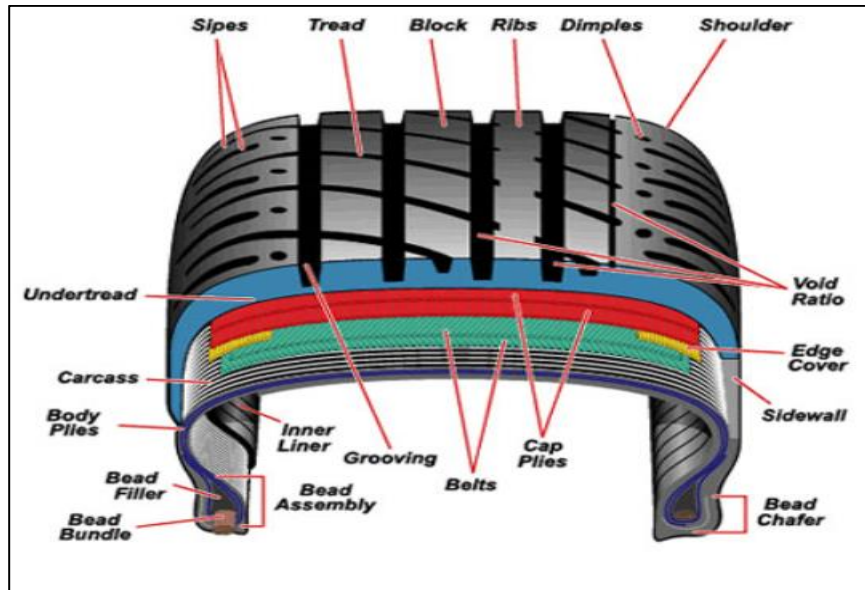
The major Tyre segments are OE (Original Equipment) Tyres and replacement Tyres primarily for Passenger Car, Light Commercial Vehicles (LCV), Trucks / Buses, Two / Three-wheelers, Aircrafts, Off-the-Road (OTR) vehicles, Bicycles. Three out of 4 Tyres used is a replacement Tyre. Based on construction, Tyres may be classified as Radial Tyre and Bias Tyre or Tubeless and with Tube type. Similarly, carcass material may be nylon, steel etc. Tread pattern may be lug, semi-lug, rib etc.

- **Non-Tyre Industrial Rubber Products (Including Automotive Rubber Components) :**

The product segment of industrial rubber include mechanical rubber goods (body seals, vibration control devices, wiper blades etc.) , molded and extruded rubber goods such as weather stripping products, wiper blades, vibration control products, rubber hoses, large bore dredging hose, high pressure hoses, rubber belting, elevator and conveyor belting, transmission

belts, gaskets, diaphragms, belt drive system, floor and wall coverings, roll coverings, sheet & film, geo-membranes (rubber products used in construction industry for waterproofing applications), fabricated rubber products etc.

Industrial rubber products used in automobiles are generally called as Automotive Rubber Components (ARC). The manufacture of automotive rubber components is a major sector in the rubber industry. The modern automobile contains about two hundred different parts made wholly or in considerable part of rubber. Automotive Rubber Components include Rubber Air Bags, Rubber Bumper, Dust Cover, Mud Flaps, Rubber Pads on Pedals, O-Rings, Grommets (reinforcement materials that protect a hole from damage while safeguarding hoses and other cables that pass through), Seals (rubber component that is used to prevent leaks, vibrations and noise, they usually come in two types: crankshaft seals and radiator seals), Gaskets, Bushings, Rubber Mats, Engine Mounts, Wiper blade, Weather Strip, Rubber Hoses (like radiator hoses which carry coolant to keep your engine at the proper operating temperature), Belts, Bushings (Serving as anti-vibration mountings, car bushings provide cushioning that reduces the friction between the metal components of a vehicle) etc.

Few automotive rubber components are shown in the following figure.

Figure 1.04 Automotive Rubber Components
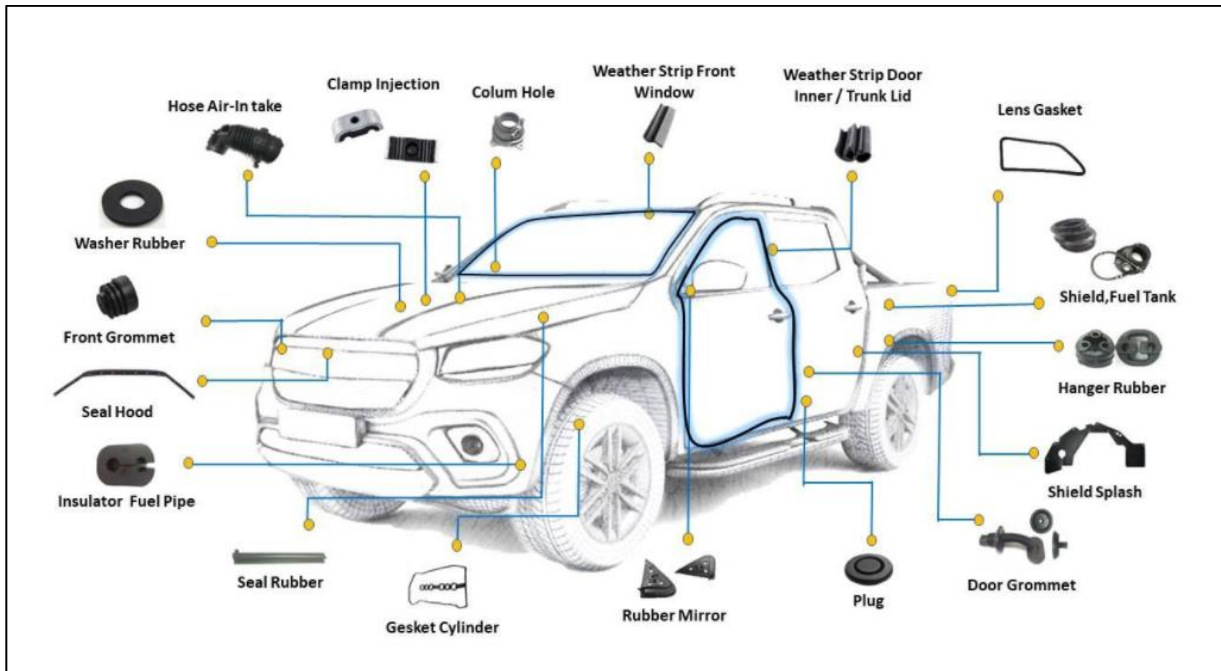
Source: Bangkok Post, 26 May, 2021

Carbon black used in a typical EPDM rubber-based compound of automotive rubber component is around 30% by weight.

The Rubber Industry as a whole is facing major challenges to meet the changing demands of auto industry in meeting material specifications, performance, durability and reliability requirements.

● **Specialty:** Carbon Back which is used for non-rubber application or special purpose of the product primarily called Special Black. Specialty blacks are produced with special types of raw material, reactor, operating condition, and technology.

 The usage of specialty blacks is as follows:

i) **Plastics:** The modern plastics industry is a significant industrial user of Carbon Black. Carbon Black is used in plastics for coloring, ultraviolet resistance or electrical conductivity as per product requirements.

ii) **E****lectrostatic Discharge (ESD) Compounds:** Carbon blacks are designed in such a way it can transform electrical characteristics from insulating to conductive in products such as electronics' packaging, safety applications, and automotive parts. Static charges can build up on the surface of petrol pump hoses, on polypropylene bags or boxes containing explosive materials where one spark could be devastating. Role of conductive carbon black comes into play in these cases.

iii) **High Performance Coatings:** Because of its' unique property of pigmentation, conductivity and UV protection, carbon black is used for a number of coating applications including automotive, marine, aerospace, decorative, wood, and industrial coatings.

iv) **Toners and Printing Inks:** Toner is a powder used in with a toner cartridge of laser printers and photocopiers to form the printed text and images on the paper. Pigmentation characteristics of carbon black is used in manufacturing of inks for printing on newspapers, books, directories, magazines, packaging (labels) etc.

The selection of the grade of carbon black for different applications is primarily based on the surface area and structure, and in some special applications on the surface activity or surface modifications of chemical groups on the surface of carbon black. Selection of carbon black grade for use in different Tyre components is based on requirement in field conditions.

Names of major carbon black manufacturers across the globe are Cabot Corporation, Birla Carbon (SKI), Orion Engineered Carbons, Jiangxi Black Cat Carbon Black Company Limited, China Synthetic Rubber Corp. (CSRC), Omsk Carbon Group Ltd., Longxing chemical stock Co. Ltd., PCBL Limited, Tokai Carbon Co., Ltd.

According to Research and Markets (March 2019), the demand for carbon black in India was 984.63 KTPY in 2018 and is projected to grow at a CAGR of 5.82% during 2019-2030 to reach 1853.84 KTPY by 2030 (https://www.researchandmarkets.com/reports/4759304/india-carbon-black-comprehensive-techno).

Names of the leading carbon black manufacturers in India and their operating revenues in Financial Year 2021-22 (April-March) are given below.

Table 1.01 Leading Carbon Black manufacturing companies in India

Names of Carbon Black manufacturing companies	Operating Revenue (INR) <u>FY 2021-22 (April-March)</u>	Link
PCBL Limited	4446.42 Crore	PCBL_Annual_Report_FY_2021_22_d63807b1e7.pdf (pcblltd.com)
Birla Carbon India Pvt. Ltd.	3695.00 Crore	Rating Rationale (crisil.com)
Himadri Speciality Chemical Limited	2791.31 Crore	financial-results-for-the-quarter-ended-31-03-2022.pdf (himadri.com)
Epsilon Carbon Private Limited	1786.00 Crore	Rating Rationale (crisilratings.com)
Continental Carbon India Private Limited	100–500 Crore	CONTINENTAL CARBON INDIA PRIVATE LIMITED (TFR.CO. FROM W.B. TO DELHI) - Company Profile, Directors, Revenue & More - Tofler
BKT Carbon	8295 Crore (For Balkrishna Industries)	combined.pdf (bkt-tires.com)
Ralson Carbon Black Limited	Under 1 Crore	RALSON CARBON BLACK LIMITED - Company Profile, Directors, Revenue & More - Tofler

Customers of Carbon Black for Rubber Products used in Automobiles:

As per Automotive Tyre Manufacturers' Association (ATMA), there are 41 (forty one) Tyre manufacturing companies in India having 66 (sixty six) Tyre manufacturing plants in 2020. Industry turnover FY 2019-20(est.) is INR 60000 crore (US$ 8.5 Bn).

The Indian tyre industry is going to more than double its revenue to $22 billion by the year 2032 from $9 billion in the year 2022 according to a report of Automotive Tyre Manufacturers' Association (ATMA), based on the study done by CRISIL Market Intelligence & Analytics (MI&A) Consulting (https://www.crisil.com/en/home/newsroom/press-releases/2023/07/tyre-industry-on-a-roll-driving-towards-doubling-in-size.html).

Names of some leading Tyre manufacturing companies in India are given below:

Table 1.02 Leading Tyre manufacturing companies in India

Names of Tyre manufacturing companies	Operating Revenue (INR) FY 2021-22 (April-March)	Link
MRF Ltd.	18989 Crore	Annual-Report-2021-22.pdf (mrftyres.com)
Apollo Tyres	20,948 Crore	corporate.apollotyres.com/press-and-media/news/financial/FY23-revenue-up-17-percent/
J.K.Tyres and Industries	11982.96 Crore	JK Tyre IR 2022-23.pdf
Ceat Ltd.	9312.63 Crore	CEAT-Limited-Integrated-Annual-Report-FY23.pdf
Bridgestone India Pvt. Ltd.	Over 500 Crore	https://www.tofler.in/bridgestone-india-private-limited/company/U25111PN1996PTC147267/financials
Goodyear India Limited	Over 500 Crore	https://www.tofler.in/goodyear-india-limited/company/L25111HR1961PLC008578
Continental Tyres	Over 500 Crore	https://www.tofler.in/continental-india-private-limited/company/U25203HR2006PTC069888
Michelin	Over 500 Crore	https://www.tofler.in/michelin-india-private-limited/company/U25119TN2009PTC071454/financials

Names of Tyre manufacturing companies	Operating Revenue (INR) __FY 2021-22__ __(April-March)__	Link
Yokohama India Pvt. Ltd.	Over 500 Crore	https://www.tofler.in/yokohama-india-private-limited/company/U25190HR2007FTC081296/financials
Birla Tyres (1 plant) (Closed in 2021)	34.7 Crore	https://www.equitymaster.com/research-it/annual-results-analysis/BITY/BIRLA-TYRES-2021-22-Annual-Report-Analysis/3033
TVS Tyres	2528.20 Crore	https://tvseurogrip.com/wp-content/uploads/investor-relations/ANNUAL%20REPORT/2021-22/TVS%20Srichakra%20Limited-Annual%20Report%202021-22.pdf
Balkrishna Tyres	8,180.56 Crore	https://www.moneycontrol.com/financials/balkrishnaindustries/profit-lossVI/BI03
ARL Tyres	100–500 Crore	https://www.tofler.in/arl-tyres-limited/company/U25199TG1983PLC003868/financials
Metro Tyres	Over 500 Crore	https://www.tofler.in/metro-tyres-limited/company/U25112DL1974PLC246378/financials
MRL Tyres	100–500 Crore	https://www.tofler.in/mrl-tyres-limited/company/U74899DL1978PLC009127
Ralson (Ralco) Tyre	Over 500 Crore	https://www.tofler.in/ralson-india-limited/company/U51909PB1974PLC058656
Poddar Tyres Ltd.	100–500 Crore	https://www.tofler.in/poddar-tyres-limited/company/U25100MH1981PLC023895

As per information collected from marketing and sales people, there are approximately 40 (Forty) leading Automotive Rubber Component (Non-Tyre) manufacturers in India.

Names of some leading Automotive Rubber Component (ARC) manufacturers in India are given below:

Table 1.03 Leading Automotive Rubber Component (ARC) manufacturing companies in India

Names of ARC manufacturing companies	Operating Revenue (INR) FY 2021-22 (April-March)	Link
Toyoda Gosei Minda India (P) Ltd.	Over 500 Crore	TOYODA GOSEI MINDA INDIA PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Hwaseung Materials (India) Pvt. Ltd.	100–500 Crore	HWASEUNG MATERIALS (INDIA) PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Cooper Standard Automotive Pvt. Ltd.	20839 Crore	Cooper Standard (CPS) - Revenue (companiesmarketcap.com)
Alps Nishikawa Co. Pvt. Ltd.	100–500 Crore	ALP NISHIKAWA COMPANY PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Jayashree Polymers Pvt. Ltd.	100–500 Crore	JAYASHREE POLYMERS PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Roop Polymers Ltd.	4436 Crore	Roop Polymers - Overview, News & Competitors	ZoomInfo.com
National Engineering Industries Ltd.	Over 500 Crore	NATIONAL ENGINEERING INDUSTRIES LIMITED - Revenue, Net Worth, Profits & More - Tofler
Pulsar Rubber	1–100 Crore	PULSAR RUBBER MANUFACTURING COMPANY PVT LTD - Company Profile, Directors, Revenue & More - Tofler
Sundaram Industries Pvt. Ltd. (TVS Rubber)	100–500 Crore	SUNDARAM INDUSTRIES PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Alp Overseas Pvt. Ltd.	100–500 Crore	ALP OVERSEAS PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Innova Rubbers Pvt. Ltd.	100–500 Crore	INNOVA RUBBERS PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Mysore Polymers and Rubber Products Pvt. Ltd.	100–500 Crore	MYSORE POLYMERS AND RUBBER PRODUCTS PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Osaka Rubber Pvt. Ltd.	1–100 Crore	OSAKA RUBBER PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Vibracoustic India Pvt Ltd.	Over 500 Crore	VIBRACOUSTIC INDIA PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Imperial Auto Industries Limited	Over 500 Crore	IMPERIAL AUTO INDUSTRIES LIMITED - Company Profile, Directors, Revenue & More - Tofler
JK Fenner India Ltd.	Over 500 Crore	J.K. FENNER (INDIA) LIMITED - Revenue, Net Worth, Profits & More - Tofler

Names of ARC manufacturing companies	Operating Revenue (INR) FY 2021-22 (April-March)	Link
Polyhose India (Rubber) Pvt. Ltd.	100–500 Crore	POLYHOSE INDIA RUBBER PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Sigma Freudenberg NOK Pvt. Ltd.	100–500 Crore	FREUDENBERG-NOK PRIVATE LIMITED - Revenue, Net Worth, Profits & More - Tofler
Filtrum Polymers Pvt. Ltd.	1–100 Crore	FILTRUM POLYMERS PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Motherson Automotive Elastomers	1–100 Crore	MOTHERSON AUTO LIMITED - Company Profile, Directors, Revenue & More - Tofler
ASP Sealing Products Ltd.	1–100 Crore	ASP SEALING PRODUCTS LIMITED - Company Profile, Directors, Revenue & More - Tofler
Y-TEC India Private Ltd.	100–500 Crore	SKH Y-TEC INDIA PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Cikautxo India Pvt. Ltd.	1–100 Crore	CIKAUTXO INDIA PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Goldseal Engg. Products Pvt. Ltd.	1–100 Crore	GOLD SEAL ENGINEERING PRODUCTS PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Polybond India Private Limited.	100–500 Crore	POLYBOND (INDIA) PVT LTD - Revenue, Net Worth, Profits & More - Tofler
Premier Seals (India) Pvt. Ltd.	100–500 Crore	PREMIER SEALS (INDIA) PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Parker Hanniffin India Private Limited.	Over 500 Crore	PARKER HANNIFIN INDIA PRIVATE LIMITED - Revenue, Net Worth, Profits & More - Tofler
Mega Rubber Technologies Pvt. Ltd.	100–500 Crore	MEGA RUBBER TECHNOLOGIES PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Exel Rubber Ltd.	Over 500 Crore	EXEL RUBBER PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Classic Auto Tubes Ltd.	Over 500 Crore	CLASSIC INDUSTRIES AND EXPORTS LIMITED - Company Profile, Directors, Revenue & More - Tofler
Trambak Rubber Industries Ltd.	1–100 Crore	TRAMBAK RUBBER INDUSTRIES LTD - Company Profile, Directors, Revenue & More - Tofler
Art Rubber Industries Ltd.	1–100 Crore	ART RUBBER INDUSTRIES LTD - Company Profile, Directors, Revenue & More - Tofler
Triton Valves Ltd.	100–500 Crore	TRITON VALVES LIMITED - Company Profile, Directors, Revenue & More - Tofler

Names of ARC manufacturing companies	Operating Revenue (INR) **FY 2021-22 (April-March)**	Link
R K Profiles Pvt. Ltd.	1–100 Crore	R K PROFILES PRIVATE LIMITED - Revenue, Net Worth, Profits & More - Tofler
Gibraltar Airsprings	1–100 Crore	GIBRALTAR AIRSPRINGS PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
G B Gummi LLP	1–100 Crore	https://www.zoominfo.com/c/gb-gummi-llp/481650395
Triveni Rubber	1–100 Crore	https://www.zoominfo.com/c/triveni-rubber/363440166
Tokai Imperial Rubber India Private Ltd.	100–500 Crore	TOKAI IMPERIAL RUBBER INDIA PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler
Rubber craft industries	1–100 Crore	As per feedback from marketing team. Operating revenue not available in public domain
Anand NVH Products Private Ltd	100–500 Crore	ANAND NVH PRODUCTS PRIVATE LIMITED - Company Profile, Directors, Revenue & More - Tofler

In the recent past, Indian carbon black industry faced stiff competition with cheaper imports coming from China, which adversely affected the sales and profit margins of domestic players. However, various duties and taxes imposed by the Indian government on these imports have provided a respite to domestic industry players in the country.

With the rising demand from tyre industry, in addition to construction and manufacturing sectors which use carbon black to provide strength to industrial rubber products and other equipment, global carbon black market has become highly competitive. All major players are now investing heavily in R&D to improve the quality of their product.

Packaging: Carbon black is packed either in multiwall kraft paper bags of capacity 25 kg (typical) or in bulk bag (capacity may vary from 450 kg to 1300 kg typically) of laminated

polypropylene woven fabric. Poor packaging bag quality and non-standard packing procedure may result in leakage / damage of bags or poor appearance of packaging bags.

Sulphuric Acid (CAS#7664-93-9)

Sulphuric acid (H2SO4) is a mineral acid made of oxygen, hydrogen, and sulfur. According to https://www.pciplindia.com/product-detail/Sulphuric-Acid, Sulphuric is the third most largely manufactured industrial chemical. It is a salient commodity chemical, and the production of Sulfuric acid is a positive sign of its industrial influence for any nation.

It is an odorless, viscous and colorless liquid which is soluble in water. A pungent odor may exist in presence of certain impurities in the acid. It is a corrosive chemical for metals and tissue and it has an oily, glassy appearance. It causes severe burns and / or eye damage. Mist causes respiratory irritation and it is harmful if inhaled, fatal if swallowed. Concentrated Sulfuric Acid reacts with many organic materials and may cause fire due to the heat of the reaction. It is not flammable, but reacts with most metals to form explosive/flammable hydrogen gas. According to Martin's MSDS of Sulphuric Acid, this product contains ingredients that are considered to be hazardous as defined by the OSHA Hazard Communication Standard 29 CFR 1910.1200, and is listed in the Toxic Substances Control Act (TSCA).

Sulfuric acid has many uses in different industries, such as fertilizer production, metal (steel, iron etc.) production, mineral processing, petroleum refining, wastewater processing, etc. It is also used in the production of cleaning agents, dyes, pigments, drugs, detergents, and explosives.

It is commonly used as the electrolyte in Lead-Acid Batteries. Lead acid batteries are manufactured with a number of individual cells containing layers of lead alloy plates immersed in a solution of approx. 35% sulphuric acid and 65% water. The average car battery contains approx. 3 kg of sulphuric acid.

The production of precipitated silica starts with the reaction of a neutral silicate solution with Sulfuric acid.

In Steam Power Plants (CPP) Cationic exchangers are regenerated by HCl, H2SO4: all cationic species trapped in the resin are removed and replaced by H+. After the completion of the regeneration, the resin is full of H+ sites to be exchanged with cations again. In wastewater treatment also, an acid or a base is added, depending on the pH level of the water being treated. Usually, either sulfuric acid or a base chemical such as sodium hydroxide is added to the water to achieve optimal pH balance.

In India Sulphuric acid is manufactured by around 150 companies. Some of the leading manufacturers of sulphuric acid in India are given below.

- Hindalco Industries Limited,
- The Fertilizers and Chemicals Travancore Limited (FACT),
- Hindustan Zinc Limited,
- Birla Copper Limited,
- Sterlite Copper Limited,
- Paradeep Phosphates Limited,
- Gujarat State Fertilizer & Chemicals Limited,
- Aarti Industries Limited,

- Khaitan Chemicals and Fertlizers Limited,

- Trident Limited,

- Bodal Chemicals Ltd.,

- Prakash Chemicals International etc.

In India, market size of Sulfuric Acid is 14.15 million tonnes in 2020 and is expected to reach 21.56 million tonnes by 2027, at a CAGR of 6.2% during the forecast period (https://www.maximizemarketresearch.com/market-report/india-sulfuric-acid-market/26006/).

Sulphuric Acid is packed in Jerry cans of different sizes, HDPE Drums, or Intermediate Bulk Container (IBC) as per requirement.

Hydrochloric Acid(CAS#7647-01-0)

Hydrochloric acid (HCl) is an aqueous solution of hydrogen chloride. It is a colorless solution with a distinctive pungent smell. It is classified as a strong, corrosive mineral acid. Hydrochloric acid is one of the most widely used chemicals in the world today. It is a component of the gastric acid in the digestive systems of most animal species, including humans. It is an important laboratory reagent and industrial chemical.

Hydrochloric acid is produced in solutions with concentration up to 38% HCl (concentrated grade). Higher concentrations up to just over 40% are chemically possible, but the evaporation rate in that case will be so high that storage and handling require extra precautions, such as pressurization and cooling. Bulk industrial-grade of HCl is therefore,

optimized (30% to 35%) to balance transport efficiency and product loss through evaporation.

Hydrochloric Acid is corrosive, Causes severe skin, eye, and digestive tract burns. It is harmful if swallowed. Mist or vapor is extremely irritating to eyes and respiratory tract. This product is considered a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquids). All warnings and precautions listed for the product to be observed. Always acid to be added to water while stirring to prevent release of heat, steam and fumes.

Amid the COVID-19 crisis, the global market for Hydrochloric Acid estimated at US$1.5 Billion in the year 2020, is projected to reach a revised size of US$2 Billion by 2027, growing at a CAGR of 4 (ReportLinker, 2021, February 23). According to ChemAnalyst (2020, April), Hydrochloric Acid demand in India will grow at a CAGR of around 4.5% during the forecast period (2022 – 2030).

Hydrochloric acid is used in Pickling of metals to remove rust or iron oxide scale from iron or steel before subsequent processing, pH control and neutralization in food, pharmaceutical, drinking water, processing of textiles, food processing, manufacture of chlorine and chlorides (Zinc Chloride, Calcium Chloride etc.), manufacture of chloro-organic compounds and polymers such as PVC, chlorinated rubber etc., laboratory use.

In Steam Power Plants (CPP), cationic exchangers are regenerated by HCl, all cationic species trapped in the resin are removed and replaced by H+. After the completion of the regeneration, the resin is full of H+ sites to be exchanged with cations again. Hydrochloric acid or Sulphuric acid are selected as per input water quality, productivity and resin quality of cation exchanger.

HCl reacts with most metals and so, it cannot be stored in metal containers, According to Lords Chloro Alkali Limited, Hydrochloric acid should not be stored with or near oxidizing agents, particularly nitric acid and chlorates, it should be stored in a cool, well ventilated place, all electrical wiring and fixtures in and around the storage area should be protected with acid vapor proof casings. Storage tanks should be provided with adequate vents. Hydrochloric acid is generally supplied in rubber lined lorry tanker, barrels, drum, carboys, glass bottle.

Leading Manufacturers / suppliers of Hydrochloric Acid in India are as given below.

- Lords Chloro Alkali Limited
- Heetu Chemicals & Alkalies Ltd.
- ChemieOrganic Chemicals
- Aditya Birla Chemicals (India) Limited
- Dow Chemical
- Shreenathji Chemicals
- Nutan Chemicals
- Navin Chemicals
- Surya Fine Chem
- Alpha Chemika
- Suvidhi Industries
- Choice Organochem Llp
- Triveni Chemicals
- Maa Bhagwati Chemicals
- Meru Chem Private Limited
- Shivam Industries
- Suvidhi Industries

Sodium Hydroxide (CAS#1310-73-2)

Sodium hydroxide (NaOH), also known as caustic soda, is a white solid inorganic compound. It is highly soluble in water. It readily absorbs moisture and carbon dioxide from the atmosphere. It forms a series of hydrates. The monohydrate $NaOH \cdot H_2O$ crystallizes from water solutions between 12.3 and 61.8 °C (Wikipedia). The commercially available Sodium Hydroxide is often this monohydrate. In bulk, it is most often handled as an aqueous solution, since solutions are cheaper and easier to handle. Dissolution of solid sodium hydroxide in water is a highly exothermic reaction in which a large amount of heat is liberated. It poses a threat to safety through the possibility of splashing. The resulting solution is usually odorless and colorless. It feels slippery with skin contact due to the process of saponification that occurs between NaOH and natural skin oils.

Due to its strong corrosive qualities, exposure to sodium hydroxide in its solid or solution form can cause eye irritation, blisters, Caustic burns/corrosion of the skin, Slow-healing wounds. Inhaling Sodium Hydroxide can irritate the lungs. Higher exposure may cause a build-up of fluid in the lungs, a medical emergency. Sodium Hydroxide is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

According to Alkali Manufacturers Association of India the installed capacity of sodium hydroxide production as on 31 March 2020 was 45.44 Lakh MTPA and the actual production during the year 2019-20 was 36.05 Lakh MT. India's Caustic Soda plant capacity is forecasted to grow at a compound annual growth rate (CAGR) of 6.1% from 2017 to 2022, according to GlobalData, a leading data and analytics company. According to Maximize Market Research Pvt. Ltd. India Sodium Hydroxide Market was valued at US$ 11.2 Bn in 2019 and is expected to reach US$ 18.9 Bn by 2027, at a CAGR of 6.8% during the forecast period.

Sodium hydroxide is a strong base widely used in industry. It is used in the manufacture of sodium salts and detergents, pH regulation, organic synthesis and as drain cleaners. The main sectors that consume most of the Caustic Soda in India are Textile, Organic Chemicals, Alumina, Paper and Pulp, Soaps and Detergents, Inorganic Chemicals, and Water Treatment. Poor quality crude oil can be treated with sodium hydroxide to remove sulfurous impurities in a process known as caustic washing.

In Steam Power Plants (CPP), Anionic exchangers are regenerated by Sodium Hydroxide (NaOH), removing all anions trapped by OH. When generation is completed, the resin is full of OH^- sites.

In wastewater treatment also, an acid or a base is added, depending on the pH level of the water being treated. Usually, either sulfuric acid or a base chemical such as sodium hydroxide is added to the water to achieve optimal pH balance.

The names of some leading Caustic Soda manufacturers in India are given below.

- Shriram Alkali & Chemicals
- Bharuch Caustic Soda Plant
- Grasim Industries Nagda Caustic Soda Plant
- Gujarat Alkalies and Chemicals
- Dahej Caustic Soda Plant
- Grasim Industries Bharuch Caustic Soda Plant
- Nirma Kalatalav Caustic Soda Plant
- Aditya Birla Chemicals (India) Limited
- Nirma Ltd and Reliance Industries Ltd.

Caustic soda needs to be stored in containers that are resistant to the chemical's corrosive nature. Solution temperature should be maintained above 21deg.C for both indoor and outdoor containers to ensure fluid viscosity and prevent precipitation (crystallization) of the solution. Certain metals viz. aluminum, lead, tin, zinc, and the alloys of zinc such as brass and bronze should be avoided when storing or transporting NaOH. Sodium hydroxide chemically attacks these metals which may lead to the generation of flammable and explosive hydrogen gas. Sodium hydroxide is successfully stored in 1.9 specific gravity storage tanks of HDPE, XLPE, Fiberglass Reinforced Plastic (FRP), Carbon Steel, Titanium etc. Popular tank component materials include PVC or CPVC or 316SS for piping/fittings, EPDM for gaskets, and 316SS bolts. HDPE bags are used for transporting solid Sodium Hydroxide.

Potassium Nitrate (CAS#7757-79-1)

Potassium nitrate (KNO_3) is an inorganic nitrate salt of potassium. Potassium nitrate appears as a white to dirty gray crystalline solid. It is slightly soluble in water; however, its solubility increases with temperature. It is a strong oxidizing agent which can explode on reaction with other organic compounds. It is noncombustible but accelerates the burning of combustible materials. If large quantities are involved in fire or the combustible material is finely divided an explosion may result. It may explode under prolonged exposure to heat or fire and toxic oxides of nitrogen are produced in fires.

Contact with Potassium Nitrate can cause eye and skin burns. Breathing the dust or mist can irritate the nose, throat and lungs and may cause coughing with phlegm. Ingestion may result in diuresis, headache, nausea or methemoglobinemia. Higher exposures can cause pulmonary edema, a medical emergency that can be delayed for several hours. This can cause death.

Owing to its beneficial properties, potassium nitrate is used as a constituent of fertilizers, fireworks, rocket propellants, as gunpowder in explosives (bombs, grenades, etc.), in medicinal applications such as a diuretic in medicine, in the manufacturing and production of cigarettes, in the food industry to preserve meat against microbial agents. It is also used in toothpaste to make the teeth less sensitive to pain.

In Carbon Black manufacturing process, water solution of potassium nitrate is used widely to control the structure of carbon black aggregate.

According to Expert market research (https://www.expertmarketresearch.com/reports/ potassium-nitrate-market), the global potassium nitrate market attained a value of USD 1.56 billion in 2020 and is projected to reach USD 1.9 billion by 2026. The market is estimated to grow at a progressive CAGR of 3.4% during the forecast period of 2021-2026. According to knoema (https://knoema.com/atlas/topics/Agriculture/Fertilizers-Production-Quantity-in-Nutrients/ Potassium-nitrate-production), Poland is the top country by potassium nitrate production in the world. As of 2018, potassium nitrate production in Poland was 9,161 tonnes that accounts for 100.00% of the world's potassium nitrate production in that year. The top 5 countries (others are Luxembourg, Slovenia, Cyprus, and Kyrgyzstan) account for 100.00% of the production.

Potassium Nitrate is packed in HDPE laminated bags, LDPP Bag or as required by the buyer.

Leading Manufacturer / Supplier of Potassium Nitrate in India are as follows:

- Arkon Industries
- Anmol Chemicals

- M/S Seth Nandram Daulatram Biyani

- Positive Chemicals Pvt. Ltd.

- Triveni Chemicals

- DS Fine Chem

- Chirag Mineral & Chemicals

- Sanskar Chemicals & Drugs Private Limited

- Destiny Chemicals

- Endeavour Industries

- Atharv Chemicals & Fertilizers Private Limited

Potassium Carbonate (CAS # 584-08-7)

Potassium carbonate (K_2CO_3) is a white inorganic compound . It is readily soluble in water (insoluble in alcohol), which forms a strongly alkaline solution. It is hygroscopic, deliquescent, often appearing as a damp or wet solid. It has a pH of 11.6. It is non-combustible. When heated to decomposition it emits toxic fumes of K2O. It is odorless and available in granule or powder form. Impurities like small amounts of sodium and chloride plus trace amounts of heavy metals such as lead may be present in it.

When Potassium Carbonate comes in contact with skin, eyes, and respiratory tract it can cause irritation. Inhalation may cause sore throat, cough. AS per MSDS of Potassium Carbonate, discharge into the environment must be avoided because harmful ecological effect may be observed due to pH shift.

Potassium carbonate is mainly used in the production of soap and glass. It is also used as a mild drying agent, as a fire suppressant in extinguishing deep-fat fryers and various other B class-related fires, in TV Picture tubes, GLS lamps and ophthalmic glass, Fertilizer Industry, Rubber Chemicals, Pesticide Industry, Drugs and Pharmaceutical Industry, Dyes industries, in the manufacture of inorganic salts and other Potassium based chemicals.

In Carbon Black manufacturing process, water solution of potassium nitrate is used widely to control the structure of carbon black aggregate.

According to Chemanalyst (2020, February), Potassium Carbonate demand in India grew at a CAGR of around 5.35% during 2013-2019 and is anticipated to achieve a healthy growth rate during the forecast years 2021 – 2030. Increasing consumption of Potassium Carbonate in pharmaceutical and fertilizer applications along with its usage as a raw material in electronic industry is anticipated to spur the demand for Potassium Carbonate in India. The total installed capacity of Potassium Carbonate in India is around 23 KT per annum in 2019 whereas its demand exceeds 25 KT. The demand gap is fulfilled by imports. With ever-increasing demand from pharmaceuticals industry, electronics and agriculture sector, this demand and supply gap is expected to widen in the coming years. Coming to Global market, the total production is around 350,000 tonnes per year.

Potassium Carbonate is generally packed in HDPE woven bags with inner HM-HDPE liner. Some of the manufacturer/suppliers of potassium carbonate in India are as follows:

- Gujrat Alkalies and Chemicals Limited

- Neel Chemicals

- Triveni Chemicals

- Aditya Chemtec Pvt. Ltd.

- Ramniklal S. Gosalia & Company

- Sree Rayalaseema Alkalies & Allied Chemicals Limited

- Anmol Chemicals

Sulphur (CAS#7704-34-9)

Sulphur (S) is a chemical element which is abundant, multivalent and nonmetallic. Elemental sulfur is a bright yellow, crystalline solid at room temperature. Pure sulfur is odorless and tasteless. However, trace hydrocarbon impurities may give it a faint oily and/or rotten egg odor. According to Wikipedia, Sulfur is the tenth most common element by mass in the universe, and the fifth most common on Earth. Though sometimes found in pure, native form, sulfur on Earth usually occurs as sulfide and sulfate minerals. Today, almost all elemental sulfur is produced as a byproduct of removing sulfur-containing contaminants from natural gas and petroleum. Sulfur is an essential element for all life, but almost always in the form of organosulfur compounds or metal sulfides. Sulfur is one of the core chemical elements needed for biochemical functioning and is an elemental macronutrient for all living organisms.

Sulfur burns with a blue flame with formation of sulfur dioxide, which has a suffocating and irritating odor. Sulfur is insoluble in water but soluble in carbon disulfide and, to a lesser extent, in other nonpolar organic solvents, such as benzene and toluene.

According to MSDS of Sulphur, dust particles may be irritating to the eyes, nose, throat, and skin. Dust contact with eyes may cause mechanical irritation (abrasion), characterized by a scratchy discomfort which may progress to burning and tearing, with blurring of vision upon repeated or prolonged exposure. Molten sulfur may cause thermal burns. Large doze of ingestion can produce mucous membrane irritation, difficult swallowing, redness of the throat and tongue, stomach, urinary disturbances, vomiting, abdominal pain and diarrhea.

Solid and molten sulfur can be ignited; burning sulfur produces sulfur dioxide, an irritating, toxic, and suffocating gas. Molten sulfur can cause thermal burns. Molten sulfur may evolve Hydrogen Sulfide (toxic gas) which may accumulate in storage container vapor space. High concentration may cause immediate unconsciousness- death may result unless victim is promptly and successfully resuscitated. Hydrogen sulfide causes eye irritation. Hydrogen sulfide is less likely to cause surprise poisonings from small, inhaled amounts because of its disagreeable odor. Hydrogen sulfide quickly deadens the sense of smell, and a victim may breathe increasing quantities without noticing the increase until severe symptoms cause death.

The burning of coal and/or petroleum by industry and power plants generates sulfur dioxide (SO_2) that reacts with atmospheric water and oxygen to produce sulfuric acid (H_2SO_4) and sulfurous acid (H_2SO_3). These acids are components of acid rain, lowering the pH of soil and freshwater bodies, sometimes resulting in substantial damage to the environment and chemical weathering of statues and structures. Fuel standards increasingly require that fuel producers extract sulfur from fossil fuels to prevent acid rain formation. This extracted and refined sulfur represents a large portion of sulfur production. In

coal-fired power plants, flue gases are sometimes purified. More modern power plants that use synthesis gas extract the sulfur before they burn the gas.

The hazards of hydrogen sulfide should be considered when storing or transporting molten sulfur. It is to be protected against hot liquid. Smoking should be prohibited in storage and work areas.

It is to be kept out of sewers, drainage areas, and waterways. Spills and releases to be reported, as applicable, under Federal and State regulations.

By end-user industry, the market is segmented into fertilizer, chemical processing, metal manufacturing, rubber processing and other end-user industries. The greatest commercial use of the element is the production of sulfuric acid for sulfate and phosphate fertilizers, and other chemical processes. The element sulfur is used in matches, insecticides, and fungicides. Organosulfur compounds are used in pharmaceuticals, dyestuffs and agrochemicals.

One of the important uses of elemental sulfur is in vulcanization of rubber, where polysulfide chains crosslink organic polymers and thus facilitates to impart strength to the product (e.g. Tyre, Automotive Rubber Components etc.)

According to Mordor Intelligence, the global sulfur market size was estimated at 61.88 million metric ton in 2020, and the market is expected to register a CAGR of more than 5% during the forecast period (2021-2026). According to Statista, (https://www.statista.com/ statistics/ 1031181/sulfur-production-globally-by-country/), Sulphur production in India was 3.6 million

metric tons in 2020.

Some leading manufacturers/ suppliers in India are as follows:

- The Standard Chemical Company Private Limited

- Jain Chemical

- Jaishil Sulphur and Chemical Industries

- Solar Chemferts Private Limited

- Ram Shree Chemicals

- Penta Bioscience Products

- Fertinagro India Private Limited

- Garg Trading Company, HD Chemicals

- Durga Chemical Industries

- Tata Steel

- Gujrat Sulphur Limited (GSL)

Solid sulphur packing bag is a kind of flexible Intermediate Bulk containers (FIBC bags), PP woven bags with lamination, Jumbo bags. Polyproplene and Polyethylene (HDPE Bags) is its main material. Desirable characteristics of these bags are dustproof, moisture-proof, radiation-resistant, safety, high strength structure, easy to load and unload etc.

Zinc Oxide (CAS# 1314-13-2)

Zinc oxide (ZnO) is an inorganic compound, which is insoluble in water. It is obtained as a white powder, produced synthetically from the naturally occurring mineral zincite.

According to MSDS of Zinc Oxide, it is chemically stable under standard ambient conditions

(room temperature). However, the dust or fume of Zinc oxide can irritate the respiratory tract. Prolonged contact with skin can produce a severe dermatitis called oxide pox. If the level of exposure to dust or fume is high, it can cause metallic taste, marked thirst, coughing, fatigue, weakness, muscular pain, and nausea followed by fever and chills. In case of severe overexposure, it may result in bronchitis or pneumonia with a bluish tint to the skin. Prolonged or repeated exposure may cause reversible liver enzyme abnormalities, diarrhea. According to Wikipedia, Zinc oxide itself is non-toxic. It is hazardous, however, to inhale zinc oxide fumes, such as generated when zinc or zinc alloys are melted and oxidized at high temperature. This problem occurs while melting alloys containing brass because the melting point of brass is close to the boiling point of zinc. Exposure to zinc oxide in the air, which also occurs while welding galvanized (zinc plated) steel, can result in a malady called metal fume fever. For this reason, typically galvanized steel is not welded, or the zinc is removed first. Zinc Oxide is very toxic to aquatic life with long lasting effects. Zinc oxide has several environmental hazards, as it is insoluble in water. Release to the environment should be avoided. It should be handled in accordance with good industrial hygiene and safety practice. Spillage should be collected and disposed of contents/ container to an approved waste disposal plant.

Major end use industries for zinc oxide include automotive, building and construction, personal care, healthcare, food and beverages, metallurgy, and others. ZnO is used for the vulcanization of rubber to increase the durability of rubber product e.g. tyre. In 2018, the rubber industry consumed more than half of the ZnO produced around the world due to the growing production of tyres as well as non-tire applications. ZnO has several medicinal uses, and can be employed as an additive in various materials such as plastics, ceramics, batteries, glass, sealants, cement, lubricants, paints, ointments, adhesives, pigments, foods, ferrites, and fire retardants. It has various applications in the pharmaceutical industry, especially in skin

care products, and is employed as a raw material in the manufacture of ointments, baby powders, creams, lotions, anti-dandruff shampoo etc. It has various applications in anti-septic creams and first-aid bandages due to its usage as an astringent, topical protectant, and an antiseptic. Zinc can carry an electrical charge, which is used to act as a building block for protein synthesis in the human body. Moreover, zinc has a positive impact on the digestive tract and immune system.

According to Fortune Business Insights (https://www.fortunebusinessinsights.com/zinc-oxide-market-102480), the global zinc oxide market Size was valued at USD 4.10 billion in 2018 is projected to reach USD 6.36 billion by 2026, exhibiting a CAGR of 5.7% during the forecast period. Asia Pacific holds the highest revenue (USD 2.248 billion) share of the zinc oxide market in which China, India and Southeast Asian countries are the leading contributors. According to Mordor Intelligence, The Global Zinc Oxide Market was valued at over 1,400 kilotons in 2020 and the market is projected to register a CAGR of over 4% in terms of volume during the forecast period (2021-2026).

Leading manufacturers / suppliers of Zinc Oxide in India are as follows:

- Upper India
- J.G. Chemicals
- SURAJ UDYOG
- Rubamin
- Zinc-O-India
- Ambica Dhatu Private Limited
- Hemadri Chemicals
- Nahar Zinc Oxide
- Neelkanth Finechem LLP

- Chandigarh Zinc & Residues Pvt. Ltd.

Packaging of Zinc Oxide is done in HDPE bags / Drums as per requirement.

Stearic Acid (CAS# 57-11-4)

Stearic Acid ($C_{17}H_{35}CO_2H$) is a saturated long-chain fatty acid with 18-carbon backbone. It is found in various animal and plant fats. Stearic Acid is a waxy white solid with a mild odor. It is insoluble in water, rather it floats on water. However, it is soluble in acetone, chloroform, carbon disulfide. Stearic acid, also known as octadecanoic acid, is nontoxic, fairly inert and stable under recommended storage conditions. It decomposes at boiling point of 360 °C at 1 mm Hg. Stearic acid, when heated to decomposition, emits acrid smoke and irritating fumes.

Dust of stearic acid is irritating to eyes, nose, and throat. It may cause chemical conjunctivitis. It causes skin irritation. Ingestion may cause gastrointestinal irritation with nausea, vomiting and diarrhea. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. It may be harmful if swallowed. Inhalation causes respiratory tract irritation. It is stable under normal temperatures and pressures, highly flammable, combustible when exposed to heat or flame. It should be kept away from oxidizing agents. Container should be tightly closed and should be kept away from heat, sparks and flame. It should be stored in a cool, dry, well-ventilated area away from sources of ignition and incompatible substances. It is hazardous to the aquatic environment. Spilled substance should be swept into covered containers. If appropriate, moisten first to prevent dusting. It should not be allowed to enter drains. It should be picked up and suitably disposed without creating dust.

Attributes of activating, lubricating, softening and non-toxic nature allow Stearic acid to play a key role in several sectors. Based on application of stearic acid, the market is categorized into Soaps & Detergents, Personal Care, Textiles, Lubricants, Rubber Processing and Others (Intermediates, Plastics, etc.). Soaps & detergent segment holds the maximum share in Indian stearic acid market. The action of stearic acid as an activator and lubricant yields benefits for the rubber industry (e.g. Tyre) by aiding in vulcanization and improving the texture of the finished products.

According to ResearchAndMarkets.com, the Global Stearic Acid Market was valued at around $8.47 billion in 2018 and is projected to reach nearly $11.5 billion by 2024. According to TechSci Research, in India stearic acid market was valued at around $ 216 million in 2018 and is projected to reach nearly $ 344 million by 2024, exhibiting a CAGR of 8.6%.

Some of the leading manufacturers / suppliers of stearic acid in India are as follows:

- VVF (India) Limited

- Godrej Industries Limited

- Ritesh International Limited

- 3F India Limited

- Jocil Limited

- Sheel Chand Agroils Private Limited

- Fine Organics Industries Pvt. Ltd.

- TGV SRAAC Limited

- Adani Wilmar Limited

- Pioneer Agro Extracts Ltd.

- Niram Chemicals

- Nilkanth Organics

- Lumega Industries

- Shree Chem Export Private Ltd.

Stearic acid is generally packed in laminated paper bags, HDPE bags, HDPE drums, Jumbo bags, and Intermediate Bulk Container (IBC) as per requirement.

Rubber Process Oil

- Paraffinic Oil (CAS# 64742-62-7)

- Aromatic Oil (CAS# 64742-04-7)

- Naphthenic Oil (CAS# 67254-74-4)

Rubber process oil is used to facilitate dispersion of fillers and flow characteristics of the compound throughout the mixing process. It is derived from petroleum crude oil when the additional volatile petrol and heating oil fractions are removed by distillation. Rubber process oil is mixtures of paraffinic, naphthenic and aromatic compounds of wide distribution of molecular weight. It is important for the rubber industry due to the requirements of improving the efficiency and productivity, lowering energy consumption, reducing production cost, improving product quality.

OSHA 29 CFR 1910.1200 do not list this product as a potential carcinogen. As per Safety Data Sheet of different types Rubber Process Oil, contact may cause minor eye irritation, expected to cause minor skin irritation. Ingestion of this product and subsequent vomiting can result in aspiration into the lungs, causing chemical pneumonia and lung damage. Breathing the vapour

or mist at concentrations in air that exceed the Threshold Limit Values (TLV) can cause respiratory irritation or discomfort. Prolonged or frequently repeated contact may cause more severe irritation or may cause the skin to become cracked or dry from the defatting action of this material. It is a combustible material, low hazard. The product can form flammable mixtures or can burn only on heating above the flash point. However, minor contamination by hydrocarbons of higher volatility may increase the hazard. It is to be kept away from heat, sparks, and flame. Misuse of empty containers can be hazardous. Residue may ignite with explosive violence if heated sufficiently. Products of combustion are carbon monoxide, carbon dioxide, and aldehydes and ketones, combustions products of nitrogen and sulfur. Periods of exposure to high temperatures should be minimized. This material may present environmental risks common to oil spills. Contamination of groundwater or surface water should be prevented.

Depending on the type of rubber and also the end product applications, type of rubber process oil is selected from Naphthenic types, Aromatic types and Paraffinic types. Unique color stability, solubility and good thermal stability make Naphthenic Oil ideal for molded articles, slippers, LPG tubes, floor tiles etc. Aromatic extracts, procured from selected refineries and suitably blended to fulfill stringent specifications, are used for compounding batches to manufacture automobile tyres, beltings, mats, shaped rubber components etc. Aromatic oil is compatible with wide range of rubbers like NR, SBR and PBR. Paraffinic oils find extensive usage in ethylene-propylene rubbers, butyl rubbers. paraffinic content are preferred for achieving high retention of properties when ageing and higher loading of oil in applications like heat resistant / steam hoses, conveyor belts, butyl tubes.

According to markets and markets (https://www.marketsandmarkets.com/Market-Reports/rubber-process-oil-market), Rubber Process Oil Market is projected to grow from

USD 1.85 billion in 2017 to USD 2.33 billion by 2023, at a CAGR of 4.1%, from 2018 to 2023. Asia Pacific (China, India etc.) is the leading market of rubber process oils, followed by North America and European regions. The growth of the rubber process oil market can be credited to the growing consumption of rubber process oils in the manufacturing of tyres. Leading domestic manufacturer / suppliers of rubber process oil are as follows:

- Panama Petrochem Ltd.

- Indian Oil Corporation Ltd.

- Sah Petroleum

- Hindustan Petroleum Corporation Limited

- Apar Industries Ltd.

- GP Petroleums Ltd.(IPOL)

- Gandhar Oil Refinary

Rubber Process Oil is generally packed in HDPE & Mild Steel drum / barrel.

Sodium Silicate(CAS#1344-09-8)

Sodium Silicate [$(Na_2O)_x \cdot (SiO_2)_y$] is a compound of oxides of sodium and silica. It is prepared by the reaction of silica sand and sodium carbonate at a high temperature ranging from 1200 to 1400 deg. C. Aqueous solution of sodium silicate is called water glass. In industry, the various grades of sodium silicate are characterized by their SiO_2:Na_2O weight ratio. Grades with ratio below 2.85:1 are termed alkaline. Those with a higher SiO_2:Na_2O ratio are described as neutral. Sodium silicates are colorless glassy or crystalline solids, or white powders. Except for the most silicon-rich ones, they are readily soluble in water, producing alkaline solutions.

Sodium silicates are stable in neutral and alkaline solutions. In acidic solutions, the silicate ions react with hydrogen ions to produce silicic acid, which tend to decompose into hydrated silicon dioxide gel. On heating to drive off the water, we get a hard translucent substance called silica gel, widely used as a desiccant. It can withstand temperatures up to 1100 °C. The commercial product, available in water solution or in solid form, is often greenish or blue due to the presence of iron-containing impurities.

According to MSDS, liquid Sodium Silicate– Alkaline is considered hazardous by the OSHA Hazard communication standard (29 CFR 1910.1200). Contact with eye may cause serious eye damage. It may cause severe irritation, pain and corneal burns (possibly leading to blindness). Contact with skin contact may cause skin irritation, may result in redness, itching, irritation, burning sensation, swelling. Repeated or prolonged skin contact may result in dermatitis. Inhalation of mist, vapor, or spray may cause irritation of the respiratory tract, possibly with coughing, choking, and pain either immediately or within 72 hours. It is harmful if swallowed. It may cause immediate pain and severe burns of the upper and lower gastrointestinal tract with vomiting, nausea, and diarrhea. Upon drying forms thin glass that can cut skin. Spilled material may cause a slipping hazard. Container should be kept tightly closed and properly labeled. Not reactive under normal temperatures and pressures. It can generate heat when mixed with acids. Sodium silicate should not be stored in aluminum container, aluminum fittings or transfer lines should not be used and prolonged contact with alkali sensitive metals such as aluminum, brass, bronze, copper, lead, tin, zinc should be avoided because flammable hydrogen gas can be generated. This material has exhibited moderate toxicity to aquatic organisms. Disposal of container should be done in accordance with applicable local, regional, national, and/or international regulations.

The product has a wide variety of uses, including the formulation of cements, passive fire

protection, textile and lumber processing, manufacture of refractory ceramics, as adhesives, and in the production of silica gel. The main applications of sodium silicates are in detergents, paper, water treatment, and construction materials. Neutral sodium silicate in liquid form is suitable for use in pharmaceutical and toilet preparations. Precipitated silica, which is used as a filler in Tyre manufacturing, is produced by the reaction of neutral silicate solution with Sulfuric acid. Sulfuric acid and sodium silicate solutions are added simultaneously with agitation to water till the precipitation of silica.

According to Market Data Forecast, the sodium silicate market is anticipated to grow from USD 9.42 billion in 2020 to USD 13.45 billion in 2025, with a CAGR of 4.5% during the forecast 2020 and 2025. Most important Regions playing dynamic role in Sodium Silicate market share are North America, Europe, China, Japan, Middle East and Africa, India, South America, Others (https://www.wboc.com/story/43523602/sodium-silicate-market-size-2021). Some of the leading domestic manufacturers are as follows:

- Kiran Global Chem Limited

- Shree Saibaba Chemical Industries

- Patel Chemicals, Ankit Silicate

- Sahajanand Industries

- Aanya Chemicals, Kg Silicate and Chemicals

- Acid And Chemicals

- Kunal Chemical Co.

- Sri Varahi Chemicals

Liquid sodium silicate is packed in carboy / drums / barrel / bottle and HDPE Bag is used for powder/ crystal.

1.1.3 Identified Customer Satisfaction Factors for Industrial Chemical Products

According to Hoe et al. (November 2018), assessing customer satisfaction is a vital element in any strategy for business performance improvement. Thus, customer satisfaction has become a driver for survival, competitiveness, and growth. Customers today have different needs and they have increasing demand for higher quality of products and services. In most of the cases customer priorities often differ significantly from what organizations think they are (Quinn & Humble, 1993). While the needs of customers are recognized as crucial but that understanding has not yet been fully translated into action in terms of accessing the necessary information.

Based on the review of existing literatures and the experience gained by the research scholar during interaction with several customers and marketing personnel in his professional field, following factors were identified which can influence satisfaction of customers.

Product stewardship of the supplier

Product stewardship is a strategy to minimize the health, safety, environmental, and social impacts of a product throughout the entire supply chain from the design of chemical products to manufacture as well as sale, use or consumption, and disposal. It is also known as Extended Producer Responsibility (EPR) which includes the assessment of risks and mitigating those risks to protect people's health and the environment throughout the product life cycle. Manufacturers and suppliers of raw material and industrial products are expected to reduce the proportion of hazardous substances in their product to reduce the impact on the environment and health of the user. As mentioned by Wong (2012), product stewardship provides

opportunity to minimize waste, and improve efficient use of resources through product design, packing, and material uses. The author recommended that manufacturers should emphasize the Environment Management Capability of suppliers in their Green Operations to reap financial as well as environmental benefits.

As mentioned by Jensen (2017), Product Stewardship as a concept relating to the domain of the circular economy. The concept of Product Stewardship evolved from responsible management of hazardous wastes towards a broader focus on resource conservation. Product life cycle management (PLM) software or enterprise information system (EIS) are some information handling tools, where partners share information and collaborate on various issues, e.g., optimization of recycling or reuse of materials. According to Section 2e of the Environment (Protection) Act,1986 (India code), any substance or preparation which, by reason of its chemical or physico-chemical properties or handling, is liable to cause harm to human beings, other living creatures, plants, micro-organism, property or the environment is characterized as 'hazardous substance'. According to Safeopedia, a hazardous substance is any substance that has one or more of the following inherent hazardous properties like flammability, explosiveness, toxicity, ability to oxidize, capacity to develop any of the aforesaid properties in contact with air or water.

These substances are regulated by laws and regulations administered by various countries viz. the American Environmental Protection Agency (EPA), the Federal Occupational Safety and Health Administration (OSHA), the Federal Department of Transportation (DOT), the Nuclear Regulatory Commission (NRC) of the United States. The following two chemical regulations are the most important ones in force in India. a) Manufacture, Storage and Import of Hazardous

Chemical (Amendment) Rules, 1989; the regulation was firstly enacted in 1989 by the Ministry of Environment & Forests (MoEF) and later amended in 1994 and 2000. b) Ozone Depleting Substance (R&C) Rules (2000)

The materials which are hazardous to the environment and pollute landfills, and are dangerous in terms of occupational exposure during manufacturing and recycling are to be restricted. Restriction of Hazardous Substances (RoHS), also known as Directive 2002/95/EC, originated in the European Union and restricts the use of specific hazardous materials viz. lead (Pb), mercury (Hg), cadmium (Cd), hexavalent chromium (CrVI), polybrominated biphenyls (PBB), polybrominated diphenyl ethers (PBDE), and four different phthalates (DEHP, BBP, BBP, DIBP). There are discussions taking place for the possible amendment and inclusion of seven new substances viz. Beryllium, Cobalt (dichloride and sulphate), Diantimony trioxide, Indium phosphide, Medium-Chain Chlorinated Paraffins (MCCPs), Nickel (sulphate and sulfamate), and Tetrabromobisphenol A (TBBP-A). RoHS-like regulations have spread to a number of other countries.

REACH is a general regulation and stands for Registration, Evaluation, Authorization, Restriction of Chemicals, and addresses the production and use of chemical substances and their potential impact on human health and the environment. REACH is monitored by the European Chemical Agency (ECHA) and deals with 211 Substances of Very High Concern (SVHC) as on 20th January, 2021. REACH SVHC list is not a static list and it is updated frequently and available in the website. All the RoHS restricted substances are also on the REACH restricted list. Substances on the list have been identified as being carcinogenic, mutagenic, reprotoxic, bio-accumulative and toxic, or as endocrine disruptors. If a substance is added to SVHC list, that does not mean it is banned. However, if the substance is further

added to REACH authorization list, it cannot be placed on the EU market or used after a given date, unless an authorization is granted for their specific use, or the use is exempted from authorization. According to latest draft amendment published in Aug 2020, a REACH-like registration requirements have been introduced which are known as **"India REACH".**

According to Maliszewska-Kordybach, B. (1999 February 23), Polycyclic Aromatic Hydrocarbons (PAHs) belong to the group of persistent organic pollutants (POPs). These are organic contaminants that are resistant to degradation, can remain in the environment for long periods, and have the potential to cause adverse effects on environment and health. There are thousands of PAH compounds in the environment but in practice PAH analysis is restricted to the determination of 6 to 18 compounds based on their potential human and ecological health effects. Individual PAHs differ substantially in their physical and chemical properties. The emission of PAHs into the environment has increased with the increase in demand for petroleum products. The incomplete combustion of organic products such as coal, fuel oil, fire wood etc. remains an important contributor to emission of PAHs; the other sources being forest fires, motor vehicles, volcanoes, refineries and many more.

It is expected that the supplier will disclose ecological information (toxicity, persistence, degradability, etc.) in the Safety Data Sheet of the product they supply.

Quality Management System (QMS) Ensuring Quality of the Product

Quality means that a product meets customer needs leading to customer satisfaction. As defined in ISO9000:2015 standard, Quality is the degree to which a set of inherent characteristics of an object fulfils requirements. According to Rimawan et al. (2017), Quality of the product is no longer a competitive weapon but the core requirement as expected by

customers from all the organizations. Jilcha et al. (2014) however, mentioned strong relationship exists between quality and competitiveness of chemical manufacturing industries. They referred to the definitions of Quality given by different authors as follows:

Authors		Definitions of Quality
Juran (1964)	:	Fitness for use
Crosby (1979)	:	Conformance to requirements
Deming (1986)	:	Satisfaction of present and future needs of the customer
Feigenbaum (1983)	:	Combined product characteristics of engineering and manufacture that determine the degree to which the product will meet the expectations of the customer
Taguchi (1986) and Adnan, et al.(2000)	:	The loss imparted to society from the time a product is shipped, apart from any losses caused by its intrinsic functions
ISO 8402 : 1986	:	The totality of features and characteristics of a product or service that have a bearing on its ability to satisfy stated or implied needs

Garvin (1987) mentioned eight dimensions of Product Quality as Performance, Features, Reliability, Conformance, Durability, Serviceability, Aesthetics and Perceived quality.

Any deviation in quality of the product from the stated and implied requirements of customers may be a source of dissatisfaction of customers. In case of chemical products, there may be some product specific requirements on chemical properties or physical properties which need

to be fulfilled. Otherwise, it may either affect the productivity at customer end or it may affect the quality of final product. Most of the customers do not like impurities in the product. There are some customers who are interested to inspect by their own the quality parameters of incoming materials at high frequency, while there are some other customers who expect their suppliers to self-certify the quality so that utilization of resources in inspection of incoming material is reduced. In case of wide range of specification limits, there may be variation in quality from one batch of product to another batch even within the specification. Suppose the target value of a quality parameter is 380 g, the upper specification limit is 400 g, lower specification limit is 360 g and if the value of this quality parameter is 365 g for one batch and 395 g for another batch of supplied material, this batch-to-batch quality variation may affect the quality consistency of final product though both these values are within the specification. Some customers may expect batch to batch quality consistency along with the quality parameters close to the target value, which needs to be understood by the supplier.

There may also be specific requirements from customer end to improve some of the quality parameters of the chemical in such a manner, it can contribute to sustainability e.g. development of tyre with increased fuel efficiency, increased life of tyre etc.

According to Cater et al. (2010), customers are typically unwilling to compromise on quality and consider this as a basic criterion to qualify potential suppliers, being an even more important factor than price. Researchers define product quality as "the extent to which the supplier's product meets the customer's specification". The literature mostly addresses product quality as the customer's perception of the relative superiority of a supplier's product along three dimensions of the product – performance, reliability, and consistency.

According to Sewel et al. (2002), 'Being nice to people is just 20% of providing good customer service, The important part is designing systems that allow you to do the job right the first time'. Mangula et al. (2013) pointed out that adoption of Quality management System and subsequently certification on international standard on QMS (ISO9001) has revealed to be the pro-active strategy to improve organizational performance in terms of quality of the product. Consistency in quality can be ensured only through the development and implementation of Quality Management System (QMS). The Quality Management System, as defined in different literatures, is the organization structure, responsibilities, activities, resources, and events that together provide organized processes and techniques of implementation to ensure the capability of the organization to meet Quality requirements. It is an approach which encourages an organization to understand and analyze customer requirements, identify and establish suitable processes that contribute to the realization of product / service acceptable to the customer, and provides confidence to the organization and its customers that, the organization is able to provide product / service that consistently fulfill their requirements and enhance their satisfaction. QMS essentially involves documentation, implementation, and demonstration of effectiveness. It is based on Deming Cycle or Plan-Do-Check-Act cycle. In the planning and implementation of QMS, risks and opportunities are determined and reviewed for all the processes, products, design, infrastructure, and the actions taken to address the risks and opportunities and these actions are evaluated for effectiveness. ISO 9001 is one such international standard that specifies requirements for a quality management system (QMS). Internal audit to verify the conformance of QMS and management reviews to know the opportunity for improvement are essential requirements for QMS.

Suppliers' Sustainability Performance

Now-a-days most of the big and ethical companies globally have been driving Sustainability at the core of all their activities. Stakeholders (investors, shareholders, jobseekers, customers etc.) are trying to be associated with future-ready organizations. The factors which are responsible for this increasing awareness about sustainability are global warming, disruption of the usual balance in the nature, depletion in the ozone layer, loss of biodiversity etc. It is understood, if harmful processes are continued, it is likely that we will run out of fossil fuels, huge numbers of animal species will become extinct, and the atmosphere will be irreparably damaged. Companies are now trying to maintain a balance among People, Planet and Profit. There are regulatory tailwinds also both from national and international level which are forcing companies to follow sustainability practices.

Sustainability means the ability to sustain. It is defined as the ability to meet the need of present generation without compromising the ability of future generations to meet their own needs. While sustainability is an umbrella term for many green concepts and corporate responsibility, ESG has become the preferred term for investors and the capital markets. ESG is an acronym of Environment, Social and Governance. ESG is a framework for assessing the impact of the sustainability practices and ethical practices of a Company. Customers are now analyzing the performance of their suppliers through the ESG lens because sustainable procurement plays a major role in achieving sustainability of an organization.

According to Gualandris et al. (2016), manufacturing firms' sustainability (Environmental and Social) performance is improved by internal to external practices of an organization; while internal practices have a direct impact on the sustainability performance of the manufacturing firm, the effect of external practices is fully mediated by the sustainability performance of the key suppliers of manufacturing firm. Sustainable procurement ensures that the products bought

are having the lowest environmental impact and most positive social results. This can be achieved by a) implementation of a robust systems to reduce, reuse and recycle non-bio degradable materials and natural resources b) implementation of robust systems for water, energy and Green House Gas (GHG) management c) Standardization of Environment Management Systems and Occupational Health and Safety Management Systems d) mitigating long term Environmental, Social and Governance(ESG) risk e) disclosing the actions taken and results achieved on ESG objectives in a third party assessed sustainability report (e.g. GRI based reporting) regularly to increase the credibility.

Company Image of the Supplier

Company image is the perception of people about a company. A good brand image can help a company in establishing credibility in the industry. It is created through consistency, professionalism, competence etc. Brands like XEROX have become synonymous with the underlying product, regardless of the company that makes it. If the customers trust a company and can link that brand to values, they may be willing to pay more for what is offered.

A good company is recognized by its loyal customer base. Many customers also want to be associated with a company who is not just a supplier, but an industry leader. It is expected that a good company will anticipate the future needs of the customers and will have the agility in responding quickly to the market needs. Capability of developing customized product to fulfill variegated needs of customers is also considered as a criterion of good company. Company image may serve as a medium to attract new customers or may be a source of satisfaction for existing customers if the image of the company is good.

Customer Service of the Supplier

Customer service plays an important role in improving satisfaction level of customers. Customer service, as defined in websites, is the support suppliers offer their customers, both before and after they buy and use the products or services, that helps the customers have an easy, enjoyable experience with the suppliers' brand. According to Sewel et al.(2002), ' Customers want service organizations to look good, be responsive, be reassuring, be empathetic, and most of all be reliable.' Customer service may be provided to both prospective and existing customers. Certain customers may be interested to get technical assistance from their suppliers in improvement of their product performance. They might be interested in frequent interaction with the technical personnel of supplier for solutions to wide variety of their needs. Sales representative of supplier play a major role in providing necessary support to customers as they directly interact with the customers. Responsiveness of sales representatives is very important in this regard. It is expected that the sales representative should have adequate product knowledge to understand and capture the requirements of customers. They need to communicate these requirements to the technical or other concerned function and take their help to fulfill that. Timely resolution of customer complaint with effective corrective action is an area of concern for most of the customers. So, monitoring of the resolution time of customer complaint and effectiveness of corrective actions taken are very important. As mentioned by Radder et al. (2019), customer complaint satisfaction is crucial for the successful relationships with customers. With reference to Hirschman, A. O. (1970), the author reminded that the voicing of concern' is an indication of customers' willingness to maintain the relationship. The authors also recommended companies should do their best when they get a second chance as most of the unsatisfied customers do not complain; rather, they exit with negative word of mouth.

Packaging of the Product

The packaging is used not only to protect the chemical product from exposure to moisture and other contaminants but also allows the end user to use the chemical without causing any hazard. Customers are now paying high attention to proper packaging of the chemicals. Maintaining cleanliness of bags at the time of receipt is important for many customers. They are also concerned about Identification visibility of batch number and color code on the packaging bags. As mentioned by Rimawan et al. (2017), manufacturers of industrial packaging increase their value through the perfection of print quality in addition to increasing the basic functionality of product protection.

With the rising concern on sustainability and ESG, it is expected that the impact of packaging on the environment shall be minimized. It may be in terms of ensuring zero leakage from the bags during transportation so that the customer receives the material in intact condition, or by using biodegradable or recycled material in packaging. Customers are becoming increasingly conscious on the reduction of solid wastes and tighter regulatory norms are being implemented by the government on the solid waste management. So, the suppliers of industrial chemical products are expected to develop methods to recycle the packaging bags after their use to reduce the impact on the environment.

Maintaining the weight of material nearer the target is also important in standard packaging. Many customers are interested in getting the proper weight of individual bags even if the total weight of consignment (which consists of several bags) is within the specification, because they are interested in counting the number of bags to be used in a mixture of different materials for manufacturing a product and any variation in weight from bag to bag may result in variation in the quality of the product.

Order Execution and Delivery of the Product

Delivery performance of supplier is an essential criterion for the development of healthy relationship between a supplier and customer. Delivery of the expected product in the quantity ordered by the customer at the place agreed by the customer and at the time agreed by the customer is often expressed by the OTIF (On Time in Full). OTIF is calculated by the number of deliveries made on time in full divided by the number of all deliveries made and it is expressed as a percentage. Smooth order execution and delivery of the chemical is expected by most of the customers. A supplier may be considered as unreliable in case of any deviation from agreed delivery schedule. Some customers may also be interested in getting the real time information on order and delivery status from the supplier. There may be sudden augmentation in demand from customer end and meeting this sudden augmented demand may also be considered as an important criterion for being a preferred supplier. Lean management is followed by many customers who prefer a supplier delivering the chemical 'Just in time' in order to reduce their inventory holding cost.

Incentives Offered to Customers

An incentive can be defined as something offered to motivate an individual to perform an action. A customer incentive program is a marketing strategy designed to offer incentives to customers in order to motivate them to engage and purchase from the same company. In order to increase the sales or to achieve the target of sales volume, some of the ~~suppliers~~ suppliers' offer incentives like longer credit period, higher credit limit, discount in price while purchasing, reward for repeated purchase etc. Some customers are also interested to accept these incentives notwithstanding the impact on the long-term benefit. As for example, ~~very~~ few companies are able to make all their procurement on a cash basis. Offering credit to these customers is a

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common practice between the businesses.

As mentioned by Subramanian, K. R. (2017), in current competitive business environment, most of the companies are offering incentives of varying degrees and proportions. However, the ethicality of such marketing promotions is in question. According to the author, well planned incentives can increase the sales volume of products and market share of a company. But companies should not focus on incentives alone at the cost of product quality and performance factors, as recommended by the author. Behavior change of customers is a complex phenomenon. Understanding the mindset of only one customer and implementing a 'one-size-fits-all behavior change solution' will not bring the suppliers the desired result.

Price of the Product

Price is defined by what is given up or sacrificed to obtain a product (Bei and Chiao, 2001; Zeithaml, 1988). Price is a function of cost of production, profit margin, and market forces. By the price of product, a signal may be sent to the customer about the quality of the product and the value of their purchase. Higher price may be meant to signal that the product is of better quality. Similarly, for low prices, customer perception may be the product in question is not particularly valuable or perhaps it is of a lower quality than higher priced products. It is often referred to as price-quality signaling. Customer will be eager to know the price paid by other customers.

Price plays a critical role in selection of suppliers for many customers who always look for the lower price. Some of the suppliers may increase the price for their brand reputation, for high standard packaging, for customization of the product etc. It is customers' choice whether to pay higher prices for the factors described above or not.

1.2 Relevance of the Study

In this age of increased competition and globalization of markets, customer satisfaction plays a vital role to achieve the status of preferred supplier and thereby to increase the market share and profitability. Thus, it is important to identify the factors which can satisfy the customers of industrial chemical products and to understand the relative importance of these factors in improving customer satisfaction. Most of the industrial chemical products are generic in nature and produced by various manufacturers. Price alone cannot decide the business as it can be easily imitated. There are other important factors which can act as a key differentiator. Several studies have identified multiple parameters which influence customer satisfaction in business-to-business context. However, there is hardly any detailed study done on critical customer satisfaction factors which are specific to carbon black and other industrial chemical product manufacturing industry. Few dimensions such as Product stewardship of the supplier, Quality Management System (QMS) ensuring Quality of the product, Incentives offered to customers, Suppliers' Sustainability Performance etc. which apparently play a vital role, have not been under the purview of any existing literature studied. It is also necessary to explore other factors, if any, which influence satisfaction of customers of the industrial chemical products. Significance of these factors in customer satisfaction may vary from one industry to another industry which is not found to be addressed for industries like Tyre manufacturing, Automotive Rubber Components manufacturing, Carbon Black manufacturing etc. Thus, it is felt necessary to sensitize the suppliers of industrial chemical products regarding the major variables that ought to be considered while seeking to improve customer satisfaction and thereby to increase the market share and profitability. By understanding the factors that influence a Customers' preference for buying from a manufacturer as far as Carbon black and other industrial chemical

products are concerned, organizations can frame their strategy to improve Customer Service level and thereby can retain their existing Customers as well as gain more Customers to increase their business volume.

As per International Carbon Black Association (ICBA), Carbon Black is in the top fifty industrial chemicals manufactured worldwide, based on quantity. Because of its' unique properties, Carbon black has a variety of applications starting from tyre, industrial rubber products to plastics, coating, toner, printing inks etc. which are used in our daily life. Similarly, other industrial chemical products viz. Sulphuric Acid, Hydrochloric Acid, Sodium Hydroxide, Sodium Silicate, Sulphur, Zinc Oxide, Stearic Acid, Rubber Process Oil, Potassium Carbonate, Potassium Nitrate, which have been considered under the scope of this study also play a vital role in the manufacturing process of various products which are essential in our daily life as described earlier in this chapter. Market size of all the selected industrial chemical products is very big and the findings of this study may be horizontally deployed to other industrial chemical products.

International Organization for Standardization (ISO9001:2015) has also included Customer Satisfaction as one of the clauses (Clause number 9.1.2) in which it is mentioned that the organization shall (mandatory requirement) monitor customer's perceptions of the degree to which their needs and expectations have been fulfilled.

1.3 Research Scope

The study concentrates on and around identification of the factors which can influence satisfaction of Carbon Black customers in two major industries i.e. Tyre manufacturing industries and Automotive Rubber Component (ARC) manufacturing industries in India and evaluation of the relative importance of these factors on overall satisfaction of customers. An

effort has also been made to study the applicability of these factors in influencing satisfaction of customers for other industrial chemical products. Various industrial chemical products which have been chosen under the scope of this study apart from Carbon Black are Sulphuric Acid, Hydrochloric Acid, Sodium Hydroxide, Sodium Silicate, Sulphur, Zinc Oxide, Stearic Acid, Rubber Process Oil, Potassium Carbonate, Potassium Nitrate. These chemical products play a vital role in the manufacturing of various products which are essential in our daily life.

1.4 Outline of Thesis Chapters

The paper has been organized as follows.

Chapter 1 – Introduction
This chapter gives an overview of the research work undertaken and the conceptual basis of this study. It introduces the subject and discusses about the elements connected with satisfaction of industrial customers, the motivation for this research and the scope of this research.

Chapter 2 – Literature Review

This chapter presents an overview of the various literatures reviewed in the field of satisfaction of industrial customers and associated areas. The basic idea of the review is to understand the customer satisfaction factors addressed in the business-to-business context, the continual development which has happened in the field of customer satisfaction and the indication in which future research can be conducted. This chapter also describes the development of conceptual framework which will guide the rest of the research.

Chapter 3 – Research Methodology

This chapter describes the research methodology followed i.e., the research design, the sources of data, sampling design applied for this research, research instruments opted for data collection. Pilot study conducted initially before finalizing the questionnaire design for the main survey has been explained. Various analytical tools which are used for the analysis of the collected data to arrive at the conclusions are discussed. This chapter also describes the research objectives evolved from the research gap identified from the existing literature review and the hypotheses formulated to achieve the objectives.

Chapter 4 –Data Analysis and Interpretation

This chapter presents the analysis of data collected by using the questionnaire and the interpretation of the findings. At first, reliability analysis was done for all the independent and dependent variables to understand the internal consistency between items in a scale. Then the presence of Common Method Bias (CMB), one of the potential sources of measurement error which threatens the validity of the conclusions about the relationships between measures, was checked. Next the number of independent variables which have impact in the regression model was assessed. Then regression analysis was done to understand the significance of each of the identified factors in influencing customer satisfaction and thereby hypotheses testing was done. Degree of significance of these factors was analyzed by using Standardized Regression Coefficients to test another set of hypotheses. A comparison of the relative importance of the factors satisfying customers for different industrial chemical products was made from the weightages given by the respondents. Finally, the findings of the research survey were validated by the expert interview.

Chapter 5–Results, Discussion and Conclusion

This chapter details out the summary of the findings from the analysis of the data followed by the discussion on the findings. It also highlights the contribution of this study to the existing body of knowledge from the theoretical, practical and social perspective along with the managerial implications. Lastly the chapter also explains the limitation of the present study and the scope for future research.

1.5 Summary

The aim of the study that is identification of the factors which can influence satisfaction of the customers of carbon black in tyre manufacturing companies and automotive rubber component manufacturing companies and applicability of these factors in other selected industrial chemical products in the context of India have been discussed in this chapter. An introduction to the theoretical background of this study along with a brief description of the selected industrial chemical products has been provided. Introduction to identified factors which can influence customer satisfaction is also given. The chapter also explained the motivation for this study and provided an insight into the scope of this study. Finally, it is concluded with an overview of the other four chapters that followed.

CHAPTER 2

REVIEW OF LITERATURE

Review of Literature

The present study is an attempt to analyze the different factors influencing satisfaction of customers of various industrial chemical products with their suppliers. This chapter ~~will~~ throws light ~~in~~ on the identification of different factors which influence satisfaction of industrial customers as captured in different literatures reviewed.

2.1 Introduction

Achieving customer satisfaction is still an area of increasing interest particularly in a business-to-business context for both researchers and practitioners. Various literatures on the concepts or theories and previous research findings in the field of Customer Satisfaction, especially in business to business (B2B) context, were reviewed. It was observed that the literatures on customer satisfaction for industrial products are not available as adequately as that for consumer products. The term industrial products summarize all products which are exclusively sold from one company to other company for use in producing other products.

Based on whatever literatures studied on the customer satisfaction, an effort has been made to identify the factors which play important role in the satisfaction of industrial customers.

2.2 Literature Reviewed

Literatures were reviewed to understand the Concept of customer satisfaction and the Factors which can influence customer satisfaction.

2.2.1 Concept of Customer Satisfaction

Rahimić (2012) opined that customer satisfaction as a key factor in developing and sustaining competitive advantages. According to Ngo, V. M. (2015), customer satisfaction can play an important role in putting higher barrier against switching to other competitors.

Naumann et al.(2009) mentioned two major benefits of customer satisfaction:

1) Satisfied customers are more likely to continue buying from the company over the longer term, and to increase their business volume

2) Satisfied customers are more likely to spread their positive experiences, which in turn will attract new customers for the company

Mittal et al. (2010) mentioned the benefits of customer satisfaction as follows; it increases the expected 'life' of current customers, reduces price elasticity (i.e. they are less likely to defect when competitors offer lower prices), insulates customers from the competition, lowers costs of future transactions, reduces operating costs, lowers costs of attracting new customers, builds trust and reputation, leading indicator of future economic returns.

Anderson et al. (2004) opined that ensuring customer satisfaction is a central strategic concern of any business. They also added if any business cannot satisfy customers as effectively and efficiently as their competitors, customers and investors will turn elsewhere. Customer satisfaction, according to the authors, is determined by quality as well as by market segmentation and customer selection executed though product and service offerings, pricing, distribution channels, and proper communications.

Rossomme, J. (2003) mentioned about four elements which influence the customer satisfaction in B2B context. These are a) Information satisfaction i.e. satisfaction with the information used to choose a product e.g. technical specifications, marketing literature, pricing and payment schedules delivery schedules shipping information etc. b) Performance satisfaction i.e. satisfaction on the post purchase overall performance of the supplier in delivering and supporting the transaction e.g. smooth transactional processes, ROI etc. c) Attribute

satisfaction i.e. satisfaction from the performance of a product or service feature or dimension e.g. product reliability, technical support, training, post-sales service d) Personal satisfaction i.e. satisfaction resulting from the relationship with the supplier e.g. perceived personal risk, supplier reputation, past experience with supplier, past experience with similar products/services, personal relationship with supplier contact

According to Mill (2011), there is no universally accepted definition of customer satisfaction. He referred a number of definitions of customer satisfaction given by different authors as follows:

- Customer satisfaction, as defined as the buyer's cognitive state of being adequately or inadequately rewarded for the sacrifice he has undergone (Howard and Sheth,1969)

- It can be seen as an evaluation (cognitive) that the chosen alternative is consistent with prior beliefs with respect to that alternative (Engel and Blackwood, 1982)

- It can also be seen as a complex human process involving extensive cognitive, affective and other undiscovered psychological and physiological dynamics (Oh and Parks, 1997)

Mill mentioned two widely accepted theories that best describe customer satisfaction viz. disconfirmation paradigm and expectancy value concept. Both these theories, however, do not address the relationship between customer satisfaction and actual purchase behavior. According to Disconfirmation theory, customers do purchases based on their expectations, attitudes, and intentions (Oliver 1980). Then a perception of performance occurs as customers evaluate the experience during or after consumption and compare this actual service performance with their pre-experience standard or pre-consumption expectation. This results in confirmation, satisfaction, or dissatisfaction of customers. Disconfirmation or dissatisfaction results if there is a deviation of actual performance from the expectations. Expectations are

evolved from 1.Equitable performance which is based on the individual's investment and anticipated rewards 2. Performance of ideal product or service 3.The desired performance based on comparison with competitors 4. Quality of relationship of customer with the salesperson. The author referred Oliver (1980) who mentioned the following operational assumptions as part of the theory:

a) When expectation is high and performance is low, moderately low disconfirmation will result as the expectations are not met. On the other hand, high performance against high expectation will result in moderately high level of expectations being met (EM) due to confirmation.

b) When expectation is low and performance is also low, it will result in very low EM ratings, while high performance against low expectation will result in very high EM ratings due to a surprise effect.

c) When expectations match performance at any level, it will result in conformation and EM will represent the value of the expectations/ performance level.

As par expectancy-value theory customers often make some judgment about a product, its benefits, and the probable outcomes of using the product. The overall attitude of customers is a function of beliefs about the attributes of an object and the strength of these beliefs. The following relationship was presented by Carmen (1990): $Q = I_i (P_i - E_i)$, where Q is the overall quality; I is the importance of service attribute i; the sum is over the number of service attributes; P is the perception; E is expectation. Some models indicate a link of satisfaction to repeat purchase intention but not yet to actual purchase.

Yüksel et al. (2008) reviewed various consumer satisfaction theories viz. Dissonance Theory, the Contrast Theory, the Expectancy-Disconfirmation Theory, the Comparison Level Theory, the Value-Percept Theory, the Attribution Theory, The Equity theory, the Person-Situation Fit

concept, and the Importance-Performance model. The deviation of actual outcome from the expected one constitutes the basis of most of the satisfaction theories. According to majority of these theories when product performance exceeds prior expectations or some form of standards, it signifies satisfaction. When product performance falls short of the standard or expectation, it results in dissatisfaction.

Thus, customer satisfaction is generally based on meeting the expectations of customers. However, when customers receive a positive surprise that is beyond their expectations, it results in customer delight (Berman, 2005). Studies suggest that customer loyalty increases significantly as a result of delight.

As per Lingqvist et al. (2015), the companies with a handful of big customers, need to meet them to analyze how they really make purchase decisions whereas large companies with huge number of customers need data-driven market research to gain deeper insights on how different variables such as price, delivery times, or product features affect purchase decisions of customers.

The findings of the study conducted by Russo, I. et al. (2017) showed that customer satisfaction moderates the relationship between re-purchase intent of the customers and the switching costs. Exit barrier imposed by the higher switching costs may force customers to stay loyal. The findings of their study also indicate that even when switching costs are low, purchase intent of customers can be increased by improving the level of customer satisfaction.

Day (1994) mentioned that for several years managers have been exhorting to stay close to the customers and to define the purpose of a business as the creation and retention of satisfied customers. In order to enjoy long-term competitive advantage and superior profitability, companies need to be better equipped in responding to market requirements and in anticipating changing conditions. Market sensing and customer linking capabilities are recognized as the

two distinctive features of market-driven organizations and these distinctive capabilities are difficult for the competitors to understand and imitate.

2.2.2 Factors which can Influence Customer Satisfaction

According to Berry (1995), levels of relationship bonding with customers are categorized as financial, social and structural bonds. Financial bond comes first and it includes the pricing incentives such as discount during purchase, rewards for repeated purchase etc. to secure customers' loyalty. In this case the potential for sustained competitive advantage is low. Social bonds comes in level two which involves personalization and customization of the relationship e.g. communication with customers regularly through multiple means, referring to customers by name during transactions, providing continuity of service through the same representative, and augmenting the core service with educational or entertainment activities such as seminars or parties. In this case the potential for sustained competitive advantage is medium. Structural bonds comes in level three which includes value-added services that help clients to be more efficient and that are not readily available elsewhere. These services are usually technology-based and the solution to the important customer's problem is designed into the service-delivery system rather than merely interpersonal interaction. The problem solution in this case is structural and thus binds the customer to the company instead of or in addition to an individual service provider who may leave the firm. In this case the potential for sustained competitive advantage is medium to high.

Joseph et al. (2016) analyzed the effect of relationship bonding strategies on customer retention. Their study was on the customers of a particular carbon black manufacturer in Kerala and Chennai. From the analysis it was found that different bonds will generate different

customer states of mind towards the company. During the initial stages of the relationship, the buyer's intentions to repurchase will be based on their satisfaction with respect to financial benefits. The interactive communication during the initial stages helps in developing customer relationship. During later stages of relationship, social and structural bonds act as important drivers. Social bonds via the mechanism of interpersonal interaction exert a sufficiently strong influence on customer retention. Structural bonds, operating through value creation activities also exert enough influence on customer retention. These results suggest that interpersonal interaction, triggered by identification and value creation activities, plays an important role in retaining customers. The findings highlight that the companies should not merely rely on financial bonds as a mechanism to build long term customer retention, because they are easily imitated. Instead, the findings suggest that the use of structural bonds and social bonds are more effective to achieve customer retention during later stages of customer-firm relationship. Thus, relationship building strategies should be appropriately executed for retention of customers in B2B context.

Homburg and Rudolph (2001) proposed a model where satisfaction of industrial customers is measured by seven different dimensions such as satisfaction with product, salespeople, product-related information, order handling, technical services, internal personnel and complaint handling. The product dimension covers such issues as product reliability, price/value relationship, and service friendliness etc. The salespeople dimension demonstrates interactions between the salespeople and customers, knowledge of salespeople about their products as well as their usage conditions at customer end. It also includes social aspects of the interaction between the customers and the sales force (e.g. salespeople's friendliness). Product-related information includes information given by technical documentation as well as

information given in brochures or prospectuses etc. Order handling is associated with speed of order confirmation and delivery times etc. The technical services dimension includes the full range of services related to technical aspects of the product application and the speed of availability of service staff. Interaction with internal staff is associated with approachability of the relevant persons at supplier end as well as to the quality of their reactions to written or telephone-based requests. Finally, supplier's complaint handling covers product-related complaints within or without the warranty period.

Einar et al. (2011) mentioned that customer satisfaction is an antecedent to loyal customers which, in turn, are related to profitability. More specifically the cost of customer retention is less than the cost of acquiring a new customer. It is also considered an important source of competitive advantage. The authors provided frameworks for measurement of Customer satisfaction in B2B context and the role of various functions of Customers' organization in purchase decision. The different roles in the customer organization can influence overall customer satisfaction. The authors pointed out that the individuals in an organization will each have different perceptions, history, intentions and goals which will affect their level of satisfaction. It was found that for those responsible for purchasing, the commercial aspects were more important than product related information, while the engineers emphasized the importance of the product-related information over the commercial issues. It was also mentioned that customer organizations may have very different structures. In one organization the main purchase manager decides which product to purchase, while in another organization this decision can be made by a group, often referred to as decision making units or buying centers. In the study of Einar et al., the role as decision-makers was not found as strong as initially believed. Technical service was the dimension with the biggest effect on overall

customer satisfaction in high technology B2B industry. High-technology products will often need skilled technicians when the product malfunctions. Product performances for customer's personnel and for customer's customer both have a positive effect on overall customer satisfaction. Disconfirmation of expectations and perceived performance have different influence depending on which dimension of the product offer they are measuring.

According to Narasimhan, P. L. (2015), purchase decision depends on multiple factors and customer satisfaction approach is an effective tool for optimizing profitability. Customers in industrial markets are professionally trained and technically qualified. Purchasing decisions are made on the basis of compliance of specification, cost effectiveness, dependability of the supply and multiple influencers contribute different point of view to purchasing decisions. Functional benefits involving product design characteristics, aspects that might be particularly attractive to technical personnel. Operational benefits related to product attributes such as reliability and consistency are important to manufacturing and quality control people. Financial benefits i.e. favorable credit terms and cost saving opportunities are important to purchasing managers. Author recommended four elements that affect customer satisfaction viz.

1) The basic elements of the product and service that the customers expect all competitors to deliver

2) Basic support services such as customer assistance or order tracking that make the product or service incrementally more effective and easier to use

3) E recovery process for counteracting bad experiences and

4) Extraordinary services that so excel in meeting customers' personal preferences, in appealing to their values or in solving their problems that they make the products or services seam customized.

Profits from customer relationships can be increased by acquiring new customers, enhancing the profitability of existing customers and extending the duration of customer relationship.

Čater et al. (2010) examined how product and relationship quality influence customer commitment along with their combined effect on customer loyalty in a business-to-business context. Authors mentioned that due to recent technological improvements and increased competition, suppliers find it very difficult to differentiate themselves from competitors solely on the basis of product quality. The focus of differentiation has slowly shifted to building a unique relationship with business partners. That is why managers are generally becoming more and more concerned with understanding and managing the quality of individual business relationships as well as the whole portfolio of relationships. Establishing and maintaining long-term business-to-business relationships require a supplier to establish a high level of customer loyalty. Loyalty depends on different components of commitment viz. affective, positive calculative, negative calculative, and normative commitment. 'Affective Commitment' includes a desire to develop and strengthen a relationship with another person or group because of familiarity, friendship, and personal confidence built through interpersonal interaction over time. Affective commitment therefore, comes from a general positive feeling towards the relationship partner. On the other hand, calculative commitment relates to a rational, economic calculation. Such commitment represents some kind of constraining force that binds the customer to its supplier out of need. Calculative commitment can be 'Negative (locked-in commitment)' or 'Positive (value-based commitment)'. Locked-in commitment refers to staying in the relationship due to a perceived lack of alternative suppliers or perceived switching costs, whereas value-based commitment involves the rational calculation of benefits arising from continuing the relationship. Fourth component of commitment called 'Normative Commitment' was described as an attachment due to felt obligations. Normatively committed

partners continue the relationship because of moral imperatives. Authors also mentioned that meeting the customer requirement of product quality is the basic condition, but quality relationships between customers and suppliers bind members to each other in such a way that they are able to reap benefits beyond the mere exchange of goods. The results show that product quality influences positive and negative calculative commitment. With regard to relationship quality, its "social" dimensions such as cooperation and trust have a much greater influence on commitment than its "technical" dimensions such as knowledge transfers and adaptation. A supplier may possess specific expertise that is not available within the customer's firm and such knowledge may be transferred between firms in the relationship. Adaptation occurs when one party in the relationship adapts its processes, procedures or products to another party. On the "social" side, cooperation and trust positively influence affective and normative commitment, with trust also positively affecting positive calculative commitment, while on the "technical" side the only significant link is between adaptation and normative commitment. As for the consequences of commitment, affective commitment positively influences attitudinal and behavioral loyalty, while negative calculative commitment positively influences behavioral loyalty. In addition to indirect effects, product quality also directly positively influences attitudinal and behavioral loyalty. The results imply that customer loyalty depends more on "Emotional" (affective commitment) than on "rational" (negative calculative commitment and product quality) motivation to continue the relationship.

Gil-Saura et al. (2009) studied the correlation among relationship value, trust, commitment, satisfaction, and loyalty intentions in the business-to-business (B2B) context. It was found that relationship value has a positive influence on trust, commitment and satisfaction towards the supplier. Relationship value in the context of B2B, as defined by Eggert et al. (2002), is a trade-

off between the multiple benefits and sacrifices on the supplier's supply, as perceived by the major deciders in the customers' organization by comparing with the offers available from the alternative suppliers in a specific use situation. According to Gil-Saura et al., loyalty was also positively affected by satisfaction with the supplier. Thus, satisfaction and commitment are key factors because of their impact on intention to continue and expand business with the supplier. In this sense, the supplier should first of all create value for the customer. When the relationship is considered valuable, it generates satisfaction and commitment, affective variables that lead to favorable behavioral intentions. According to the authors, manufacturers should recognize the role of assessing and building relationship value with their partners, as it has an impact, direct or indirect, on intentions to stay in the relationship. The authors recommended future research could include other variables affecting long-term relationships. Moreover, only customer's perspective in the perception of value has been considered in this paper but the vendor's perspective can be different and potential gaps between both parties' value perception can be captured by analyzing this perspective in future.

Rimawan et al. (2017) conducted a study on the factors influencing customer satisfaction for flexible packaging and observed that the factors other than Quality of Product are Quality of Service and Trust which affect customer satisfaction.

Kong Shin Yee (2008) proposed a theoretical framework of relationship quality, customer perceived quality as antecedent of relationship quality and business loyalty as ultimate dependent variable in the business-to-business (B2B) context. According to the author customer satisfaction towards the supplier can be improved by focusing on their perceived quality on both service and product. Consequently, customer loyalty and relationship quality can be enhanced

by increasing customer satisfaction.

Figure 2.01 Proposed theoretical framework of Rimawan et al. (2017)
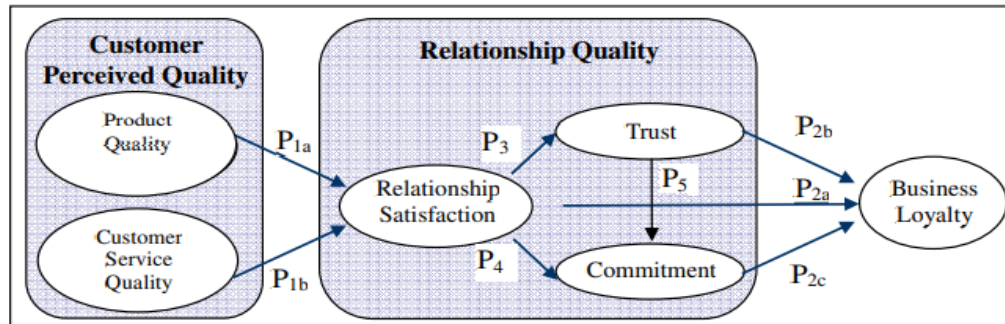
Source: Kong, Shin Yee (2008). Customer perceived quality, relationship quality and business loyalty: An example of B2B organization [Diss]; University of Malaya.

This study has three significant aspects. First, the result of this study shows that it successfully integrates the service (functional)/ product (technical) performance quality dimensions of customer perceived quality, relationship satisfaction, trust, and commitment in a business-loyalty model. As a whole, the results confirms that perceptions of service/product performance quality can be viewed as antecedents to relationship satisfaction which, in turn, affects trust, commitment, and business loyalty as mediation effect. The result demonstrates the equal importance of investment in both product and customer service to achieve greater customer satisfactions. Secondly, results concluded that determinants of relationship quality that are relationship satisfaction, trust and commitment have significant positive effects on the ultimate outcome variable, Business Loyalty. There were consistent results to indicate that relationship satisfaction acts as the greatest outcome influencer on relationship quality and loyalty. Specifically, determinants of relationship quality have been widely accepted in the literature as a relationship outcome and an overall assessment of the strength of the relationship. Thirdly, this study provides empirical evidence of the role of relationship satisfaction as a mediating variable between the constructs of service/product quality and trust, commitment and business

loyalty. Overall, the study supports the proposed integrated conceptual framework of three constructs, namely 'Customer perceived quality-Relationship quality-Business loyalty' in the case of manufacturing organization. Therefore, it gives a useful foundation on which further theoretical and empirical research in the field of B2B business relationship and loyalty can be built. An organizations' marketing strategies should focus on relationship satisfaction, in addition to its product strategies & customer service, in order to sustain its market competitiveness and customer satisfaction. However, the results of the study were based on the survey of a single organization of manufacturing industry, the wooden product manufacturing sector. As such, the applicability of the current findings to other industry contexts would need further research.

Chakraborty et al. (2007) conducted a study to identify the factors that influence customer satisfaction in a business-to-business context. Authors explored customer satisfaction as a function of respondents' perceptions about a supplier and then related the importance of these perceptions to respondents' primary functional areas. According to the authors, the increasing recognition of the significance of developing long-term relationships increases the importance of understanding customer satisfaction. This study enlightens our knowledge about the factors affecting customer satisfaction in B2B contexts. Based on the review of academic literature and expert interviews, the authors identified three major factors viz. reliability, product-related information, and commercial aspects as drivers of overall customer satisfaction in a B2B context. The dimension 'Reliability' includes the items Reliability of the supplier and adherence to delivery schedule. Technical specifications for products and breadth of product line were considered under the dimension 'Product-related information'. Competitive prices, credit policy, return policy, and warranty coverage were considered under the dimension 'Commercial

aspects'. Results supported the importance of these three drivers. Although commercial aspects and product-related information were found to be significant predictors for overall satisfaction, the importance of these two drivers in influencing satisfaction was found to differ among the respondents from different functional areas. For respondents from purchasing, management, and finance/accounting, commercial aspects were found to be more important than product-related information whereas for respondents from engineering, maintenance, and production, product related information was found to be more important than commercial aspects. The reliability driver emerged as the most important regardless of the functional association of respondents. An interesting outcome from this study is that on aggregate the average satisfaction with a supplier was found not to be significantly different regardless of the respondent's primary job functions. Although aggregate satisfaction was not different, the significances of the drivers of satisfaction were indeed different depending on buyers'/users' primary job functions. This differential impact of the drivers of customer satisfaction based on industrial buyers'/users' job function that were uncovered in this study implies that to achieve the best results, a supplier's communication with its buyers needs to be customized to emphasize the right factors. This study is based on customers' perceptions of and satisfaction with a supplier of hydraulic and pneumatic equipment. Therefore, the findings from this study need to be interpreted with caution as they may not generalize to other industries. Another limitation of the study is the small number of items used for measuring the constructs. Though reliabilities of the three factors are reasonable, it would have been better to measure those factors with more items to make sure the whole domain of each construct is tapped properly. Moreover, a significant amount of variance in overall satisfaction was explained with the three factors, but it is possible that there are more factors that contribute to overall satisfaction in a B2B context. Thus, there is a scope of future research to overcome these limitations.

Shirani et al. (2014) presented a conceptual model to measure the relative impact of various factors on customer satisfaction for industrial products such as milk. The factors considered for satisfaction of customers in the model were Price of the product, Quality of the products, Distribution of the product i.e. on time and appropriate delivery, Suppliers' appropriate communication, Trust, Improvement and being responsive, Meeting customers' expectations and Existence of conflict. The relationships between satisfaction of customers in dairy producers as dependent variable and different factors as independent variables were studied. The results of Pearson correlation indicated that there were positive and meaningful relationships between price, quality, distribution, trust and meeting expectations on one side and customer satisfaction from suppliers. In addition, the results of stepwise regression have indicated that price, quality, distribution, trust, expectations and conflict had meaningful impact on customer satisfaction. The effects of the first five variables were positive and conflict had negative impact on customer satisfaction.

Rauyruen et al. (2007) provided a picture of how relationship quality can influence customer loyalty in the business-to-business context. They proposed relationship quality as a higher construct comprising trust, commitment, satisfaction and service quality. These dimensions of relationship quality can reasonably explain the influence of relationship quality on customer loyalty. This study follows the composite loyalty approach providing both behavioural aspects (purchase intentions) and attitudinal loyalty in order to fully explain the concept of customer loyalty. This study was conducted in a business-to-business setting of the courier and freight delivery service industry. As the results show, in order to maintain customer loyalty to the supplier, a supplier may enhance all four aspects of relationship quality which are trust,

commitment, satisfaction and service quality. Specifically, in order to enhance customer's trust, a supplier should promote the customer's trust in the supplier. In efforts to emphasize commitment, a supplier should focus on building affective aspects of commitment rather than calculative aspects. Satisfaction appears to be a crucial factor in maintaining purchase intentions whereas service quality will strongly enhance both purchase intentions and attitudinal loyalty. The limitation of this research is the data in this study is from the courier service industry, which may limit the generalization to other industries and business-to-business settings. The study sampled only Australian SMEs. Because SMEs have different size and characteristics compared to larger corporate buyers, their buying behavior and attitude cannot be generalized for the whole population of business-to-business buyers. Loyalty of larger business buyers may be different to the loyalty of SMEs. These limitations open the scope of future research.

Cheraghi et al. (2004) studied more than 110 research papers to identify the critical success factors for suppler selection and to understand the change in relative importance of various critical success factors in the research reported during 1966-1990 versus 1990-2001. As rightly mentioned by the authors, purchasing can have a significant impact on quality, customer satisfaction, profitability, and market share. According to the authors, increased competition and globalization of markets facilitated by internet-based technologies have combined to dramatically change the ranking of factors while introducing new criteria to the supplier selection process. Dickson (1966) considered 23 factors as important to the supplier selection based on a survey of purchasing agents. These factors are 1)Quality, 2)Delivery, 3)Performance History, 4)Warranties & Claims Policies, 5)Production Facilities and Capacity, 6)Price, 7)Technical Capability, 8)Financial Position, 9)Procedural Compliance, 10)Communication System, 11)Reputation and Position in Industry, 12)Desire for Business, 13)Management and

Organization, 14)Operating Controls, 15)Repair Service, 16)Attitude, 17)Impression, 18)Packaging Ability, 19)Labor Relations Record, 20)Geographical Location, 21)Amount of Past Business, 22)Training Aids, 23)Reciprocal Arrangements. It was confirmed by Dickson that price is not a consistently important factor in the vendor selection process. Similarly, the importance of technical capability, production capacity, and warranties also changes from one instance to other instances. He finally concluded that three factors which are crucial in the choice of vendors are the ability to meet quality standards, the ability to deliver the product on time, and the performance history. Dickson made a few generalizations about the importance of factors in the vendor selection process. He also mentioned that more factors are likely to be considered with the increasing complexity of the product/service being purchased and, in these cases, the price is likely to be relatively unimportant. On the other hand, price is generally the primary factor that is considered in purchases of ordinary products like nuts and bolts. Thus, it was concluded that the nature of the item to be purchased has a major influence on the factors that are considered when selecting a supplier. Thus, the credibility of one universal system for vendor analysis that could be appropriate for all kinds of purchasing decisions was in doubt. Dickson's pioneering work was re-visited by Weber et al. (1991) where 76 articles were published between 1966 (year of Dickson's study) and 1990 based on Dickson's 23 vendor selection criteria. These results were extended by Cheraghi et al. (2004) to encompass research on the supplier selection criteria published between 1990 and 2001. It was observed that Reliability, Flexibility, Consistency, and Long-Term Relationship are four significant new entrants into the list of critical success factors for supplier selection. On the other hand, Warranties and Claim Policies, Amount of Past Business, Desire for Business, and Training Aids are among the factors that have become passé. Based on the results of this study, it is concluded that the change in supplier selection criteria will continue for excellence to include

traditional aspects of performance (quality, delivery, price, service) in addition to non-traditional, evolving ones (JIT, communication, process improvement, supply chain management).

According to Khan et al. (2011), there are always some factors that exist with the product whether goods or services, which may impact customers positively or negatively as well. They studied for a Swedish company which is almost newly growing and performs services (web designing and web marketing) for its customers and tried to highlight some basic factors and examined how they effect on customer satisfaction. Their findings showed that the factors such as responsiveness, professionalism, complaint management system, customer care, technology, efficiency & performance, price, service quality and overall experience of the customers towards company's services are examined with negative impact on customer satisfaction as almost half of company's customers were observed dissatisfied. Customers showed their dissatisfaction level with respect to aforesaid factors which considered with negative impact. Two factors that are found with positive impact on customer satisfaction are company's responsiveness and attitude towards its customers. Responsiveness, attitude, professionalism, complaint management system, customer care are regarded as human factors; whereas technology, efficiency & performance, price, and service quality belong to product factors. It is quite notice worthy for a company to take serious considerations to remove the negative impact of above-mentioned factors in terms of making customers satisfied. Authors recommended that negative impact of human factors on customer satisfaction can be reduced by providing sufficient training to the company's employees and establishing specific department for specific job (if a company doesn't have specific department for customer care) such as sales department for sales and customer care for handling customer complaints etc. Authors also mentioned that companies need to figure out with product factors in the same way.

In case customers seem dissatisfied with the price and service quality, company may add more value to justify the price or set the reasonable price to give its customers a complete set of offerings in order to wipe off the impact of dissatisfaction. Companies need to upgrade technology, increase its efficiency and performance level for producing quality products for its customers in order to make them satisfied or delight. Therefore, companies need to work out more in order to generate positive impact of both human factors and product factors as well.

Ahmad et al. (2001) studied how HDoX (a producer and supplier of per oxygen products, which includes Hydrogen Peroxide) retain a group of business customers. Hydrogen peroxide is an industrial chemical that has wide applications from the disinfecting of equipment in the foodstuffs industry to the bleaching of paper pulp. According to the authors, about 80 per cent of its bulk users have been buying from HDoX for more than five years, which has given HDoX a substantial slice of the market for hydrogen peroxide at several times the combined shares of its competitors. This case study highlighted two issues viz. 1) retaining business customers and ensuring that they continue to buy a particular industrial product involves building and maintaining relationships not only with buyers but also with third parties 2) sellers can retain their business customers by continuously adapting to their needs within the context of their network relationships. It is an extremely challenging activity to retain existing customers. The authors illustrated how HDoX managed relationship with its buyers through multi-level bonds as follows:

- Level-1: Financial bonds by maintaining a competitive price. It is achieved by adopting a flexible stance on pricing. HDoX adjusted its price by taking into account the importance of customers in terms of volume of consumption and value of purchases. It is a basic

approach which might be suitable for regular switchers or for products that have a very limited scope for augmentation.

- Level-2: Social or Actor bonds by maintaining close friendship between representatives of HDoX and its buyers at various levels from engineering to production. It is achieved mainly by operating a dedicated customer care team and assigning a dedicated sales manager to every customer. There are other activities such as joint research and development projects which also had helped to enhance bonds between engineers and production staff. HDoX adjusted social behaviors to customers' preferences for closeness and used the appropriate mechanism, e.g., members of the customer care team maintained contacts by telephone and Area Sales Managers made regular visits. Closeness in relationships increased the level of dependency by representatives of buyers for advice as an avenue to voice their opinion and / or complaints, provided opportunities for representatives of sellers to gather useful market information or used to build activity links and forge resource ties.

- Level-3: Structural bonds where HDoX maintained activity links and built resource ties. It is achieved through the process of educating the public, providing specialized technical support, and in providing ancillary support. Activity links are maintained through joint activities in research and development, inventory management, training, education, safety audits, and marketing (with distributors). Resource ties are built on joint investment in telemetry system, expertise and knowledge. HDoX customized products, in terms of grade and / or packaging, adjusted its marketing and administration activities to suit buyers, exchanged and shared knowledge on new processes or product specifications, recognized the usefulness of third parties and made them involved–outsourcing some of the activities.

Activity links and resource ties could not only increase the barriers for switching but also offer opportunities for optimizing resources e.g., joint knowledge and improved production processes, which in turn reduced operating costs. Structural bond is potentially a useful mechanism for keeping customers profitability.

The normative strategy of HDoX was to understand its customers and adapt to their situations. HDoX adapted to their buying behavior, their competitive situation, and their product applications. The authors recommended that firms could consider using a hybrid channel both in physical distribution of goods and in the dissemination of information. Firms like HDoX could develop a website and use the internet to educate the public and potential users. Sales people, buyers, engineers and production managers could discuss and share information with the use of document-based groupware. Orders, enquiries, status of deliveries, progress of projects could also be available on an extranet (between the firm and specific customers). Similarly, essential information about a particular customer could be made available to selected parties within the firm through an intranet (between members of staff within the firm). The authors mentioned that many firms like HDoX have moved away from relying entirely on financial bonds or attractive prices to higher level bonds such as actor bonds and structural bonds. More importantly they customized their relationships with various business customers. Authors reminded also that the firms should be aware that not all business customers will prefer closer actor bonds. Some of them resist entering into a long term commitment such as sharing information about business operations. The authors suggested that selling firms should remain flexible in forming the right type of relationships with their business customers and that can be achieved through mutual adaptations. Further studies on other contexts may offer new insights into new form of business-to-business bonds.

Akman et al. (2012) investigated manufacturer-supplier relationships in metal manufacturing industry of an emerging country, Turkey and tested the measurement and structural features of a model. The findings of the study include a significant positive relationship of trust and commitment with customer satisfaction, and a significant relationship between cooperation and satisfaction, as well as an indirect relationship (via customer satisfaction) of trust, commitment, cooperation with loyalty, a direct relationship between communication and loyalty, a direct relationship between satisfaction and loyalty. This study makes a contribution to both theory and practice in the field. Contrary to the expected mediation by satisfaction, direct effect of communication on loyalty can be of particular interest in the context of B2B relationship. Managers can utilize the findings of this study that trust and commitment are a key factor for customer satisfaction and communication is very important for customer loyalty. The authors recommended for future research, validity of the findings should be investigated through studies in other industries and other countries. Other dimensions of relationship should be included to the model of the study such as knowledge sharing, power, autonomy, conflict, adoption etc. and their effects should be investigated on the satisfaction and loyalty.

According to Arefi et al. (2010), since customer satisfaction is essential for lasting survival and development of a business, screening and observing customer satisfaction and recognizing its underlying factors must be one of the key activities of every business. According to the authors, when customer satisfaction improves, customers will become loyal to business and it makes people talk positively about the business and ultimately the profits will grow. Also, when customers are satisfied, they will have less complaint and therefore, the costs of controlling the complaints will decrease. Thus, evaluating customer satisfaction and understanding factors that affects this satisfaction will be useful for the firms to find methods to improve their competitive advantage. The authors conducted a study on business customers of a manufacturer of Diesel

Generator in Iran to know their ideas and satisfaction on supplier's services related to its products and to recognize the drivers that effect customer satisfaction in a business-to-business situation. The authors made the following list of factors, based on literature studies and expert interviews, that might be important for customers to be satisfied with the company's products or services:

1) Supplier reliability

2) Sticking to delivery schedule

3) Technical characteristics of the product

 4) Breadth of product line

5) Competitive prices

6) Credit strategy

7) Return policy and

8) Warranty coverage.

Above list was summarized to three features of Reliability (items 1 and 2), Information about the product (items 3 and 4), and Commercial features (items 5 to 8). Their findings of the study also supported the significance of these factors. The most important driver of satisfaction was found as 'reliability', since lack of reliability of supplier may result in downtime, whose cost is often high. Respondents from different functional areas attribute different degrees of importance to the last two drivers. For example, people from buying and management areas believe that commercial features are more important than information about products. Whereas people from production, engineering and maintenance functions believe that having information about products is more important than commercial aspects. The authors recommended that marketing experts should consider the attribute of customers regarding information about the product and commercial features to improve market share. Although all the three factors are logically

reliable, the number of questions in the survey was kept less may be in order to obtain a good response rate with better quality. So, it is better to evaluate them with more items, because by so doing, it can be assured that the complete realm of every construct is correctly tapped. Samudra et al. (2020) conducted a study to identify the effects of different factors such as perceived value and perceived quality to influence customer satisfaction in chemical industry. The study was done to help in managing customers properly and balancing between perceived quality and perceived value. In this empirical study, perceived quality is reflected by product quality and four constructs of services dimensions viz. reliability, assurance, empathy, responsiveness. The authors mentioned product quality in the chemical market is considered in terms of quality consistency, the emissions and toxicity level, the reject level, lifetime, and durability. Although quality must meet the set parameters, the chemical market keeps monitoring cost from the economic point of view. As long as the quality parameter is still within the acceptable standard range, the chemical market will choose the most efficient chemical product and the efficiency, in chemical industry, is measured in terms of cost during consumption in the end product. According to the authors every chemical quality improvement by one manufacturer can be duplicated by other manufacturer fast. Hence chemical market tends to evaluate product quality based on performance consistency. Chemical companies sometimes try to get a competitive advantage from services; however, it does not contribute a significant impact to the value. The implication of the first finding is the seller's effort to get the most efficient chemical product. R&D team of seller makes an effort to get a chemical formulation with the lowest cost while still meeting the parameters or fitting into the customer's quality standard range, while the sales and technical people will work together to penetrate the market. From a technical standpoint, the application result will come with an economic benefit such as savings. The perceived value, on the other hand, is the customer's benefits (in terms of

core solution and the additional services) towards sacrifices (in terms of price and relationship cost). It compares the benefit obtained by the customer and the cost customer gives in the interaction between buyer and seller. The result of the study confirms that the influence of perceived value on customer satisfaction is stronger than that of perceived quality. The authors mentioned that chemical market tends to put perceived value as a priority as long as the product quality meets the standard parameter. They also mentioned that perceived quality is reflected more by service while there is less point of differentiation on tangible product. The authors explained the background why perceived quality is reflected by services dimensions stronger than tangible product does. As long as the product meets to the parameter range, then customers review to the cost. Sellers try to avoid commoditization by enhancing services performance. The implication of this finding is necessary to focus more on customer service to get a competitive advantage purposely. The authors recommended that responsiveness level is the most robust service dimension; responsiveness is about speed and accuracy level in responding to technical and commercial issues. The ideal site location in the middle of the chemical market concentration, proper recruitment and development of people becomes necessary as they relate to service performance.

An empirical study conducted by Susanti et al. (2020) to investigate which rational factors have a stronger influence on customer satisfaction and brand loyalty, with the particular focus being on rational perceived quality and rational perceived value in B2B context with reference to chemical complex products, such as emulsions. It was also studied how price sensitive is the buyer towards the product quality. This research was limited to the common rational factors that influence customer satisfaction to brand loyalty, which is rational perceived quality and rational perceived value. Rational perceived quality was identified as a reflective latent construct of second order, capturing three dimensions: product quality, reliability, and

responsiveness. The authors defined perceived value as the consumer's overall assessment of the utility of a product based on what benefit is received and what is sacrificed. Benefits may be economic and social, and other sacrifices as, time, effort, price, risks and convenience. The economic and rational analysis is done by comparing benefits and sacrifices. According to the authors, the benefits are the functional performance, all technical parameters, performance during and after chemical application, and technical service performance in case of chemical complex products, such as emulsions. The authors mentioned that a brand is defined in terms of name, sign, symbol, design, or a combination of them, which are intended to identify the product and/or services (Keller, 2013). In the chemical complex products industry, brand identity is indicated by the company's name in the buyers' perspective; buyers perceive corporate brands to be more important than product brands. The conclusion of the study was that the rational perceived quality has a stronger positive influence on customer satisfaction than the rational perceived value does. It was found that buyer's brand loyalty is driven by customer satisfaction. It was also found that the service dimensions in terms of reliability and responsiveness are the stronger dimensions of perceived quality than tangible product quality, although both factors are important when it comes to customer satisfaction. It was concluded that services play a crucial role in the chemical industries. Authors proposed future study by taking other constructs into account as, brand awareness and brand associations. Although the purchasing decision process in the industrial markets is often through rational and calculative consideration, in some cases, there could be a possibility that the decision is also partially influenced by emotional aspects. For instance, if the buyer has no experience of dealing with the seller before, or it is a new product for them, then the brand image might be beneficial in the purchase decision-making process.

Sinčić Ćorić et al. (2015) studied the applicability of Keller's brand equity model in the B2B

chemical market. Buyers of specific industrial chemical products in the South and Eastern European B2B chemical market were interviewed. Authors mentioned that a B2B brand's importance is enhanced due to the following drivers: globalization, hyper competition, proliferation of similar products and services, increasing complexity, high price pressures, greater awareness of a strategic brand issues provoked by significant mergers and acquisitions, increased societal impact of many B2B operations, and increased interest in brands and corporate reputation among business buyers. Keller's Customer Based Brand Equity (CBBE) model presumes that brand equity is built through four steps, and that every step is dependent on the successful realization of the previous one. The steps ensure that the brand is first identified (identity), and then understood (meaning), then it provokes a customer's reaction (response) and finally builds the relationship with the customer (relationships). In order to achieve the final goal – a harmonious relationship between customer and the brand, Keller's model consists of six brand building blocks – salience, performance, imagery, judgements, feelings and resonance. Moreover, each building block is made of several sub-dimensions: category identification, and need satisfied (Salience), primary characteristics and secondary features, product reliability, durability and serviceability, service effectiveness, efficiency & empathy, style & Design, and Price (Performance), User profiles, Purchase & usage situations, Personality & values, and History, heritage & Experiences (Imagery), Quality, Credibility, Consideration, and Superiority (Judgments), Warmth, Fun, Excitement, Security, Social approval, and Self-respect (Feelings), and Loyalty, Attachment, Community, and Engagement (Resonance). The results of the study conducted by Sinčić Ćorić et al. (2015) showed that the Keller's brand equity model is applicable to B2B chemical market, however, the six brand building blocks – salience, performance, imagery, judgements, feelings, and resonance – as well as sub-dimensions that assemble the blocks, need arrangements in different ways to meet

the logic of the B2B marketing philosophy. As a result, the respondents perceive corporate brands as more important than product brands. The relationship with sales representatives is also significant in building brand equity. Partnership relations and cooperation in developing solutions oriented towards improvement of customers' production processes were set at the top block of the pyramid.

Figure 2.02 Applicability of Keller's brand equity model in the B2B chemical market

Figure 1. Revised model appropriate for B2B market.
Source: Keller (2003), Kuhn et al. (2008) and the current study.

Figure 2. Subdimensions of revised model appropriate for B2B market.
Source: Keller (2003) and the current study.
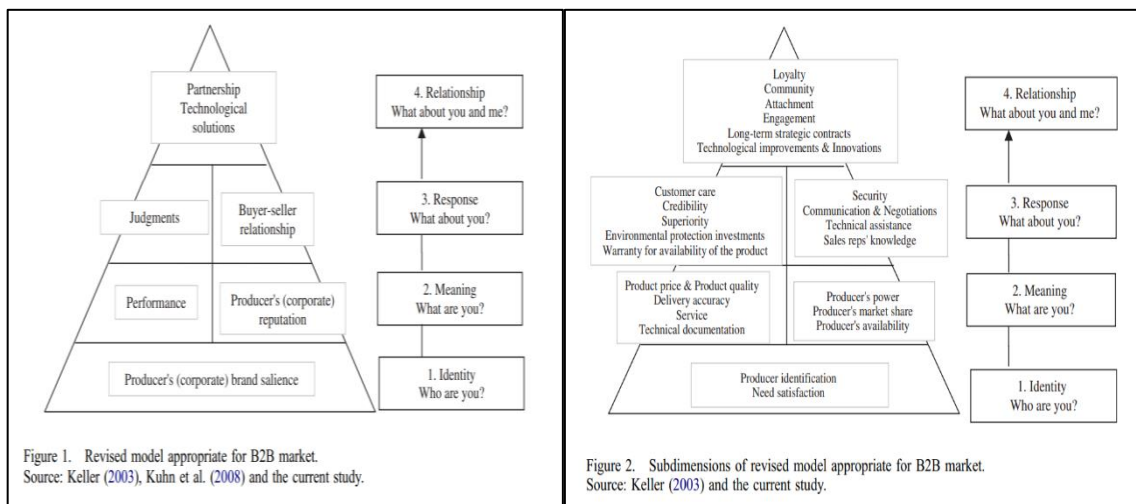
Source: Sinčić Ćorić,D.S., & Jelić,D. (2015) Applicability of Keller's brand equity model in the B2B chemical market, Economic Research-Ekonomska Istraživanja, 28(1), 1006-1017.

The authors recommended some future research should focus on behavior of the sales representatives especially in interactions with the customers, in order to define the dimensions that enhance (or weaken) brand reputation amongst demanding B2B customers.

By using the Multi-criteria Satisfaction Analysis (MUSA) method, Dimitrios Drosos et al. (2019) measured industrial customer satisfaction in the natural gas sector in Greece based on criteria related to the provided products and services, communication and collaboration with providers' staff, customer service, pricing policy and website. The research results show that

the satisfaction index of the global customer has a good performance as its value is about 75%.

In certain criteria such as pricing policy and website the level of satisfaction is very low.

However, these criteria with low performance are in the so called "status-quo" of the action

diagram, which means they are not significantly important for industrial customers'

satisfaction. Thus, the natural gas providers should not invest very high resources in improving

these criteria. The satisfaction criterion with the highest performance is the one concerning

communication and collaboration with the staff of natural gas providers. The criteria

"communication and collaboration with staff" and "customer service" are located in the

transfer resources area which means that no funds should be invested for improving them, as

they are of low importance. The "products-services" criterion is located in the leverage

opportunity area of the action diagram, which means that this criterion is of high performance

and importance; thus, it is the criterion the greatest attention should be paid.

Figure 2.03 Satisfaction criteria action diagram
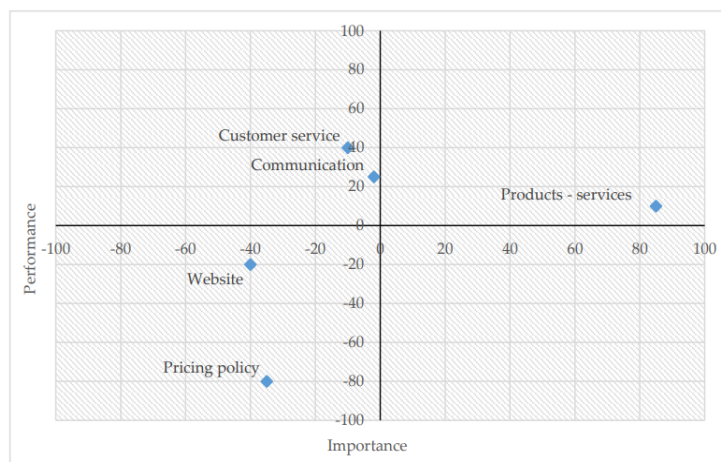
Source: Dimitrios Drosos , Michalis Skordoulis , Garyfallos,Arabatzis, Tsotsolas, N., Galatsidas,S. (2019, March). Measuring industrial customer satisfaction: The case of the natural gas market in Greece, Sustainability, MDPI, Open Access [Journal], 11(7), 1-16.

The authors recommended that the results cannot be automatically generalized before a

systematic replication is achieved. Besides, the results of similar surveys show that there are differences in the satisfaction level of industrial customers belonging to different sectors and, as far as it is concerned, there is a need for different strategic choices.

Susanti et al. (2019) conducted a study to identify which factor has a stronger influence on customer satisfaction: perceived value or brand association. By understanding the influencer, the seller can understand what policies and implications should be addressed to maintain and even enhance customer loyalty. The authors mentioned their findings on literature survey that globalization across countries and commoditization encourages companies to develop branding strategies to give themselves a competitive advantage in the market. Perceived brand quality influences customers to pay a higher price. This finding triggered them to investigate the influence in the context of the chemical market. The authors also highlighted that industrial buyers tend to mitigate risks in purchasing decisions by purchasing from a strong brand and strong brand has a rational influence and an emotional influence on its customers. In this empirical study, a rational influence is reflected by perceived value, which compares the product and/or service performance towards the price. It is understood that successful B2B branding would enhance a company's sustainability in a turbulent business environment and even help with the company's financial performance. They also mentioned that the chemical market concerns product quality, product safety, delivery, accessibility, availability, and correct technical documentation. The chemical market the products are perceived as high quality, dependable, consistent, and innovative. As experienced by the authors, the chemical market sets its prices by comparing product quality and price. They mentioned that BASF AG, a worldwide chemical corporation in Germany, introduced eco-efficiency tools, which correlates chemical products with environmental awareness and the possible effects of chemicals on human health and the product cost. The positive impact of this awareness is then

associated with the company's brand. The socio-eco-efficiency solutions combine a relatively environment friendly chemical product performance with perceived value (social benefits and low costs) at the same time. This study aims to examine the effect of emotional brand associations and rational perceive value on customer satisfaction. Based on the findings of this study, the author identifies some critical findings. First, the chemical market is influenced more by brand association than perceived value. Hence, a company must keep delivering positive value to their customers as anything related to their brand will contribute either positively or negatively to their brand image. As brand ambassadors, salespersons contribute critical messages, experiences, and company image to the customers. A chemical company must monitor and deliver proper policies and training to all stakeholders; every activity and everything related with the product, services, company or other stakeholders are associated with the company's brand. Second, a proper pricing strategy should be implemented to support brand value. In the chemical market, price is a secondary consideration. The right pricing strategy will add value to the brand since it relates to the point of differentiation for products and services. This empirical study concludes that positive perceived brand quality shall influence customers to pay a higher price. This empirical study contributes to the literature in two ways. First, the findings confirm the importance of brand associations over price. The final purchase decision is influenced by brand associations more strongly than price, thereby demonstrating the importance of positive activities related to the brand. Second, the study provides insight on brand associations, which is more strongly assessed by salesmen personality than brand image. This demonstrates the importance of proper recruitment and development of talent, in particular salesmen as brand ambassadors. This finding may serve as a starting point for further research. Due to the simplicity of the model used in this study, future research should use other constructs to measure perceived quality, brand loyalty or even social

bonds. Authors also recommend replication of the studies in other contexts to confirm the applicability of the findings in other industries.

According to Brunner et al. (2008), satisfaction plays a crucial role, whereas image plays a much smaller role in impacting loyalty in case of new customers. However, the importance of satisfaction decreases and the impact of image increases for experienced customers.

Hoe et al. (November 2018) conducted a study on the factors that can assist a company to get a sustainable competitive advantage through the effective enhancement of customer satisfaction and ultimately customer loyalty. They proposed a conceptual model which consists of the different dimensions of product quality as the independent variables with customer satisfaction as dependent. The authors mentioned about Garvin's eight dimensions of Product Quality that affect Customer Satisfaction which impacts Loyalty. These dimensions are as follows:

1) Performance which refers to a product's primary operating characteristics

2) Features which are additional characteristics that enhance the appeal of the product to the customer; these are the secondary aspects of performance

3) Reliability which is the likelihood that a product will not fail within a specific time period when put in use

4) Conformance which is the precision with which the product or service meets the specified standards

5) Durability which measures the length of a product's operating life

6) Serviceability which is the speed, ease and costs with which the product can be put back into service when it breaks down

7) Aesthetics which refers to how the product looks, feels, sounds etc.; it is a matter of personal judgement and a reflection of individual preference

8) Perceived quality is the quality attributed by the customer, noting that perception is not always reality.

Using survey questionnaires participants from the Procurement Department of the different business segments of the industry were asked to consider aspects of the major suppliers of the company that provide parts, service, and/or raw materials that have high contribution in their business processes and productions. The results of the data analysis provide insights to understand the dimensions of Product Quality that affect customer satisfaction in the engineering industry in Malaysia. The dimensions of Product Quality highlighted by the participants of customer organizations as significant are Durability, Serviceability, Aesthetics and Perceived Quality. Out of these dimensions, Serviceability and Perceived Quality has the highest impact on Customer Satisfaction, leading to Loyalty. The influence of Performance, Features and Reliability on the satisfaction is not significant. A possible explanation for this result could be due to stress given by the Procurement personnel on cost as their main priority. Customers highlighted the importance of product design that differentiates from that of others in terms of Serviceability, Perceived Quality, Durability and Aesthetics. They also identified the requirement of research and development for the products superior to that of competitors offering that meet the needs of the customers and on the future needs of the market. This may also require review of talent management program from the stages of attraction, training, development and retention of their employees. The authors recommended for future research to carry out a longitudinal study as the expectation and requirements of customers can change over time. They also recommended to replicate this study with other customer organizations in the industry to further validate its findings.

The study conducted by Radder et al. (2019) identified and confirmed five drivers of customer satisfaction namely: Service quality, Trust and commitment, Product quality, Commercial

aspects, and Reliability which are relevant to the stainless-steel stockist and distributor market in South Africa, and thus adds to the knowledge base of customer satisfaction in B2B markets in developing countries in general, and in the stainless-steel industry, in particular. The target population for their study included all the account clients of one of the major stockists and distributors in the South African stainless-steel industry. Typical clients of stockists and distributors are manufacturers, production companies, small, medium and large traders, and private customers. The authors referred various researches done earlier on the drivers of customer satisfaction in B2B context as follows:

Table 2.01 The drivers of customer satisfaction in B2B context

Authors	Driver(s) of customer satisfaction (B2B)
Askariazad and Bahakhani (2015)…………….	Perceived quality
Čater and Čater (2009)……………………...	Delivery performance, supplier knowhow, personal interaction
Chakraborty, Srivastava, and Marshall (2007)..	Reliability, product related information, commercial aspects
Chenet, Dagger, and O'Sullivan (2010)……….	Trust, commitment
Chaniotakis and Lymperopoulos (2009)………	Service quality
Chumpitaz and Paparoidamis (2004)………….	Service quality
Deng et al. (2010)……………………………...	Trust, Service quality
Gruber et al. (2008)……………………………	Attributes of customer contact employees (Friendliness, Active Listening, Competence, Apology and Respectful Treatment))
Helgesen (2007)…………………………………	Product quality, Service quality, Competitive prices (Hygiene factor)

Authors	Driver(s) of customer satisfaction (B2B)
Hsu (2008) …………………………………..	Perceived quality, perceived value, trust
Jayawardhena (2010) ………………………….	Service encounter quality encompassing professionalism, civility, friendliness and competence dimensions. (Service encounter is a dyadic interaction between the customer and service provider)
Juga, Juntunen, and Grant (2010) …………….	Service quality
Selnes (1998) …………………………………..	Communication, commitment, Conflict handling
Spreng et al. (2009) …………………………….	Service quality

Source: Construction with reference to Radder et al. (2019) and the sources indicated in the table.

Fornell et al. (1996) referred American Customer Satisfaction Index (ACSI) model to mention overall customer satisfaction (ACSI) has three antecedents viz. perceived quality, perceived value, and customer expectations. Perceived quality is the evaluation of recent consumption experience by the served market. According to the authors two primary components of perceived quality are 1) the degree to which the firm's offering (product and / or service) is customized to meet various customer requirements (customization) and 2) the degree to which a firm's offering is standardized, trustworthy and free from deficiencies (reliability). They found that the influence of customization is more than that of reliability on customer satisfaction and the impact of quality on customer satisfaction is more than that of price.

Their analysis shows a moderate to strong positive relationship with overall satisfaction for four of the five drivers. It was found that Reliability is the most important driver and product quality received the highest average satisfaction rating. Reliability, service quality and

commercial aspects are the drivers with the largest significant gap scores (the differences in the mean scores). According to the authors, management should focus on the important drivers with the highest negative gap scores between satisfaction and importance, and those showing a significant relationship with overall satisfaction. This research has practical implications also. The results show that the importance ratings exceed the satisfaction ratings for all the drivers of satisfaction. Knowledge of the specific gaps can help in drawing the attention of management on those aspects where delivery is unsatisfactory, while directing the application of resources away from areas where delivery exceeds importance. The authors recommended that the organization should pay specific attention to the following points:

a) Keeping promises regarding delivery

b) Adhering to delivery due dates

c) Being dependable

d) Ensuring accurate account documentation

e) Offering a good returns and credit policy

f) Maintaining consistent and reliable product quality

g) Conforming to job specific requirements

h) Meeting expected standards

i) Making the customer feel that the organization has his/her best interest at heart

j) Handling complaints in a satisfactory manner and

k) Delivering prompt service.

According to the authors future research can be done to examine further variables such as e-service, project management and convenience, to acquire a more holistic understanding of what drives customer satisfaction in the business-to-business context. It is also recommended to include more organizations in future research in order to confirm the importance of the drivers

of satisfaction and to examine the combination of trust and commitment as a driver of satisfaction.

Lostakova et al. (2014) conducted quantitative research in four selected chemical companies in the Czech Republic in different SBUs producing products for further manufacturing viz. industrial explosives, organic dyes and pigments, organic semi-finished products and specialties and cellulose derivatives, inorganic acids and salts. The aim of this quantitative marketing research was to map how managers operating at different levels of the management hierarchy and managing various business activities within the internal value network perceive the usefulness of various aspects of the supply and the behavior of suppliers for strengthening their relationships with the suppliers. It was also examined how customers evaluate the actual level of the various aspects of the supply and the behavior of their suppliers. This will reveal gaps in the suppliers' supply. The research has identified five key factors of enhancing relationships with customers in B2B context, namely perfect products and services to customers through professionalism, reliability, flexibility and speed of suppliers, sharing of information, know-how and common tactical and operational planning, joint R&D and strategic planning, cooperation in modernization of customer's plants and help in serving markets, personal contacts at all levels and special events for the customer's staff, and creating personal relationships of trust with customers. The research has shown that partnerships and flexibility of suppliers in serving customers is an increasingly important factor in strengthening relationships with customers, especially in the B2B markets. Professionalism, responsiveness, and reliability of suppliers in serving customers, meeting the agreed delivery dates, creation of a personal relationship of trust with customers and systematic and regular surveys of attitudes of customers towards the supplier and its supply and services were found to be very beneficial

for strengthening relations with customers, and for increasing their retention and loyalty to suppliers. The partnership between suppliers and customers is greatly influenced by the high flexibility of the supplier in serving the customer, characterized by the breadth and speed of response to changing requirements of customers and supplier's ability to meet extraordinary customer requirements. The research has revealed that, in the case of products intended for further manufacturing, collaboration in the development and testing of products and technologies and comprehensive supplier participation and assistance in securing the use or processing of the products with the customer are very beneficial for strengthening relations with customers. The research has confirmed that, organizing special events like training and professional conferences and workshops for the customers is very beneficial as it allows the suppliers to get to know each other better, to establish personal relationships and better understand the problem, requirements and preferences of business partners and develop a better offer for them and a method of serving customers. It was also shown that the perception of usefulness of most partnership and flexibility aspects does not differ among managers of the surveyed categories of chemical products. Those can be considered very useful for strengthening customer relationships for the products of the chemical industry, regardless of the product category.

Doney et al. (2007) conducted a study to specify and test factors surrounding trusting relationships between buyers and suppliers in a global, business-to-business services context. A literature review and results of qualitative interviews provides a conceptual framework for the trust formation process and relational outcomes of trust. The research then tested a model of hypothesized relationships using structural equation modeling. The sample consisted of buyers of aviation component repair services. The study confirmed the influence of behaviors

like social interaction, open communications, customer orientation and service outcomes like technical, functional and economic quality on trust formation. Trust was shown to have a positive influence on key relational outcomes, loyalty commitment and share of purchases. Research findings showed that buyers assess trust building behaviors as well as tangible aspects of the service offering in order to gauge a service provider's trustworthiness. However, social behaviors seem to dominate the trust building process. It was also revealed that customer orientation has almost twice the effect of offer quality in building trust which in turn plays an important part in developing loyalty commitment and expanded business opportunities. The authors suggested that future research might consider the part trust plays in promoting other important relational outcomes in this context e.g. relationship longevity, positive word of mouth. They also suggested additional study may be conducted on other "relational" antecedents of trust e.g. goal congruency, shared values.

According to O'Cass et al.(2012), innovation and marketing play a crucial role to provide positional advantage of supplier firms through the ability to create value for customers in a business-to-business (B2B) context. The authors conducted a study to know the extent to which the creation of superior performance, relationship, and co-creation value is driven by market orientation (as a market sensing capability), product innovation and marketing capabilities in B2B firms. The survey was conducted on 155 large B2B firms in Australia.

Figure 2.04 Theoretical framework integrating actions-performance linkages between product innovation and marketing capability, MO, and value creation in B2B firms.
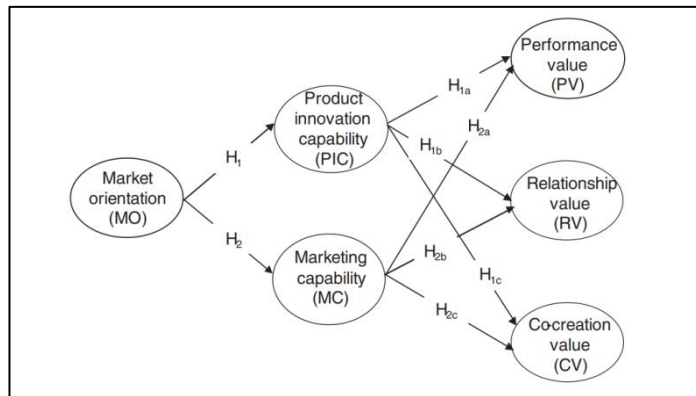
Source: *https://* doi.org/10.1016/j.indmarman.2011.11.018

O'Cass et al. (2012) mentioned that the product innovation capability helps to constantly align the firm with changing market needs in the effort to capitalize on opportunities. As per Adler & Shenbar (1990), an organization's technological base is assessed by determining its' product innovation capability that meet current market needs and to meet projected future needs, to respond promptly to unexpected technology moves by competitors and to unexpected opportunities. According to Tamer et al. (2003), firms with superior innovation capability employ a learning-by-doing effect, and it is extremely difficult for the competitors to imitate it. Marketing capability involves effectively marketing the offering to protect the customer base, building product, company reputation and brand success. The authors mentioned that a unique marketing capability is developed as marketing knowledge and skills are combined to execute marketing actions. Thus, it is difficult for the competitors to imitate marketing capability and it cannot be easily substituted. The third capability involves market orientation (MO) which provides firms with market-sensing capabilities that leads to the development and deployment of superior value creating capabilities (innovation and marketing). The authors

referred Day and Wensley (1988) to explain superior performance requires a firm to achieve positional superiority based on the provision of superior customer value. According to O'Cass et al. (2012), the firms need to understand customer expectations and then transform these expectations into a bundle of value offerings in the form of product advantage (product performance value) and relational advantage (relationship and co-creation value). The results of this study showed product innovation capability and marketing capability partially mediates the relationship between a firms' market orientation and its ability to create performance value and co-creation value, except for the role of marketing capability which the authors found to act as a full mediator of the relationship between market orientation and relationship value. The authors suggested future research can take into account potential 'action' components other than MO, product innovation capability, and marketing capability.

According to Dasbiswas, A. (2007) customer Satisfaction is the feeling of the customer that the product or service meets or exceeds the expectation of the customer. The author also mentioned that satisfying current customers is equally important as that of attracting new customers and moreover it is less expensive. The author conducted an empirical study on customer satisfaction and an in-depth analysis covering three industries viz. chemical, engineering and computer. By selecting two companies in each these three industries, a total of 409 valid responses were received from 310 buying organizations of those six companies (sellers). The author studied the effects of factors like Product Quality (PQ), Price Fairness (PF), Relationship Quality (RQ), Order Management Cycle (OMC) in his research work on customer satisfaction. In addition to studying the individual impact of these four factors on customer satisfaction, the simultaneous impact of these two variables RQ and OMC on CS, combined influence of RQ and OMC on two other associated variables, product quality (PQ) and price fairness (PF) were also studied in this research work. The major findings of this

research work indicate product quality' has a positive relationship of low degree with 'customer satisfaction', 'price fairness' has an insignificant but positive relationship with 'customer satisfaction', 'product quality' has a positive relationship of moderate degree with 'price fairness', 'relationship quality' has a significant positive relationship of high degree with 'customer satisfaction', 'order management cycle' has a significant positive relationship of high degree with 'customer satisfaction', 'relationship quality' has a significant positive relationship of high degree with 'order management cycle'. It was also found that the combined effect of 'product quality' and 'price fairness' has a greater effect on 'customer satisfaction' than the individual effects of each one and the combined effect of 'relationship quality' and 'order management cycle', has a greater effect on 'customer satisfaction' than individual effect of each one. The author also mentioned that the extent of relationship quality can help customers to accept new products much easily, to pay a higher price for it and ignore any deficiency in the order management cycle. Thus, it is evident that customer satisfaction depends on a bundle of multiple factors. Although Price and credit may help to get higher quantity of orders but customer satisfaction is the key factor in getting repeat orders. It was also found that reduction in prices may attract many customers, but it is the relationship quality which helps in retaining the existing pool of customers.

Loyal customers are likely to purchase more frequently, likely to try new products or services and recommend products and services to others (Haghkhah et al., 2013). Keeping in view the fact that customer loyalty is manifested in repeat purchases, Samudro et al. (2019) conducted an empirical study on industrial market to investigate the influence of customer satisfaction, commitment and switching cost on the final purchase decisions from the perspective of the chemical market. Satisfaction and commitment are known to be two basic predictors of loyalty. Commitment, as defined in previous studies, is an intention to develop and maintain a long-

term relationship. According to the authors, custom made products work in the early period of relationship in the chemical market; custom chemical formulations are adjusted and developed by a firm for specific prospects and/or customers. However, this commitment input works temporarily until the product trial is complete, after that the attitudinal aspect of commitment is required to maintain the relationship in the future. Firms give importance to long-term benefits rather than short-term attractive alternatives. Switching cost is defined as the perceived economic and psychological costs associated with the replacement of existing suppliers by other alternatives. According to the authors, chemical market requires a lot of work with new alternative products and services and it needs workers to make a necessary adjustment to adapt and respond to new procedures. This switching from the existing system triggers psychological resistance and burden upon workers. Moreover, it also requires chemical industry to have specific investments in machines, equipment etc. These investments may be a barrier for customers to switch to alternative suppliers. Hence, switching costs may be considered as a tactic to retain customers. The results of this study confirm that customer commitment and satisfaction have a stronger influence on customer loyalty as compared to switching costs. Satisfaction does not have a direct influence on loyalty unless commitment is used as a mediator. The findings of this study suggest that switching cost cannot be considered as an appropriate tactical step to achieve customer loyalty. The wood industry under present study considers quality consistency a top priority. Wood industry generally takes time to achieve customer loyalty and for this reason satisfaction does not directly influence customer loyalty in this industry. The authors suggested the requirement to monitor and control all the factors related to chemical quality consistency viz. raw material quality, production process, formulation, quality control and equipment maintenance. Future studies may be extended to other industries and other products apart from custom product.

Mittal et al. (2021) identified eight key strategic attributes driving B2B customer satisfaction viz. Quality of Product / Service, Pricing, Safety, Sales Process, Project Management, Corporate Social Responsibility, Communication, and Ongoing Service and Support. A multi-firm and multi-industry study conducted by the authors shows that a one-point increase in satisfaction yields a 12.96% increase in sales which provides confidence that using customer satisfaction programs for strategy formulation and execution can be a pathway to financial excellence. The authors recommended future research can be done to identify additional attributes and outcomes and understand implementation hurdles.

Mittal et al. (2001) applied a conceptual model to a large-scale study of 100040 automotive customers. The model was based on the premise that ratings given in a typical customer satisfaction survey are not error-proof measures of the customer's true satisfaction and these may vary systematically based on customer characteristics. Results of their study showed that consumers with different characteristics have different thresholds such that, at the same level of rated satisfaction, repurchase rates are systematically different among different customer groups. The authors also found that the functional form which relates rated satisfaction to repurchase intent is different from the one relating it to repurchase behavior and this functional form is non-linear.

Lewin (2009) conducted a study on the effect of downsizing companies on the satisfaction of their business customers especially when there have been significant cuts in key contact personnel. Their findings as well as other research (DeMeuse et al., 2004; Nixon et al., 2004) suggested that smaller job cuts and more strategic cuts that avoid or minimize eliminating key

contact personnel have less impact on business customer satisfaction. The cases where large broad-based cuts are unavoidable, proactive strategies should be adopted to minimize the negative effects on both customer and survivor satisfaction.

According to Homburg et al. (2005), certain customer characteristics (e.g. trust, price consciousness, and the importance of product/service to the customer) and salesperson characteristics (e.g. empathy, expertise, and reliability) systematically moderate the relationship between sales people's work satisfaction and customer satisfaction. Tests of the hypotheses were based on the dyadic data set collected across manufacturing and services industries in a business-to-business context. This research work addressed the circumstances under which the relationship between salespeople's work satisfaction and customer satisfaction becomes stronger or weaker. The findings of the study reveal this relationship is positively moderated by a salesperson's empathy, expertise, and reliability. On the other hand, customer trust in the supplier company and the importance of the product/service to the customer are positive moderators, whereas customer price consciousness is a negative moderator. It was also shown that work satisfaction has also an indirect effect on customer satisfaction through the mediating construct of a salesperson's customer orientation. The findings of this study define which situations and investments into increasing salespeople's work satisfaction are more likely to achieve higher customer satisfaction. In case of low level of importance of product/service to the customer, salespeople's work satisfaction gets less managerial attention. Thus, investments into increasing salespeople's work satisfaction may be particularly fruitful in achieving customer satisfaction when it is accompanied by activities like careful selection, training, and motivation of salespeople for improving their empathy, expertise, and reliability.

Elsäßer et al. (2017) conducted a study on 258 capital goods buyers of mechanical and plant engineering companies to examine the success factors of business-to-business branding and analyze their impact on customer satisfaction and brand loyalty. Intangible and nonfunctional features like company image and reputation were neglected for a long time until some studies were done to indicate that purchase decisions of single industrial buyers and buying groups depend also on subjective attributes (e.g. Shaw, Giglierano, & Kallis, 1989; Bendixen, Bukasa, & Abratt, 2004). For this reason, emotional brand attributes viz. trust, image, reassurance, reputation, and responsiveness are also to be taken into the consideration when branding industrial goods (e.g. Lynch, & de Chernatony, 2004, Wind, 2006; Jensen, & Klastrup, 2008). The results of their study revealed that rational brand quality consisting of the three dimensions viz. product quality, service quality, distribution quality and emotional brand associations consisting of brand image, consistent advertising style, country-of-manufacture image, salesperson's personality positively influence customer satisfaction and brand loyalty. It was observed that emotional factors also show a higher importance as rational factors do in a decision-making process of industrial buyers of capital goods. Within the rational factors, service quality was found to be the highest-rated dimension by buyers of capital goods. According to the authors, the reason for high importance of the country-of-manufacture image is that a specific country tends to produce specific stereotypes (positive ones as well as negative ones) and especially in an industrial market where brands are subject to global competition, brands being closely linked to a positive-recognized country can benefit. The authors also explained in case the customers do not reject goods manufactured in a specific country due to the country's image, the other three emotional factors are able to push the overall branding success, if the rational success factors are not suitable to recognize differences between suppliers.

Susanti et al.(2020) analyzed how strongly two drivers viz. the brand association, reflected by brand image, and social bonds influence customer satisfaction. This will facilitate sellers to anticipate future actions in order to keep the business going. The responses came from various industries of Indonesia viz. coating, paper, textile, wood, panel, putty, and printing industries. Social bond is defined as a feeling of friendship and mutual liking shared by the seller and buyer (Wilson, 1995). Social bonds comprised of social attachments that influence the economic behaviors between the involved parties (Bonner & Calantone, 2005). The results of this study revealed that the brand image has a stronger influence on satisfaction than social bonds. This customer satisfaction leads to brand loyalty and business sustainability in the chemical complex product. The authors mentioned that brand image is an essential emotional factor which comes from the set of all associations with brands, either related to products and services or activities like environmental and community programs that relate to organizations. If the buyer has direct experience with the brand, as long as the brand performance meets their perception, they will retain the relationship with the brand. Prospective buyers, who have no experience with the product, tend to take buying decision based on brand associated-information they obtain from product offerings or networks which supports past studies (Chen & Myagmarsuren, 2011). The authors recommended that sellers with less meaningful social bond influence should focus more on developing a strong positive-brand image. Kapitan, Kennedy, and Berth (2018) found that activities on corporate social responsibility through environmental and community engagement programs are able to enhance and accelerate a positive brand image. The findings of this study indicate that the seller must work on consistently improving products and service quality to ensure brand position as a quality leader which results in the higher confidence and peace of mind of buyers; this finding is in agreement

with the past studies on brand image in the chemical industry (Ćorić & Jelić, 2015). As recommended by the authors, the study can be replicated in a different industry, such as B2B commodity products and durable B2B products.

Luo et al. (2006) conducted a study based on a large-scale secondary data set to show that Corporate Social Responsibility (CSR) affects market value of firm partially through the mediator of customer satisfaction, and financial returns to CSR can be both positive and negative depending on the levels of a firm's corporate abilities viz. innovativeness capability and product quality. According to this study, CSR can be harmful to firm performance without proper support of corporate abilities. The authors found that in firms with low innovativeness, CSR actually reduces customer satisfaction levels, which in turn harms market value. Thus it is absolutely required to examine the organizational context in totality before implementing CSR initiative.

Cruz, A.V. (2015) conducted a study on U.S. automobile users to examine the relationship between product quality and customer satisfaction, using product cost and product safety as mediators. Significant statistical relationship was established between product quality and customer satisfaction. But neither the product safety nor the product cost was found to mediate the relationship between product quality and customer satisfaction.

Sangchanrung (2017) conducted a study on 278 participants to find the relationship of the factors viz. product quality, reliability, price, product design with customer satisfaction in Organic Facial Foam. It was found that product quality is the most important factor to influence customer satisfaction. Reliability was found to be the second most important factor to influence

to influence customer satisfaction while Price is the third factor to affect customer satisfaction. Product design was found to have no impact on customer satisfaction.

Aichner et al. (2017) followed a three-step approach for the development of a customer touch point management tool that allows small and medium sized B2B mass customization companies to measure, monitor and improve customer satisfaction. In the first step, customer touch points were identified in the internal analysis by employees. 48(forty-eight) customer touch points, classified as human, product, service, communication, spatial, and electronic interaction were identified. In the second step, all these customer touch points were weighted by internal employees and external customers in terms of their relative perceived importance to find the most important ones. 10 (ten) most important customer touch points were identified in this step. These are Consulting (also service), project meetings, complaints, phone calls outgoing, delivery, email, word-of-mouth, sales talk (also service), phone calls (incoming). It was observed that internal (employees) and external (customer) analysis on the perceived importance of customer touch points is relatively consistent. As per the results presented by the authors, all the identified customer touch points are not perceived to be important. In the third step, the relative importance of individual customer touch point for customer satisfaction was assessed by the external customers. Product was measured in terms of its' quality, price–performance ratio and it was found to have the highest impact on customer satisfaction. Apart from products, all the customer touch points in the top 5 and seven of the top 10 are related to human interactions (e.g., consulting, project meeting, complaints, phone calls, sales talk / service etc.). Finally, the respondents (external customers) opted following factors as the reasons why satisfied customers would recommend the company through WOM; Friendliness, product quality, reliability, trust, price-performance ratio, warmth, expectation exceeded,

speed, flexibility, others.

Aspara et al. (2008) in their study clarified the reasons for emphasizing the importance of corporate brand in B2B context. According to the authors, business customers generally assess a company, evaluate and make purchasing decisions based on company-specific images / perceptions in addition to or even instead of that specific to individual products or product brands. These perceptions are about a) the company's product delivery performance and product range b) servicing capabilities and performance c) consultative expertise or capabilities, processes, and performances d) strategic network position (company's capabilities and competencies, power and size) e) intentions to reciprocally partner and cooperate with customers and f) the sales personnel (expertise, competence etc.) and their behavior. These perceptions develop trust, commitment, and affection of business customers which results in loyalty and repeated / continued purchases, as well as customer referrals. Thus there is an opportunity for a company to differentiate from competitors by analyzing the impact of each of these dimensions on trust, commitment and effect of individual current customers or customers of certain segment and pursue more advantageous position with targeted marketing actions.

Drosos et al. (2019) conducted a study to measure industrial customer satisfaction in the natural gas sector in Greece based on five main criteria concerning the provided products and services, communication and collaboration with the staff of provider, customer service, pricing policy and website. According to this study, products and services are the most important criterion for industrial customer satisfaction and this is the criterion which needs the greatest attention of the providers. The criteria "communication and collaboration with staff" and "customer

service" are of lower importance while the criteria concerning website and pricing are of the least importance for industrial customers' satisfaction; Lower importance of pricing policy may be the result of the fact that the price of natural gas in Greece is lower than the EU-28 average.

Erjavec (2016) designed and tested a conceptual model for measuring drivers of customer satisfaction and customer loyalty in three different service industries. The results of their study showed that quality of service output, quality of staff, corporate image, and perception of price affect customer loyalty while customer satisfaction acts as a mediator. However, the strength of the relationship between these constructs varies markedly across different service settings. It implies that competitive market importantly determines the elements of service offering which leads to satisfaction and loyalty in a particular industry.

Gajic et al. (2015) conducted a study on the customers of a paint manufacturer in Egypt and India to explore the key attributes of value-in-use in the automotive paint market and impact of these attributes on customer satisfaction. The findings of this study revealed that the key value-in-use attributes are relationship quality (trust), knowledge sharing, providing support to customers in getting maximum product benefits, providing a range of product and service offerings that satisfy customer needs. Technical support builds relationship with customers through field visits for capturing customer requirements and expectation, training to customers, assistance in product support and customers' own processes which results in trust. Trust is found to have the greatest impact on customer satisfaction.

Gaudenzi et al. (2020) mentioned seven dimensions of logistics service quality (LSQ) in B2B context. These are

1) Personnel Contact Quality (Mentzer et al., 2001; Juga et al., 2010), which refers to the perceived customer orientation of sales people in the organization

2) Information Quality (Rafiq and Jaafar, 2007), which refers to the customer perception about the completeness and adequacy of the information provided about products and services

3) Ordering Procedures (Rafiq and Jaafar, 2007), which refers to the adoption of efficient and effective procedures by the supplier as perceived by the customers

4) Order Accuracy (Mentzer et al., 2001; Stank et al., 2003; Huo et al., 2016), which describes how customers perceive the delivery performance

5) Order Condition (Mentzer et al., 2001; Stank et al., 2003), which refers to the perceived integrity, in particular the lack of damages due to handling

6) Order Discrepancy Handling (Mentzer et al., 2001), which refers to the effective management of discrepancies in orders after their arrival

7) Timeliness (Mentzer et al., 2001; Huo et al., 2016) which refers to the arriving of orders at the customer premises at the promised time.

Data was collected through the sampling on Italian food companies. The study revealed that different LSQ dimensions can be combined in different ways for continuous improvement of customer satisfaction.

Hague et al. (2016) pointed out there are some hygiene factors on which every supplier is expected to perform to a minimum acceptable level, otherwise the supplier will quickly lose market share if they fail on any of these factors. The authors cited an example of 'safety' in a flight as hygiene factor while the level of in-flight service as a variable. These variables such as in-flight services create the satisfaction or dissatisfaction and differentiate companies. The

authors also highlighted a list of factors or attributes for customer satisfaction which differ from company to company. These are

a) The product: Quality of the product, Length of life of the product, Design of the product, Consistency of quality, Range of products, Processibility of the product

b) Delivery: Delivery on time, Speed of delivery

c) Staff and service: Courtesy from sales staff, Representative's availability, Representative's knowledge, Reliability of returning calls, Friendliness of the sales staff, Complaint resolution, Responsiveness to enquiries, After sales service, Technical service

d) The company: Reputation of the company, Ease of doing business, Invoice clarity, Invoices on time

e) Price: Market price, Total cost of use, Value for money.

Some other factors like environmental issues, frequency of representatives' calls, packaging etc. may also be added to the list as per the authors. The authors also mentioned that Sales volumes, Customer complaints, Unsolicited letters of thanks, Anecdotal feedback via the salesforce are some of the indicators of customer satisfaction. Depth interviews and focus groups, a quantitative survey are very useful for capturing customer satisfaction.

Hassan et al. (2010) conducted research to determine the factors influencing industrial goods (capital equipment such as machinery, test and measurement equipment, and maintenance tools) buying decision making in a manufacturing company based in Malaysia. The analysis was carried out based on new task buying and modified re-buy situations. In new task buying situation, the problem or need is considerably different from the past experience and therefore

the decision makers' lack of experience and product knowledge forces them to enter into an extensive problem-solving activity before a purchase. On the other hand, decision makers enter into Re-buy situation when they feel that significant benefits such as quality improvements, enhanced supply, cost reduction may be derived at from reevaluating alternatives. The respondents of this study were engineers with vast experiences in industrial good buying. The factors considered in influencing product purchased and supplier selection divided equally in both the new buy and modified re-buy situations include product performance, product reliability, long warranty period, product availability, product safety, user friendliness, brand, additional packaging, product outlook, and price. The factors on supplier selection include availability of product test run, long term business relationship, high degree of contact-ability, established supplier's company, excellent after sales service, high negotiation flexibility, customer recommendation, established local suppliers, and to be on par with competitor. The results revealed that in product selection, the most significant factor is product performance, and the second most significant factor is the product reliability for both new task buying and modified re-buy situations. Product test run availability was found to be the most significant factor as the engineers probably need to conduct an evaluation on product performance before justifying the purchase and relationship has been ranked second highest in supplier selection for both buying situations. Price was ranked as the least for both new task and modified re-buy situations in product selection. On the other hand, product demonstration and test run availability were found to be the most significant marketing strategies in a new task buying situation, The ability of sales representative to convince engineers on the more value addition by a new product or service is the most significant marketing strategy in a modified re-buy situation.

Hollyoake (2009) highlighted the factors that contribute to the development of bonded customer relationships are Trust, Integrity, Interdependence and Communication. These were termed by the author as the four pillars of B2B customer experience. According to the author, once an organization meets base level expectations viz. reliability, consistency, dependability, problem resolution, appropriate contact, choice and flexibility, the key areas that enhance the B2B experience are co-creation of value, strategic understanding and contact at all levels across the organization, working within strategic business units, flexibility and pro-activity. Finally, the relationship will move into a bonded experience with trust as being at the center of the bonded experience.

Krivobokova (2009) mentioned that setting up and continuous development of integrated quality management system, which will be able to self-regulate and adjust to current methods of production and market conditions, is necessary to get the real benefits from the views of customers.

Nguyen et al. (2013) opined that Brand likeability is a precursor to favorable attitude, satisfaction, and preferences for a firm. As mentioned by the authors, source stimuli for brand likeability are credibility, attractiveness, similarity, familiarity, expertise, trustworthiness, fairness.

Peltonen, E. (2016) conducted a study on the customers of a wholesaler of snowmobile spare parts to know the factors which can improve customer satisfaction in B2B context. The result revealed that good service quality, the reliability and consistency of the service, good product variety, the good price-quality ratio of those products, and most importantly, on-time deliveries have the biggest impact on satisfaction. Moreover, the customers prefer a supplier who can provide a personalized service and solve any problems the customer is facing.

Companies, while focusing on product specifications, overlook service requirements to a large extent. An exploratory study was done by Raja et al. (2013) to understand the views of customers on integrated products and services and the value-in-use i.e., how customers perceive the value they obtain from the integrated products and services offerings. In case of complex products or during new product development, offering of integrated products and services (evolving) can improve customer satisfaction. The authors mentioned following factors as the key attributes of value-in-use: knowledge, access, relational dynamic, range of product and service offerings, delivery, price, and locality (proximity to customer). Results of this study revealed that Relational dynamic (i.e., duration of relationship, quality of relationship, trust, working in partnership, quality of relationship with supplier etc.) and Access were found to have the highest impact on customer satisfaction.

According to Van Riel et al. (2005), association of following initiatives can create a strong industrial product image:

1) Focusing on buyers' perceptions of the product i.e., superior quality, dependability, consistency and innovative

2) Creating favorable perceptions of the development lead-time of the product

3) Offering value for money 4) investment in reliable distribution.

Ghoumrassi et al. (2017) revealed in their study the impact of the logistics management on customer satisfaction in small and mid-sized industrial companies. According to the authors Logistics Management is a component of supply chain management which is used to meet customer requirements through planning, control and effective implementation of movement and storage of related goods, services and information from origin to destination. The authors

studied six key issues related to logistics management which were emerged from their literature review. The results of their study revealed that 'mastery of knowledge and skills of suppliers linked to logistics' is the most important category which leads to customer satisfaction. . It was followed by 'green logistics solutions adopted by the supplier' which refers to packaging and using eco-friendly transportation method. In the next place comes 'Fragile and leanness logistics solutions', which indicates delivery on-time and quickness of delivery by eliminating wasteful activities.

Khan et al(2012) conducted a study to identify the key drivers of customer satisfaction in the context of B2B services in Japan. The result revealed that the personal interactions between service delivery personnel (account representative, technician) and customers, product perceptions (i.e. Overall product quality, Dependability) are significantly and positively related to customer satisfaction.

Panditharatne et al. (2019) studied the relationship between the service quality and customer satisfaction for the industrial chemical used in boiler water treatment and cooling tower water treatment. They mentioned the five dimensions of the service quality as Tangibility (i.e., Appearance of physical facilities, equipment, personnel, and communication materials), Reliability, Responsiveness, Assurance, Empathy. It was revealed in the study there is a strong positive relationship of reliability of the services provided and responsiveness of the employees with the customer satisfaction. However, the relationships of Tangibles, Assurance and Empathy with the customer satisfaction were found to be moderately positive.

Sheth et al. (1994) opined that retaining customer satisfaction is as equally important as that of developing customer satisfaction. Based on extensive research, they recommended ten process elements, which have a synergistic influence on the retention of customer satisfaction. These are

i)   Corporate culture -customer centric

ii)   Responsiveness

iii)   Competence and professionalism of people serving the customers

iv)   Quality obsession v) Value migration to improve performance-price ratio

v)   Mass customization (it refers to a business process of providing customized goods and services that best meet individual customer's needs)

vi)   Proactive innovation for development of new products and services anticipating the future needs of customers

vii)   Frontline information systems i.e., online information system for the frontline employees who interface with the customers

viii)   Market based organization i.e., business functions organized around individual customers or market segments

ix)   Customer-based compensation i.e., linking performance appraisal of employees with retaining customer satisfaction.

Maminiaina Aimee, R. (2019) mentioned some of the determinants of customer satisfaction such as commitment, service fairness, communication, price fairness, switching barrier, conflict handling, and relational benefit which vary depending on the scope of the particular industry.

A study conducted by Özkan et al. (2010) conducted on 182 manufacturing companies in Turkey revealed that the supplier performance factors which may contribute to customer satisfaction are delivery, flexibility, service, innovation, technical capability, conformance quality and pricing. Out of these factors, flexibility, innovation, delivery and service factors were shown to contribute significantly to the customer satisfaction.

According to the study conducted by Taylor et al. (2003) on the electronic Customer Relationship Management industry, customer satisfaction is driven by Trust and Perceived value.

Zakaria et al. (2016) recommended companies should focus on the factors like service quality, affordable price, minimizing mistakes, ease in communication and high responsiveness to ensure customer satisfaction.

In a survey conducted by McKinsey & Company (Pulido et al., 2014) on around 27,000 customers across fourteen different industries it was found that consistency is the important ingredient for customer satisfaction. The authors described three keys to consistency viz.

a) Customer-journey consistency: from making the decision to use a service or product for the first time, buying a product to actually using it, resolving issues with a product, companies must ensure consistency in providing high quality service during each interaction

b) Emotional consistency: a feeling of trust developed from the positive customer-experience emotions is an important driver of satisfaction; consistency-driven emotional connection is valuable for customer loyalty

c) Communication consistency: ensuring customers recognize the delivery of the promises made by the company.

Suchánek et al. (2015) mentioned that the degree of customer satisfaction can be demonstrated by comparing the technical parameters e.g., quality of the product to that of a competitor.

As per Samudro et al. (2018), cost savings in the B2B chemical industry context, is a core value

which can be achieved either by enhancing product quality at the same cost or by maintaining product quality at a lower cost. This saving will turn out to be the positive switching cost for customers to replace the products and services with alternatives.

Wilson, D. T. (1995). highlighted following list of variables which can enrich buyer-seller relationships: Commitment, Trust, Cooperation, joint action to accomplish mutual goals, Interdependence/Power Imbalance (i.e. the ability of one partner to get the other partner to do something which they would not normally do and thereby indicating the dependence of one partner on the other), Performance Satisfaction, Comparison Level of the Alternative (i.e. the quality of the outcome available from the best available relationship partner), Adaptation (one party altering its processes or the item exchanged to accommodate the other party), Non-Retrievable Investments (capital improvements, training, and equipment which cannot be recovered if the relationship terminates), Shared Technology, Structural Bonds, Social Bonds.

Sheth et al. (1973) opined that in a typical industrial setting there are minimum three departments viz. Purchase, Quality Control and Manufacturing departments whose members are commonly involved in the buying process.

Total number of books, thesis and journal articles and reports studied which are relevant for the research work is shown in the following table.

Table 2.02 Number of Books, Thesis and Journal articles and Reports Studied which are relevant for the research work

Literature Type:	Books	Thesis	Journal articles	Reports
Number	15	7	109	2

2.2.3 Major Findings Relevant to this Research

Major findings from the literature review are summarized in following table.

Table 2.03 Major Findings Relevant to this Research

Sl. No.	Literature Reviewed					Gist of points gained
	Title of paper/ Article	Source: Name of journal/ Magazine /Book, Chapter etc.	Literature Type: Research paper/ Review Paper	Author	Publishing Year	
1	Improving business-to-business customer satisfaction programs: Assessment of asymmetry, heterogeneity, and financial impact.	*Journal of Marketing Research,*	Research Paper	Vikas Mittal, Kyuhong Han, Ju-Yeon Lee & Srihari Sridhar	2021	● Eight key strategic attributes driving B2B customer satisfaction are as follows: Quality of Product / Service, Pricing, Safety, Sales Process, Project Management, Corporate Social Responsibility, Communication, and Ongoing Service and Support.
2	Assessing the effects of perceived quality and perceived value on customer satisfaction	Management Science Letters	Research Paper	Andreas Samudro, Ujang Sumarwan, Megawati Simanjuntak, Eva Z Yusuf	2020	● Product quality in the chemical market is considered in terms of performance consistency, the emissions and toxicity level, the reject level, lifetime, and durability ● Relaibility, assurance, empathy and responsiveness are the four constructs of service dimensions ● Perceived value is the customer's benefit (core solution and other additional services) towards sacrifices (price and relationship cost) ● Chemical market tends to put perceived value as a priority as long as product quality meets the standard parameter

Sl. No.	Literature Reviewed					Gist of points gained
	Title of paper/ Article	Source: Name of journal/ Magazine /Book, Chapter etc.	Literature Type: Research paper/ Review Paper	Author	Publishing Year	
3	The effects of product quality on customer satisfaction and loyalty: Evidence from Malaysian engineering industry,	International Journal of Industrial Marketing	Research Paper	Ling Chen Hoe & Shaheen Mansori	2018	• The dimensions of product quality that affect customer satisfaction are 1) Performance which refers to a product's primary operating characteristics 2) Features which are additional characteristics that enhance the appeal of the product to the customer; these are the secondary aspects of performance 2) Reliability which is the likelihood that a product will not fail within a specific time period when put in use 4) Conformance which is the precision with which the product or service meets the specified standards 5) Durability which measures the length of a product's operating life 6) Serviceability which is the speed, ease and costs with which the product can be put back into service when it breaks down 7) Aesthetics which refers to how the product looks, feels, sounds etc.; it is a matter of personal judgement and a reflection of individual preference 8) Perceived quality is the quality attributed by the customer, noting that perception is not always reality.

Sl. No.	Literature Reviewed					Gist of points gained
	Title of paper/ Article	Source: Name of journal/ Magazine /Book, Chapter etc.	Literature Type: Research paper/ Review Paper	Author	Publishing Year	
4	Predictors of customer loyalty in business-to-business trading.	Journal of Applied Environmental and Biological Sciences,	Research paper	Zainuddin Zakaria, Zuraini Jusoh, Mohd Hafizuddin Mohd Ghazali, & Norchahaya Johar	2016	• Companies should focus on the factors like service quality, affordable price, minimizing mistakes, ease in communication and high responsiveness to ensure customer satisfaction.
5	Relationship Bonding Strategies and Customer Retention: A Study in Business-to-Business Context	IOSR Journal of Business and Management (IOSR-JBM)	Research paper	Prof. Milna Susan Joseph, Ms. Anusree Unnikrishnan	2016	• Financial bonds should not be treated as the only mechanism for customer retention because it can be easily imitated • The use of social bonds and structural bonds are found to be more effective to achieve customer retention in B2B context
6	Optimizing profitability through customer satisfaction of the customers of textile machinery industry-a study	AMU Library	Research paper (PhD Thesis)	Narasimhan, P L	2015	• Customers in Industrial markets are professionally trained and technically qualified • Purchasing decisions are made based on compliance to specification, cost effectiveness and dependability of the supply • Functional benefits involving product design characteristics, aspects are attractive to technical personnel • Operational benefits related to product attributes such as reliability and consistency are important to manufacturing and quality control people • Financial benefits i.e., favorable credit terms and cost saving opportunities are important to purchasing managers

Sl. No.	Literature Reviewed					Gist of points gained
	Title of paper/ Article	Source: Name of journal/ Magazine /Book, Chapter etc.	Literature Type: Research paper/ Review Paper	Author	Publishing Year	
7	Customer Satisfaction in a High-Technology Business-to-Business Context	Represontralen. Universitetet i Oslo	Research paper	Einar W. Aaby Hirsch	2011	• Industrial customers are different from consumers in the decision-making process which involves several people, and this issue is often resolved by focusing the customer satisfaction study on the key decision maker • The different roles in the customer organization influence overall customer satisfaction; purchasing people would likely to give more importance on the commercial aspects than product-related information, while the engineers give more importance to product-related information over the commercial issues • Customer organizations may have very different structures. In one organization the main purchase manager decides which product to purchase, while in another organization this decision can be made by a group, often referred to as decision making units or buying centers • Loyal customers are related to profitability. More specifically the cost of customer retention is lower than the cost of acquiring new customers. It is also considered an important source of competitive advantage

Sl. No.	Literature Reviewed					Gist of points gained
	Title of paper/ Article	Source: Name of journal/ Magazine /Book, Chapter etc.	Literature Type: Research paper/ Review Paper	Author	Publishing Year	
8	A study on different factors influencing customer satisfaction on industrial market.	*Management Science Letters*	Research paper	Shirani, A., Danaei, H., &Shirvani, A.	2014	● The factors considered for satisfaction of customers in the model were Price of the product, Quality of the products, Distribution of the product i.e. on time and appropriate delivery, Suppliers' appropriate communication, Trust, Improvement and being responsive, Meeting customers' expectations and Existence of conflict. The effects of the first five variables were positive and conflict had negative impact on customer satisfaction
9	Are drivers of customer satisfaction different for buyers/users from different functional areas?	Journal of Business & Industrial Marketing	Research paper	Gautam Chakraborty, Prashant Srivastava & Fred Marshall.	2007	● Three major factors affecting customer satisfaction in B2B contexts viz. reliability, product-related information, and commercial aspects ● The dimension 'Reliability' indicates Reliability of the supplier and adherence to delivery schedule ● Technical specifications for products and breadth of product line are considered under the dimension 'Product-related information' ● Competitive prices, credit policy, return policy, and warranty coverage are considered under the dimension 'Commercial aspects'

Sl. No.	Literature Reviewed					Gist of points gained
	Title of paper/ Article	Source: Name of journal/ Magazine /Book, Chapter etc.	Literature Type: Research paper/ Review Paper	Author	Publishing Year	
10	Critical success factors for supplier selection: An Update	Journal of Applied Business Research	Review Paper	S.Hussein Cheraghi, Mohammad Dadashzadeh & Muthu Subramanian	2004	● Supplier selection criteria will continue to change with the expansion of excellence ● Traditional aspects of performance are Quality, delivery, price, service, whereas non-traditional, evolving ones are just-in-time, communication, process improvement, supply chain management ● Flexibility, Consistency, Reliability and Long-Term Relationship are four significant new entrants into the list of critical success factors for supplier selection
11	Customer satisfaction in industrial markets: dimensional and multiple role issues	Journal of Business research	Research paper	Christian Homburg and Bettina Rudolph	2001	● Satisfaction of industrial customers is measured by seven different dimensions such as satisfaction with product, salespeople, product related information, order handling, technical services, internal personnel and complaint handling
12	Relationship Marketing of Services— Growing Interest, Emerging Perspectives	*Journal of the Academy of Marketing Science*	Review-paper	Leonard L.Berry	1995	● There are three levels of relationship bonding with customers ● Financial bond comes first and it includes the pricing incentives such as discount during purchase, rewards for repeated purchase etc. ● Social bonds comes next which involves personalization and customization of the relationship ● Structural bonds, which are usually technology-based and the solution to customer's problem designed into the service-delivery system, comes in level three

2.3 Research Gap

It is observed from the review of existing literatures that multiple parameters have been identified which influence customer satisfaction. The theoretical framework of the contribution of several factors on customer satisfaction has been established through several studies as indicated in the literature review. However, gaps have been identified in the following areas which necessitate further research:

a) There is hardly any detailed study done on critical customer satisfaction factors which are specific to carbon black and other industrial chemical products

b) In most of the literatures, few common customer satisfaction factors like price, quality of product and services, distribution of product, complaint handling, technical services, relationship with customer, brand image etc. have been addressed; but other dimensions, which apparently play a vital role to influence satisfaction of customers of the industrial chemical products, have not been under the purview of these literatures.

c) Relative importance of the factors in customer satisfaction may vary from one function to another function at customer end, which is not found to be addressed for industrial chemical products

d) Significance of these factors in customer satisfaction may vary from one industry to another industry which is not found to be addressed for industrial chemical products

2.4 Conceptual Framework of the Study

It is observed from the literature survey there is hardly any in-depth analysis on customer satisfaction for industrial chemical products. However, this literature survey helps in developing the background for identification of factors which influence customer satisfaction for industrial chemical products.

There are multiple parameters, as per the existing literatures, which can influence satisfaction of industrial customers viz. price, quality of product and services, distribution of product, complaint handling, technical services, relationship with customer, brand image etc. Based on the experience of providing service to the customers of industrial chemical product, research scholar has modified few variables and included few more variables which can add value to this research work. The factors considered in the Pilot survey are Price, Commercial attributes (other than price), Quality, Packaging, Order execution and delivery, Customer service, Reputation of supplier, Long term relationship with the supplier. Based on the feedback in pilot survey and further discussion with the professionals of the chemical industries, some revisions were done for the final survey.

The consolidated list of identified factors for the final survey are as follows:

a) Price of the Product

b) Incentives offered to customers

c) QMS ensuring Quality of the Product

d) Packaging of the Product

e) Order execution and delivery of the product

f) Customer service of the supplier

g) Company image of the supplier

h) Suppliers' Sustainability Performance

i) Product stewardship of the supplier

From the research gaps captured from the existing literatures and based on the above discussion, the independent variables and dependent variables which will be studied in the research project for satisfaction of customers of industrial chemical products are explained along with the conceptual framework in following diagram.

Figure 2.05 Proposed conceptual framework of current research
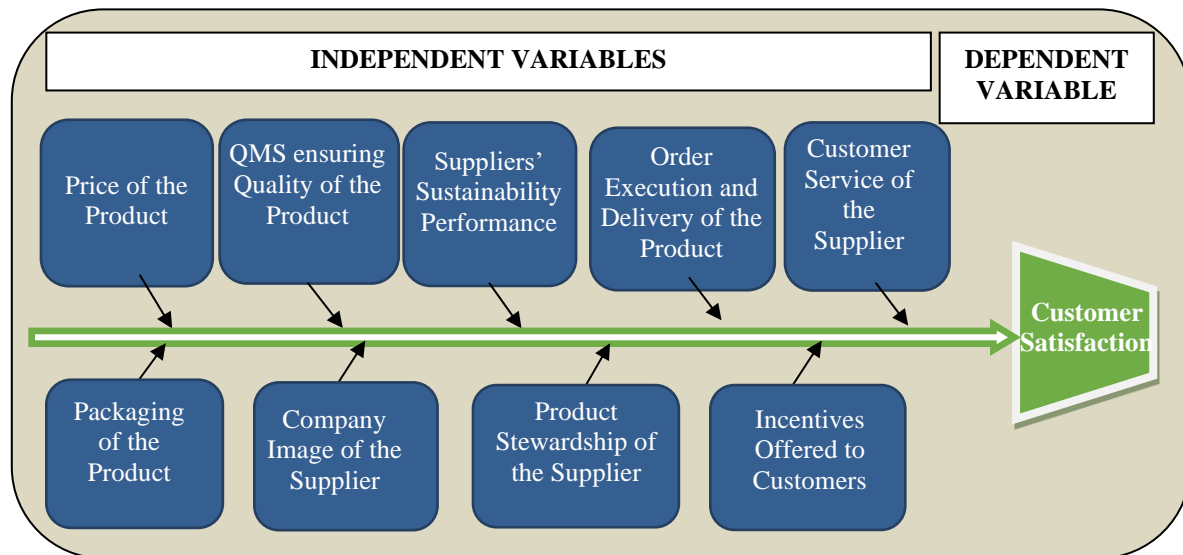
Source: as conceived by the Author

2.5 Summary

This chapter has provided an overview of the various researches which were already conducted in the field of satisfaction of industrial customers and associated areas. Through the literature survey, we have been able to understand the continual development which has happened in the field of customer satisfaction and the indication in which future research can be conducted. This chapter also describes the development of conceptual framework which will guide the rest of our   research. This chapter also identifies the various factors which influence the satisfaction of industrial customers leading to the concept of Research Gap.

CHAPTER 3

RESEARCH METHODOLOGY

Research Methodology

Research methodology adopted for this research work is described in the following subsections.

3.1 Introduction

By 'Research methodology' we mean the various steps followed to study the research problem along with the rationale behind selecting the method in the context of research study, explaining why a particular method or technique is used so that research results are capable of being evaluated either by the researcher himself or by others (Kothari and Garg, 2014). The research methodology i.e., the research design, the sources of data, sampling design applied for this research, research instruments opted for data collection are described in the following sub sections. Various analytical tools which are used for the analysis of the collected data to arrive at the conclusions are also explained.

3.2 Statement of the Problem

The present study aims to give insight to the manufacturers of industrial chemical products to serve their customers in a better way. While identifying different factors to influence the satisfaction of industrial customers of various chemical products, availability of literature is not found as adequate as with consumers. Whatever studies are available, appear to be sketchy and not adequately address the industrial chemicals products.

The studies mentioned in the literature survey have identified a number of factors to influence customer satisfaction, but it is not clear whether these factors are all applicable to industrial chemical products or there can be some other factors that are typical to industrial chemical products.

It is also not clear from the existing literatures, whether there is resemblance or difference in the relative importance of each of the customer satisfaction factors among different functions like R&D, QA, Production, Purchase, Technical function of customers' organization because different roles in the customer organization may influence overall customer satisfaction as mentioned by Einar et al. (2011).

Significance of these factors in customer satisfaction may vary from one industry to another industry which is not found to be addressed for industries like Tyre manufacturing, Automotive Rubber Components manufacturing, Carbon Black manufacturing etc.
Few other dimensions which apparently play a vital role, have not been under the purview of any existing literature studied.

Under the above circumstances, this study will be concentrating on and around different factors which influence the satisfaction of customers of various industrial chemical products with their suppliers specifically in Indian context. Prioritization of these factors will help the companies in making a proper strategy to improve Customer satisfaction level which in turn will influence buying behavior of these Customers for raw material like carbon black and other industrial chemical products viz. Sulphuric acid, Hydrochloric acid, Sodium Hydroxide, Sodium Silicate, Rubber Process Oil (RPO), Zinc Oxide, Sulfur, Stearic Acid, Potassium Nitrate and Potassium Carbonate.

3.3 Objectives of the Study

From the review of existing literatures available on the subject and from the identified research gaps following research objectives are evolved:

1. To identify the factors influencing satisfaction of carbon black customers in Tyre manufacturing companies and Automotive Rubber Component (ARC) manufacturing companies in India

2. To evaluate the relative importance of factors influencing satisfaction of carbon black customers in Tyre manufacturing companies and ARC manufacturing companies in India

3. To do comparative analysis of the factors in influencing satisfaction of customers of various functional departments of Tyre manufacturing companies and ARC manufacturing companies

4. To study the applicability of above factors to influence satisfaction of customers for other industrial chemical products

3.4 Research Hypotheses

In order to achieve the objectives as mentioned in section 3.3, a set of 21 (twenty-one) hypotheses were formulated based on the nine factors identified in section 2.4 and the applicability of these factors in Tyre manufacturing companies, Automotive Rubber Component (ARC) manufacturing companies and the companies using few other industrial chemical products. Customer satisfaction has been identified as dependent variable. These

non-directional null hypotheses were tested statistically and conclusion was drawn from the test results.

The hypotheses formulated for this research work are:

H01: QMS Ensuring Quality of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies

H02: Packaging of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies

H03: Price of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies

H04: Incentives Offered to Customers do not have significant role in satisfaction of customers in Tyre manufacturing companies

H05: Order Execution and Delivery of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies

H06: Customer Service of the Supplier does not have significant role in satisfaction of customers in Tyre manufacturing companies

H07: Suppliers' Sustainability Performance does not have significant role in satisfaction of customers in Tyre manufacturing companies

H08: Company Image the Supplier does not have significant role in satisfaction of customers in Tyre manufacturing companies

H09: Product Stewardship of the Supplier does not have significant role in satisfaction of customers in Tyre manufacturing companies

H010: QMS Ensuring Quality of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies

H011: Packaging of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies

H012: Price of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies

H013: Incentives Offered to Customers do not have significant role in satisfaction of customers in ARC manufacturing companies

H014: Order Execution and Delivery of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies

H015: Customer Service of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies

H016: Suppliers' Sustainability Performance does not have significant role in satisfaction of customers in ARC manufacturing companies

H017: Company Image of the supplier does not have significant role in satisfaction of customers in ARC manufacturing companies

H018: Product Stewardship of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies

H019: There is no significant difference in the prioritization of factors influencing satisfaction of customers in Tyre manufacturing companies and ARC manufacturing companies

H020: There is no significant difference in the prioritization of satisfaction factors among the customers in different functions of Tyre manufacturing companies and ARC manufacturing companies

H021: There is no resemblance in the prioritization of satisfaction factors among customers for different industrial chemical products.

3.5 Research Design

According to Kothari et al. (2014), 'A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure'. Overall research design decision consists of a) The sampling design i.e. the procedure to be adopted in selecting the items and the number of items to be included in the sample b) The observational design i.e. the conditions under which the observations are to be made c) The statistical design i.e. the number of items to be observed and the procedure of analyzing the information and data collected d) The operational design which is related to the techniques of implementation of the procedures specified in the sampling, statistical and observational designs.

Kothari et al. (2014) opined that most of the social research comes under descriptive research studies. The descriptive research is concerned with findings out who, what, where, when, or how much (Cooper et al., 2012). According to Sekaran et al. (2016), descriptive study is involved in collection of data that describes the topic of interest. It may be either quantitative in nature involving the collection of quantitative data such as satisfaction ratings, demographic data etc., or it may be qualitative in nature entailing the collection of qualitative information such as data to describe how consumers go through a decision. It may also include correlational studies to describe relationships between variables. It helps researchers to think systematically about the aspects in a given situation like the factors related to job satisfaction. Since the purpose of current study is to identify the factors which can influence satisfaction of customers for industrial chemical products, descriptive research design has been adopted as it is deemed to be the most appropriate.

The research process is explained by the following flow chart.

Figure 3.01 Research process flow chart

Define research problem

I

Review concepts and theories

Review of literature

Review previous research finding

II

Formulate hypothesis

III

FF

F

Design research (including sample design)

IV

Collect data (Execution)

V

FF

F

Analyze data (Test hypothesis, if any)

VI

F

VII

Interpret and report

Where, F = Feedback (helps in controlling the subsystem to which it is transmitted)

FF = Feedforward (Serves the vital function of providing criteria for evaluation)

Source: Kothari et al. (2014). *Research Methodology: Methods &techniques (3rd*

ed)

3.6 Research Sampling

Sampling can be defined as *the selection of some part of an aggregate or totality on the basis of which a judgement or inference about the aggregate or totality is made* (Kothari et al., 2014). Information about a large group of people or organization is done by sampling to save the time and cost involved in such a massive exercise.

3.6.1   Population

Population refers to the entire group of people, events, or things of interest that the researcher wants to investigate and make inferences based on the sample statistics (Sekaran & Bougie, 2016).

The target population (sources of data) for the current study are as follows:

    a) Respondents from leading TYRE manufacturing companies in India using carbon black as raw material

    b) Respondents from leading Automotive Rubber Component (ARC) manufacturing companies in India using carbon black as raw material

    c) Respondents of other industrial chemical product manufacturing companies in India which have been selected are for the comparative analysis as carbon black is also treated as an industrial chemical product

Table 3.01 Population Size
(For customers of Tyre manufacturing and ARC manufacturing companies)

Sector	Population	Remarks
Leading **TYRE** manufacturing companies in India	18	● Total number of Tyre companies in India is 41 as per ATMA; out of which, the number of leading Tyre manufacturing companies is 18 ● These 18 companies have 62 manufacturing plants which covers approx. 94% of total population as the total number of Tyre manufacturing plants in India is 66 as per ATMA
Leading **Automotive Rubber Component (ARC)** manufacturing companies in India	40	● As per feedback of Marketing People

3.6.2 Sampling Technique

According to Burns et al. (2008), the key point to be considered for selecting a particular method of sampling is based on the "*importance of the findings in relation to the decision that has to be made on them and the cost of acquiring them*".

Target respondents were chosen by using non-probability purposive sampling method in which samples are chosen arbitrarily by the researcher based on the qualification and experience of the respondents on working with industrial chemical product manufacturing companies. Since the researcher has been working with a chemical industry for quite a long time and dealing with various Tyre manufacturing and Automotive Rubber Component (ARC) Manufacturing industries, professional relationship has been built up with many people of these industries and

many other related industries which facilitated easy access to known people for collection of data. These respondents are conveniently located and reached for the survey.

The inclusion criterion for the participants were minimum qualification of graduation and industrial working experience of at least two years so that they are better placed to identify business factors that might have boosted their satisfaction levels and shaped their buying behavior. There was no restriction of rank or designation of the respondents.

3.6.3 Sample Size

As a general rule, the sample size must be of an optimum. The sample size should be chosen from the universe by some logical process. If the items of the universe are homogenous, a small sample can serve the purpose. But if the items are heterogenous, a large size sample will be required (Kothari et al., 2014).

Calculation of Sample size

These are specified for the purpose of this study as follows:

Precision rate of 5% and Confidence level of 95%, are considered adequate for the study.

The formula used for determining the sample size (Kothari et al., 2014) is:

$$n = \frac{z^2.p.\,q.\,N}{e^2.\,(N-1) + z^2.\,p.\,q}$$

where,

N = population size

n = sample size

z = standard variate at a given confidence level.

The value of z for confidence level of 95% is 1.96

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e = precision or the estimation error or acceptable error. The value of 'e' is taken as 0.05 for the current study.

p = sample proportion and q = 1 - p

The most conservative sample size can be obtained by maximizing 'n', and the sample will result in the desired precision if we take the value of p as 0.5.

Sample Size, considering p = 0.5 and the other values given above, has been determined in each category for the current study using the above formula as follows.

Customers from Leading ARC manufacturing companies in India who consume Carbon Black

- No of targeted **ARC** manufacturing companies in India   **: 36**

  (Calculated using the formula mentioned above and considering Population of 40, Confidence level 95% and Confidence interval 5)

- Number of target respondents   **: 108**

  (Considering three responses on an average from the different functions of each company i.e., from Purchase, QA and Production, R&D, Technical department etc.)

Customers from Leading TYRE manufacturing companies in India who consume Carbon Black

- No of targeted **Tyre** manufacturing companies in India   **: 17**

  (Calculated using the formula mentioned above and considering Population of 18, Confidence level 95% and Confidence interval 5)

- Number of target respondents   **: 108**

  (Considering equivalent number of samples as that of ARC)

Customers of Other selected Industrial Chemical Products

Response from customers of other selected industrial chemical products were also taken to extend the scope of this study for the customers of Industrial Chemical Products, in general.

- Number of targeted industrial chemical products : **12**
  (As per convenience)
- Number of target respondents from the customers of other industrial chemical products. : **36**

  (Considering three responses on an average from the customers of each of these industrial chemical products)

Table 3.02 Names of the other targeted industrial chemical products and the manufacturing industries consuming these products:

Sl. No.	Industrial Chemical Products	Procured by Manufacturing Industry
1	Sulphuric Acid	Manufacturer of Lead Acid Battery
		Steam Power Plant (CPP)
2	Hydrochloric Acid	Steam Power Plant (CPP)
3	Sodium Hydroxide	Steam Power Plant (CPP)
4	Sodium Silicate	Manufacturer of Precipitated Silicas and Silicates
5	Sulphuric Acid	Manufacturer of Precipitated Silicas and Silicates
6	Rubber Process Oil (RPO)	Manufacturer of Tyres
7	Zinc Oxide	Manufacturer of Tyres
8	Sulfur	Manufacturer of Tyres
9	Stearic Acid	Manufacturer of Tyres
10	Potassium Nitrate	Manufacturer of Carbon Black
11	Potassium Carbonate	Manufacturer of Carbon Black

The table 3.03 summarizes the details of sample size collected from the manufacturers of Tyre and ARC - (Users of Carbon Black) surveyed. It also shows the distribution of samples among the various functions of these industries. This sample size is surveyed both by physical surveys and through mails. The details about the data collection is mentioned in the section 3.8. Sample Units as collected from the manufacturers of Tyre and ARC - (Users of Carbon Black) during the final survey are shown in following table.

Table 3.03 Sample Units as collected from the manufacturers of Tyre and ARC - (Users of Carbon Black) surveyed.

Functions from which responses collected	Number of respondents from Tyre companies		Number of respondents from ARC companies	
Functions	No. of responses from Individual functions	No. of responses from Categorized functions	No. of responses from Individual functions	No. of responses from Categorized functions
Purchase	31	31	43	43
QA	29	37	19	34
Production	8		15	
Technical	33	48	32	40
R&D	15		8	
Total	**116**		**117**	
Number of companies responded	**17**		**37**	
Grand Total	**233**			

As per Singh et al. (2014), for more homogeneous population, the smaller sample size is required and for more heterogeneous population, the larger sample size is required to obtain a

given level of precision. In the current study, since the population is homogeneous, sample size of 233 is considered as adequate to conduct this study.

The table 3.04 shows the distribution of the samples as collected from the customers of industrial chemical products during the final survey.

Table 3.04 Sample Units as collected from the customers of carbon black and other industrial chemical products surveyed

	Industrial Chemical Products Procured by the respondents	**Total respondents**
1	Carbon Black	233
2	Sulphuric Acid	13
3	Potassium Carbonate	10
4	Potassium Nitrate	10
5	Hydrochloric Acid	9
6	Sodium Hydroxide	9
7	Rubber Process Oil (RPO)	3
8	Zinc Oxide	3
9	Sulfur	3
10	Stearic Acid	3
11	Sodium Silicate	2
	Total	298

This sample size of 298 is quite logical according to the character of the sample (industrial customers) and there was no financial motivation given to the respondents.

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3.7 Data Collection Methods / Techniques

In order to carry out the study for ascertaining the relationships of customer satisfaction with the variables identified in the conceptual framework, quantitative and qualitative primary data collection is proposed to be done using survey questionnaires. Questionnaire was used because it is economical, structured and appropriate to capture primary data to test the hypotheses formed and to answer the research questions. The instruments of data collection involved administering pre-tested structured questionnaires and conducting face to face or telephonic interviews, as deemed convenient, with the respondents to clarify the questions and capture additional insights. Given the resource constraint and time limitation on the part of the researcher, questionnaire was also sent via email to the customers of the different business segments of the industry.

As mentioned earlier, the sample size consisted of 298 (two hundred ninety-eight) industrial customers chosen from the following manufacturing companies in India

- Major Tyre manufacturing companies across India

- Major Automotive Rubber Component (ARC) manufacturing companies across India

- Lead–Acid Battery manufacturing company in India

- Precipitated Silica manufacturing company in India

- Steam power plants (CPP) in India

- Carbon Black manufacturing company in India

The manufacturing companies mentioned above are not confined in a particular region in India, rather these are spread across India.

The chemical products procured by these companies, which were considered for the present study are as follows:

- ➢ Carbon Black,
- ➢ Hydrochloric Acid,
- ➢ Sulphuric Acid,
- ➢ Sodium Hydroxide,
- ➢ Zinc Oxide,
- ➢ Stearic Acid,
- ➢ Sulphur,
- ➢ Rubber Process Oil (RPO),
- ➢ Potassium Carbonate,
- ➢ Potassium Nitrate,
- ➢ Sodium Silicate

All the three sections of the questionnaire were used to capture the information and opinion of the respondents from Tyre manufacturing companies and Automotive Rubber Component manufacturing companies for carbon black. Whereas, first two sections of the questionnaire only were used for the respondents of all the identified industries who were asked to give weightage as per their opinion to the identified factors which can influence their satisfaction for the other chemical products in addition to the information on the questions related to their demography. The researcher tried to generalize the study for industrial chemical products instead of limiting the study to only one industrial chemical product like carbon black only. Secondary data were collected as per requirement from annual report of the company, trade journals, business magazine and other publications, wherever possible.

Data was collected during the period from 2019 to 2021.

3.7.1 Survey

The most commonly used method for collection of qualitative and quantitative data is to conduct a survey through questionnaires, structured observations and structured interviews. Survey conducted to gather large amount of data from a representative sample in an economical way is described as sample survey.

3.7.1.1 Pilot Survey

According to Kothari et al. (2014), it is always advisable before the main survey to conduct Pilot Survey for testing the questionnaire. Pilot survey is actually the simulation in small scale of the main survey which indicates the opportunity for improvements, if any, in the questionnaires and also in the survey techniques.

For the pilot survey, questionnaire was prepared to know the opinion of the customers of various industrial chemical products on the significance of following factors i.e. Quality, Price, Commercial terms (credits limit, credit time, discounts etc.), Packaging, Order execution and delivery, Customer service, Company image of the supplier, Long term relationship with the supplier, Restriction of hazardous substances in the product to influence their satisfaction with the supplier.

A combination of both positively and negatively worded items were employed in the questionnaire survey to reduce participants' acquiescence bias.

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The survey instrument used was a structured questionnaire prepared by the researcher. The questionnaire consisted of three sections.

In the beginning, a brief introduction of the project along with confidentiality statement was given and the expectation from the respondents in responding to this questionnaire was also explained.

In the first section (Section A), the questions on demography of the respondents were included.

Questions were asked on the following:

1. Your name (Optional)

2. Your contact number / email id (Optional)

3. Name of Industry / company you currently work for (Optional)

4. Location of your manufacturing unit

5. Which range includes your age? (20 - 30 years, 31-40 years, 41-50 years, 51-60 years, more than 60 years)

6. What is your academic/professional qualification? (Under graduation, Graduation,

Post graduation, Others)

7. What is the business structure of your organization? (Sole proprietorship, Partnership, Private Limited Company, Public Limited Company, Other

8. What are the main products of your current industry? (Tyre, Automotive Rubber components)

9. What is your total experience in similar industry? (1 - 10 years, 11-20 years, 21-30 years, More than 30 years)

10. Functional department to which you currently belong? (Purchase, Quality Assurance, Production/Technical/ Any other)?

11. How much quantity (approximately) of carbon black is purchased by your company per month? (1-10 MT / 11-50 MT/51-100 MT/ more than 100 MT)?

12. What is the time period aimed at your company for keeping inventory of carbon black? (7 days / 8-15 days / 16-30 days / 31 to 60 days / more than 60 days)

13. Which of the following, in your opinion, best describes your level of involvement in the decision on purchasing carbon black from a supplier? (Very high, High, Less, Very less)

Names of the respondents along with their contact details, name of the industry in which the respondent is currently working were sought only to personalize the identification of respondents and were not used for any further analysis. These details were used as an optional field as many respondents do not want to disclose this information.

In the second section (Section B), the respondents were asked to select the factor / s from the options given which they think are the significant factors to influence their satisfaction with a carbon black supplier.

a. Price of carbon black

b. Commercial attributes (other than price) of carbon black

c. Quality of carbon black

d. Packaging of carbon black

e. Order execution and delivery of carbon black

f.   Customer service of the carbon black supplier

g.   Reputation of carbon black supplier

h.   Long term relationship with the supplier of carbon black

i.   Other, please specify

The third section (Section C) of the questionnaire collects the respondents' views on the various factors influencing their satisfaction. This section includes ten subsections / parts.

The opinion of the respondents was captured for various factors influencing their satisfaction of the supplier of chemical product on a Six-point Likert scale, where '6' stands for 'strongly agree' and '1' stands for 'strongly disagree'. Six-point Likert scale was used as it encourages respondents to think about the question more carefully and make a choice that either leans positively or negatively and thereby avoiding central tendency.

In the first part of third section, various items selected for measuring the opinion of the respondents on 'Price of the Carbon Black' are:

a)   I don't mind paying more for the carbon black of our desired quality

b)   I am less willing to buy carbon black from a supplier if the price is higher for whatever may be the reason

c)   I am willing to pay higher price for carbon black to maintain long term relationship with a supplier

d)   I don't mind paying more to purchase carbon black from a supplier of good repute

e) It is worth paying more for carbon black if we get desired service before, during and after a purchase

f) It is very difficult for a person like me to comment on price of carbon black

g) I don't mind paying more if on-time delivery of carbon black is ensured

In the second part of third section, various items selected for measuring the opinion of the respondents on 'Commercial attributes (other than price) of carbon black' are:

a) I would prefer a carbon black supplier offering good credit terms

b) I would expect reconciliation of accounts on regular basis from supplier end

c) I would prefer advance communication on price revision

d) I am interested in receiving correct invoice on time

e) Issuing of credit notes is expected from supplier end

f) Financial incentives like discounts, coupons etc. are not important for us

g) It is very difficult for a person like me to comment on commercial attributes of carbon black

In the third part of third section, various items selected for measuring the opinion of the respondents on 'Quality of carbon black' are:

a) I would prefer carbon black with all the quality parameters meeting the specification

b) Consistency in quality of carbon black from lot to lot is very important for our finished product

c) My expectation from a carbon black supplier is to meet our specific requirements on quality

d) I am interested in getting the desired quality of our product with the use of carbon black

e) I prefer carbon black which can be easily processed at our end

f) I am less concerned about the quality of carbon black

g) I believe that quality cannot be compromised for price

In the fourth part of third section, various items selected for measuring the opinion of the respondents on 'Packaging of carbon black' are:

a) I would prefer carbon black in standard packaging

b) It is expected that carbon black supplier will ensure no damage/ leakage of bags during receipt at our end

c) I am less concerned about the packaging of carbon black

d) It is expected that accuracy of bag weight will be maintained

e) Proper identification and coding on carbon black bags are very important

In the fifth part of third section, various items selected for measuring the opinion of the respondents on 'Order execution / delivery' of carbon black are:

a) Real time information on order/ delivery status is expected from the supplier

b) I would like to get advance intimation of deviation in order execution from the supplier

c) I am less concerned about order execution and delivery of carbon black

d) I would expect adherence to delivery against total ordered quantity as per schedule

e) It is expected that a carbon black supplier will ensure smooth order execution

f) I would prefer a carbon black supplier who has the flexibility to meet our emergency requirement

g) I would expect supplier to deliver carbon black as per our requirement to ensure lean inventory at our end

In the sixth part of third section, various items selected for measuring the opinion of the respondents on 'Support of Sales Representatives of carbon black supplier' are:

a) It is desirable that the sales representatives will be provided with higher degree of empowerment to take decision on price and delivery terms

b) I would expect sales representatives will be able to explain their product portfolio and capability

c) It is expected that sales representative will ensure material availability as per our requirement

d) Sales representative is expected to facilitate resolution of our problem / complaint

e) It is desirable that the sales representatives will keep frequent contact with us even after a purchase

f) It is desirable that sales representatives will be able to capture our requirement / issues in general

g) Support of sales representatives of carbon black suppliers is not important

for us

In the seventh part of third section, various items selected for measuring the opinion of the respondents on 'Technical service of carbon black supplier' are:

a) It is expected that technical people of supplier will understand and meet our technical requirements related to   carbon black

b) I would expect assistance from technical services team of carbon black supplier in our product quality improvement / new grade development

c) Technical service of carbon black supplier is not important for us

d) Adequate R&D facility of a carbon black supplier for development of new product / customized   product is very important for us

e) I am interested in a carbon black supplier who has a strong technical knowledge base in the field

In the eighth part of third section, various items selected for measuring the opinion of the respondents on 'Efficient Complaint Handling System' are:

a) I would expect prompt response to our complaints from the supplier

b) I would like to get innovative solutions from the supplier to resolve our problem

c) It is expected that the people handling the complaint (related to carbon black) shall have sufficient knowledge on carbon black and its application

d) It is desirable that the supplier will follow up to ensure that the problem has been solved accurately and satisfactorily

e) Structured root cause analysis of the complaint and implementation of corrective action with horizontal deployment are expected from the supplier

In the ninth part of third section, various items selected for measuring the opinion of the respondents on 'Reputation of carbon black supplier' are:

a) It is desirable that our carbon black supplier is a leading company in the sector

b) I would like a carbon black supplier with global standard in quality, technology, capacity and outlook

c) It is expected that a carbon black supplier will show overall speed and agility in responding to market needs

d) I would prefer a carbon black supplier who is highly recommended by its' customers

e) Credibility of carbon black supplier is important to me

f) I would prefer a carbon black supplier who has wide portfolio of different carbon black grades

g) Reputation of carbon black supplier is not important for us

In the tenth part of third section, various items selected for measuring the opinion of the respondents on 'Long Term Relationship with carbon black supplier' are:

a) Long term relationship with a carbon black suppler is preferable, as less variation in quality is expected from the same supplier

b) The same supplier can better understand our specific requirements

c) The existing supplier do not need further approval

d) Changing from one supplier to another would cost us too much

e) I would prefer to maintain long term relationship with carbon black supplier as It is difficult for us to find a replacement for the current supplier

f) I am not willing to maintain long term relationship with any supplier as the old supplier may take everything for granted

It was tried initially to capture data through an online questionnaire generated using Google docs. and was sent to the respondents through e-mail. The Google Forms questionnaire is shown in Appendix A-2. But there was hardly any response received from the respondents as the industrial customers do not want to click on unknown link as per IT security policy at their end. The questionnaire generated using Google docs was then changed to MS Word format and the soft copy was sent through mail or hard copy was used during face-to-face interview to capture their opinion.

Responses were collected from 28 (twenty-eight) respondents in pilot survey which is around 10% of the samples considered for the final survey.

3.7.1.2 Final Survey

Based on the experience gained in pilot survey, feedback from the customers, analysis of data collected during the pilot study and the discussion with the professionals of these industries, the questionnaire was improved for the collection of data in the final survey with maximum factual accuracy.

The changes done in the questionnaire and in the mode of data collection are summarized below:

● Industrial customers are always afraid of leakage of data or other information. During pilot

survey, some of the industrial customers advised the researcher to send the questionnaire through his official mail id only and it was followed afterwards

- It was observed during the pilot survey that many respondents showed reluctance at some point of time while responding to a lengthy questionnaire. Furthermore, as respondents were engaged with their office or plant jobs and not in the comfort of their homes, they wanted to get over with the task hurriedly. Such an adverse perceived situation is not favorable to obtain correct, unbiased responses from sample elements. Hence the questionnaire was made simple and less bothersome to respondents by eliminating certain dimensions of constructs without sacrificing the validity of the construct in the process. The questionnaire was also modified by using simple words for better understanding of the respondents and to eliminate the possibility of ambiguity

- In Section A, the questions on demography of the respondents were also reduced by eliminating some questions which are not directly related to the current research. Response to the questions on the name of the respondent, contact details, name of their company and the quantity of chemical product purchased by them were made optional because industrial customers are not comfortable in disclosing these information

- In Section B, following changes were done in the factors; a) as per suggestion of the respondents during pilot survey one additional factor was introduced on the 'Product Stewardship of the Supplier' because of the increasing consciousness and concern of industrial customers about the impact of the product on environment and health along with the introduction of regulatory norms on extended producer responsibility b) as per suggestion of respondents during pilot survey, 'Long term relationship with the suppliers'

was replaced with 'Suppliers' sustainability performance' as Sustainability has now become the focus area of most of the big and ethical companies as explained in Introduction of this thesis c) 'Commercial attributes' was replaced with 'Incentives offered to customers' to avoid any confusion among the customers about the scope of 'Commercial attributes' d) 'Quality of product' was replaced with ' Quality Management System ensuring Quality of the product' to give emphasis on the requirement of systematic approach to ensure consistency in Quality e) 'Reputation of the supplier' was replaced with the standard term ' Company image of the supplier'

- In Section C also, above changes in the factors were incorporated and various items were selected to capture the opinion of respondents for each of these factors

- In section C, factors like Technical Services, Efficient Complaint Handling System and Support of Sales Representatives were brought under the one factor of 'Customer Service of the Supplier' without sacrificing the importance of the earlier variables in the process as all the factors considered in the pilot study were captured in the different constructs of the variable 'Customer Service'

- Thus, the customer satisfaction factors identified for the final survey are as follows: Price of the Product, Incentives offered to customers, QMS ensuring Quality of the Product, Packaging of the Product, Order Execution and Delivery of the Product, Customer Service of the Supplier, Suppliers' Sustainability Performance, Company Image of the Supplier, Product Stewardship of the Supplier

- In Section C, the formats of questions used to capture the opinion of the respondents on different constructs of various factors influencing their satisfaction on the supplier of chemical product were changed from a six-point Likert scale to a seven-point Likert scale. Seven-point Likert scale is easier to use, and it reflects the true evaluation of the respondents in a better way. In this seven-point Likert scale, 1 stands for Very Strongly Disagree, 7 stands for Very Strongly Agree whereas 4 stands for Neither Agree Nor Disagree

- One dependent variable has been introduced to capture the opinion of the industrial customers on their overall satisfaction with the current supplier of chemical product to facilitate identification of the relationship between the effect and the affecting factors

- In most of the psychographic variables, some constructs were deleted to make the questionnaire easy-to-respond for the respondents.

Revised questionnaire used in the final survey for capturing the opinion of industrial customers on the factors influencing their satisfaction on the chemical products they purchase is given in Appendix A-3.

3.8 Analysis of Reliability and Common Method Bias

The factors that emerged in the questionnaire for collection of responses were tested for inter-item correlation within each of the factors using Cronbach's alpha. Since all these factors resulted in a Cronbach's alpha of 0.7 or more, these factors and their constructs can be considered as reliable and therefore useful for further analysis as part of a specific variable.

Harman's single-factor (one-factor) test, the most common statistical approach to test for Common Method Bias (CMB), was then used to check the existence of Common Method Bias which may threaten the validity of the conclusions about the relationships between measures. Since the total variance extracted by single factor was found less than the recommended threshold of 50%, we can say there is no problem of common method bias in the data set collected from the respondents of Tyre manufacturing companies and ARC manufacturing companies.

3.9 Analysis of Data

In the process of analyzing data, descriptive and inferential statistics were used to pave the way for the presentation of the results in the form of statistical tables, graphs, and charts.

From an ethical perspective, the collected information was analyzed and presented in its original form without the researcher's interference and manipulation that could have, otherwise, yielded biased outcomes. Anonymity of the participants, privacy and confidentiality of the data were ensured by avoiding the use of revealing information of the participants.

The data was first presented in tabular form representing the different responses' given by the respondents. The feedback received was analyzed by using statistical techniques with the help of software package like SPSS (Version 23), Excel etc.

Then analysis was done in nine stages as follows:

Stage I

Preparation of raw data was done after the collection to make it suitable for the required analysis. Responses were checked thoroughly to know whether the respondents understood the

questions correctly, data cleaning were done to exclude unwanted outliers and to ensure that the inclusion criterion for the participants i.e., minimum qualification of graduation and industrial working experience of at least one year are fulfilled.

Stage II

Items which were negatively worded in the questionnaire survey were made positively worded and the ratings given by the respondents were also reversed.

As explained in section 3.8, internal consistency between items in a scale was measured by using Cronbach's Alpha for all the independent and dependent variables. The reliability of the factors and their constructs was thus tested, Common Method Bias was tested by Harman's single-factor (one-factor) test to ensure that the total variance extracted by single factor is less than the recommended threshold of 50% and then the responses were selected for subsequent analysis.

Stage III

The number of independent variables in the regression model was assessed by estimating Adjusted R- Square Value. The effect on Adjusted R-square value was estimated by adding nine predictor variables (satisfaction factors) one by one for the customers in tyre manufacturing companies. In case the change in Adjusted R Square value was found in positive direction by adding any predictor variable, the contribution of that predictor variable was considered as significant. Similarly, the effect on Adjusted R-square value was estimated by adding nine predictor variables (satisfaction factors) one by one for the customers in ARC manufacturing companies.

Stage IV

The values of VIF (Variance Inflation Factor) were determined for all the identified factors in both the cases of Tyre manufacturing companies and ARC manufacturing companies to determine whether there is co-linearity between the predictor variables. It is known that the co-linearity between the predictor variables is not a matter of concern if the VIF values are lower than 10.0, which means these factors influence customer satisfaction independent of each other.

Stage V

Hypotheses on the significance of each of the nine different factors was then tested by regression analysis and finding the value of 'p' in each case for Tyre manufacturing companies and ARC manufacturing companies. It is known that of the 'p' value is less than 0.05, the null hypothesis will not be accepted and alternative hypothesis will be accepted.

Stage VI

Hypothesis on the ranking of the factors was then tested by estimating the value of Standardized Regression Coefficient (Beta). It is known that the degree of the impact of predictor variable on the dependent variable increases with the increase in the value of Beta. In this case independent nine factors were considered as the predictor variables and overall satisfaction was considered as the dependent variable.

Stage VII

Spearman correlation coefficients were then measured on the ranking of customer satisfaction factors in both the sectors i.e., Tyre manufacturing companies and ARC manufacturing companies to test the hypothesis on significance of the difference in prioritization of factors influencing satisfaction of customers in these two sectors. Critical value for Spearman's Rank Correlation Coefficient (r_s) for 9 pairs of data (n=9) at 0.05 level of significance was

determined using the standard formula. The Spearman correlation coefficients, if found less than the critical value at 0.05 level of significance, indicate there is no significant positive association between the rankings of customer satisfaction factors as per opinion of respondents from Tyre manufacturing companies and ARC manufacturing companies and reverse will be the case if Spearman correlation coefficients is found higher than the critical value.

Stage VIII

Correlation of the rankings of the identified factors as derived from the weightages given by the respondents from different functions of Tyre manufacturing companies and ARC manufacturing companies was estimated to test the hypothesis on significance of the difference in prioritization of the factors influencing satisfaction of customers of different functions in these two sectors. In case the numbers of responses from the two functions viz. Production and R&D are less as compared to the numbers of respondents from other functions, respondents of similar functions based on their nature of job were clubbed together e.g., respondents of Technical and Production functions were clubbed together, respondents of Quality Assurance and R&D functions were clubbed together while Purchase function is kept alone. Spearman correlation coefficients were then measured on the ranking of factors influencing satisfaction of customers of different functions in Tyre manufacturing companies and ARC manufacturing companies. The Spearman correlation coefficients, if found less than the critical value at 0.05 level of significance, indicate there is no significant positive association between the rankings of customer satisfaction factors as per opinion of respondents from different functions of Tyre manufacturing companies and ARC manufacturing companies and reverse will be the case if Spearman correlation coefficients is found higher than the critical value.

Stage IX

Correlation of rankings of the identified factors as derived from the weightages given by the industrial customers of various chemical products viz. Carbon Black, Zinc Oxide, Stearic Acid, Sulfur, Sulphuric Acid, Sodium Silicate, Hydrochloric Acid, Sodium Hydroxide, Potassium Carbonate, Potassium Nitrate were estimated to test the hypothesis on significance of the difference in prioritization of factors influencing satisfaction of customers of different industrial chemical products. Spearman correlation coefficients were measured on the ranking of factors influencing satisfaction of customers of industrial chemical products. The Spearman correlation coefficients, if found less than the critical value at 0.05 level of significance, indicate there is no significant positive association between the rankings of customer satisfaction factors as per opinion of different industrial chemical products and reverse will be the case if Spearman correlation coefficients is found higher than the critical value at 0.05 level of significance.

On analyzing the data, hypotheses formulated earlier were tested through various statistical tools as explained in the following chapter. The result of Hypothesis testing is either accepting or rejecting the hypothesis and inference were drawn accordingly.

3.10 Credibility of Research Findings

In order to ascertain the reliability of any research, the researcher needs to ensure that the research is equally applicable to other similar research settings and same results shall be obtained under same conditions and there shall be transparency on how the conclusion is drawn from raw data. According to Saunders et al. (2009), particular attention to be given for ensuring that the data collected are both reliable and valid.

In the current study, data collection and analysis followed the methods applied in similar type of research using similar type of information and measurement scale. The reliability of data was ensured by subjecting the data to reliability test in the statistical software package. The name of the respondent was kept optional in the questionnaire and the respondents were given adequate time to respond to the questionnaire to eliminate the possibility of the errors or biases related to respondent.

Validity refers to the extent to which the research findings represent the reality of what is being measured (Saunders et al., 2009). The findings of the main survey have been placed before a group of industrial experts to validate these findings. This ensured that identified customer satisfaction factors for industrial chemical products and the relationships of rankings of factors are endorsed.

3.11 Summary

This chapter explains the research design and the procedure followed in collection and analysis of data for solving the research problem. An overview of the mixed method approaches i.e., combination of quantitative and qualitative methods, was provided, along with detailed explanations of procedure followed in each of the phases within the study. Pilot study was conducted initially before finalizing the questionnaire design and the research design. The quantitative phase is also explained in detail, identifying the development of survey questionnaire and analysis process. Integral to the discussion the ethical elements of the study as well as issues of reliability and validity were also considered.

CHAPTER -4

DATA ANALYSIS AND INTERPRETATION

Data Analysis and Interpretation

Analysis of data collected through the questionnaire from the industrial customers using statistical tools, the results derived, and the testing of hypotheses are described in following subsections.

4.1 Reliability Analysis

In order to understand the internal consistency between items in a scale or whether a respondent responds to all the items in the same way i.e., not strongly agree for one item and strongly disagree for another item of the same variable, Cronbach's Alpha has been measured for all the independent and dependent variables. It has been ensured before measuring the Cronbach's Alfa that positively and negatively worded questions are not mixed. Question group-wise Cronbach's alpha results for both the cases i.e., Tyre and Automotive Rubber Component (ARC) are shown in the following table.

Table 4.01 Reliability Analysis using Cronbach's Alpha

Variable	Items	Cronbach's Alpha value	
		Tyre	ARC
Price of the Product	1) I always look for the lower price while purchasing raw material	0.792	0.782
	2) I don't want to pay more for high standard packaging of chemical product		
	3) I am not willing to pay more in purchasing raw material from a supplier for its' brand image		
	4) I don't want to pay more for the raw material of our desired quality		

Variable	Items	Cronbach's Alpha value	
		Tyre	**ARC**
Incentives offered to customers	1) I prefer a supplier offering longer credit period 2) I prefer a supplier offering higher credit limit 3) I am interested in getting discount in price while purchasing 4) I prefer a supplier for offering rewards for repeated purchase	0.839	0.754
Quality Management System (QMS) ensuring Quality of the Product	1) I consider certification on international QMS standard (e.g. ISO9001) is a mandatory requirement to ensure consistency in quality 2) I am interested in batch-to-batch quality consistency in addition to the quality parameters of each batch within the specification limits 3) I would prefer a supplier who can meet our specific requirement on product quality consistently 4) I am interested to deal with a supplier who adopts risk-based approach in taking preventive measure in their operations 5) I prefer a supplier who conducts internal audits to verify the conformance of QMS and systematic management review	0.831	0.814

Variable	Items	Cronbach's Alpha value	
		Tyre	ARC
Packaging of the Product	1) I would prefer to deal with a supplier who uses biodegradable or recycled material in packaging and recycle the bags after the use	**0.833**	**0.735**
	2) I am concerned about Identification Visibility of batch number and color code on packaging bags		
	3) I am interested in checking individual bag weight even if total weight of consignment is within the specification		
	4) I believe maintaining cleanliness and zero leakage of chemicals from the bags at the time of receipt at our end is a mandatory requirement for a supplier		
Order Execution and Delivery of the Product	1) I will prefer a supplier who maintains a higher percentage of OTIF (On Time in Full) in delivering material	**0.802**	**0.755**
	2) I consider real time information on order and delivery status from supplier end is an important criterion of good supplier		
	3) I consider 'flexibility to meet sudden augmentation in demand' as an important criterion for being a preferred supplier		
	4) I would prefer a supplier delivering the chemical product 'Just in time' in order to reduce our inventory holding cost		

Variable	Items	Cronbach's Alpha value	
		Tyre	ARC
Customer Service of the Supplier	1) I am interested in getting technical assistance from the supplier of chemical product for improvement of our product performance 2) I consider product knowledge is a mandatory requirement of sales representative of supplier to capture our requirement 3) I am interested in frequent interaction with the technical personnel of supplier for solutions to wide variety of our needs 4) I consider responsiveness of sales representatives of supplier to our needs is important criterion for being a preferred supplier 5) I am concerned about the resolution time of our complaints	**0.854**	**0.824**
Suppliers' Sustainability Performance	1) I would prefer a supplier who has robust systems to reduce, reuse and recycle non-biodegradable materials and natural resources 2) I do believe ISO certification on Environment Management Systems and Occupational Health and Safety Management Systems is a mandatory requirement of a supplier 3) I consider a company's resilience to long term Environmental, Social and Governance (ESG) risk is an important criterion for being a sustainable supplier 4) I would prefer a supplier having a robust system of Water, Energy, Solid Waste and Green House Gas management and publishing third party assessed sustainability report (e.g. GRI based reporting)	**0.812**	**0.786**

Variable	Items	Cronbach's Alpha value	
		Tyre	ARC
Company Image the Supplier	1) I am interested in dealing with a supplier who has a loyal customer base	0.845	0.842
	2) I am willing to give preference to a supplier for their company image		
	3) I prefer to deal with a supplier which shows overall speed and agility in responding to the market needs		
	4) I like to procure chemical product from a company who is not just a supplier, but an industry leader		
	5) I prefer to deal with a supplier who does not indulge in unfair or illegal trade practice		
Product Stewardship of the Supplier	1) I would prefer a supplier who takes the responsibility of their product from Cradle to Grave to reduce the impact on environment and health	0.830	0.809
	2) I believe that restriction of PAH (Polycyclic Aromatic Hydrocarbon) in the chemical product is an important factor for being our preferred supplier		
	3) I am interested to know the proportion of SVHC (Substances of Very High Concern) in the chemical product we purchase		
	4) I consider it is the responsibility of supplier to disclose ecological information (toxicity, persistence, degradability, etc.) in the Safety Data Sheet of the product they supply		

Variable	Items	Cronbach's Alpha value	
		Tyre	**ARC**
Overall satisfaction with the Supplier	1) On an overall basis I am satisfied with our current supplier	**0.748**	**0.704**
	2) I am satisfied with the ease of doing business with current supplier		
	3) I would like to purchase the chemical product from the current supplier again		
	4) I would like to recommend our current supplier to an associate.		

Cronbach's Alpha for all the independent and dependent variables for both the Tyre manufacturing companies and ARC manufacturing companies are summarized in the following graphs.

Figure 4.01 Reliability Analysis using Cronbach's Alpha for Tyre Manufacturing Companies
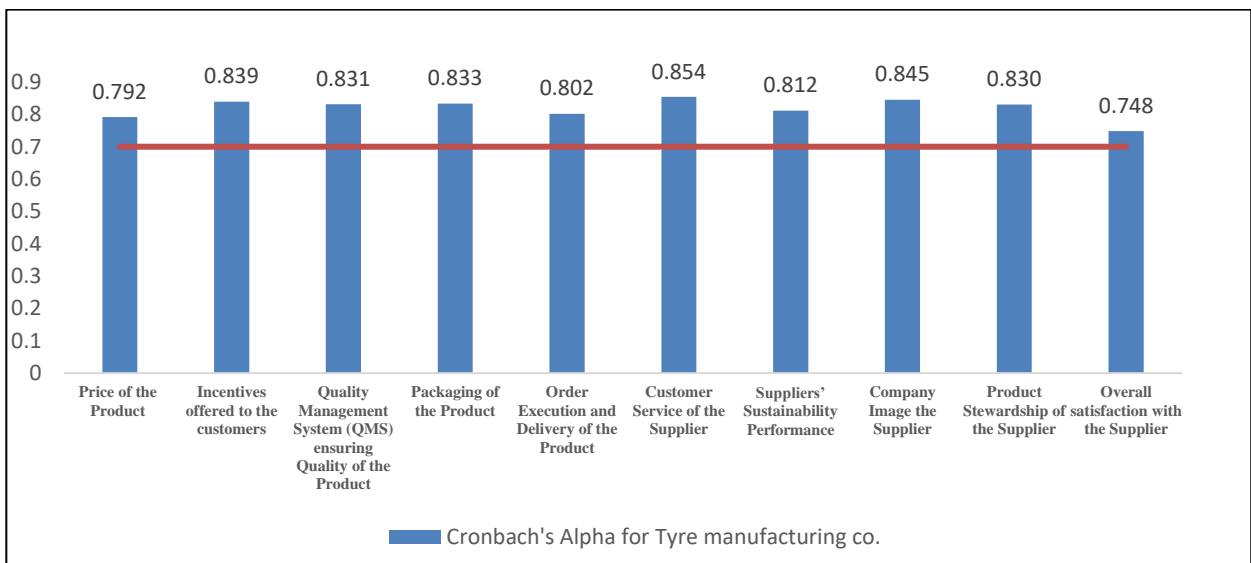
Figure 4.02 Reliability Analysis using Cronbach's Alpha for ARC Manufacturing Companies
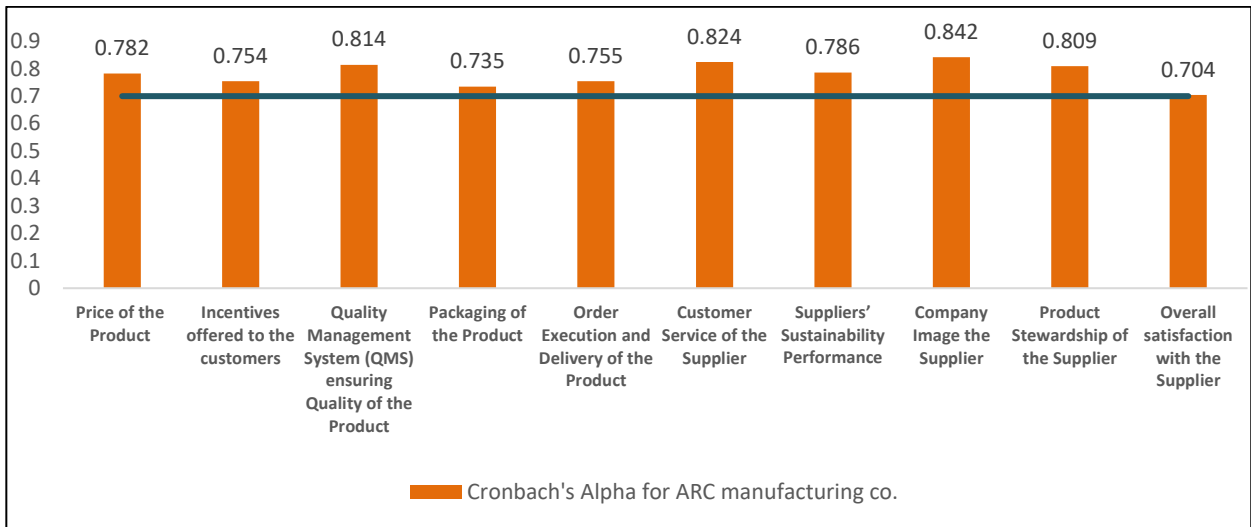
Since the reliability is greater than the minimum requirement 0.70 (Bagozzi, 1994) for all the factors in both the cases of Tyre and ARC, the factors and their constructs can be considered as reliable and therefore, useful for further analysis.

4.2 Analysis of Common Method Bias

Common Method Variance (CMV) is a potential problem in behavioral research, and it is attributable to the measurement method (Podsakoff et al., 2003). The bias produced in an estimated correlation between two variables by the common method variance is known as common method bias (Jakobsen & Jensen, 2015). As mentioned by Podsakoff et al. (2003), Common Method Bias (CMB) is one of the potential sources of measurement error which threatens the validity of the conclusions about the relationships between measures. Common method bias is likely to be more significant in studies where the data for both independent and dependent variables are collected from the same person in the same measurement context using the same item context and similar item characteristics. According to Jordan et al (2020), Harman's single-factor (one-factor) test is the most common statistical approach to test for Common Method Bias (CMB). In this test, all the variables used in the study are loaded into an exploratory factor analysis and unrotated factor solution is examined to determine the number of factors necessary to account for the variance in the variables. It is assumed that if a considerable amount of common method variance is present, a single factor will emerge from the exploratory factor analysis or one general factor will account for the larger part of the covariance among the measures (Podsakoff et al, 2003). If this newly introduced common latent factor explains more than a threshold limit of the variance, then it is expected that the common method bias is present in the study. Although there are no specific guidelines to set this threshold, it is commonly set at 50% (Eichhorn, B. R., 2014).

Table 4.02   Total Variance Explained for Tyre Manufacturing Companies

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	17.714	45.420	45.420	17.714	45.420	45.420
2	2.670	6.845	52.265			
3	1.895	4.859	57.125			
4	1.565	4.013	61.138			
5	1.081	2.772	63.910			
6	.950	2.435	66.345			
7	.883	2.264	68.609			
8	.809	2.074	70.683			
9	.762	1.954	72.637			
10	.726	1.862	74.499			
11	.680	1.743	76.243			
12	.665	1.706	77.948			
13	.613	1.571	79.519			
14	.585	1.501	81.020			
15	.556	1.425	82.445			
16	.516	1.324	83.769			
17	.495	1.269	85.038			
18	.455	1.166	86.203			
19	.441	1.131	87.334			
20	.424	1.087	88.422			
21	.413	1.059	89.480			
22	.382	.979	90.459			
23	.369	.946	91.406			
24	.352	.903	92.309			
25	.324	.830	93.139			
26	.312	.800	93.938			
27	.282	.723	94.662			
28	.263	.674	95.336			
29	.252	.647	95.983			
30	.220	.564	96.547			
31	.201	.515	97.062			
32	.196	.503	97.564			
33	.181	.465	98.029			
34	.175	.450	98.479			
35	.162	.414	98.894			
36	.141	.363	99.256			
37	.120	.307	99.563			
38	.097	.249	99.812			
39	.073	.188	100.000			

Extraction Method: Principal Component Analysis.

From the above table it is observed that the total variance extracted by single factor is 45.42% and

it is less than the recommended threshold of 50%. So, there is no problem of common method bias

in the data set collected from the respondents of Tyre manufacturing companies.

Table 4.03 Total Variance Explained for ARC Manufacturing Companies

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.893	43.315	43.315	16.893	43.315	43.315
2	1.779	4.562	47.876			
3	1.489	3.819	51.696			
4	1.432	3.671	55.367			
5	1.210	3.101	58.468			
6	1.141	2.925	61.393			
7	1.046	2.682	64.076			
8	.957	2.453	66.528			
9	.916	2.349	68.877			
10	.849	2.176	71.053			
11	.825	2.115	73.167			
12	.788	2.021	75.189			
13	.783	2.006	77.195			
14	.694	1.779	78.974			
15	.657	1.684	80.659			
16	.545	1.397	82.056			
17	.529	1.356	83.412			
18	.487	1.248	84.661			
19	.475	1.219	85.879			
20	.443	1.135	87.015			
21	.433	1.111	88.126			
22	.427	1.095	89.221			
23	.403	1.032	90.253			
24	.368	.942	91.196			
25	.343	.880	92.076			
26	.330	.847	92.923			
27	.321	.823	93.746			
28	.312	.799	94.545			
29	.287	.735	95.280			
30	.268	.688	95.968			
31	.240	.616	96.585			
32	.221	.566	97.150			
33	.212	.543	97.694			
34	.196	.501	98.195			
35	.178	.457	98.652			
36	.156	.400	99.052			
37	.143	.367	99.419			
38	.120	.309	99.728			
39	.106	.272	100.000			
Extraction Method: Principal Component Analysis.						

From the above table it is observed that the total variance extracted by single factor is 43.315% and it is less than the recommended threshold of 50%. So, there is no problem of common method bias in the data set collected from the respondents of ARC manufacturing companies.

4.3 Assessment of the Number of Significant Independent Variables

As mentioned by Frost, J. (2013), Adjusted R-square is used to compare the goodness-of-fit for regression models which contain differing numbers of independent variables. Every time we add an independent variable to a regression model, Adjusted R squared increases only when independent variable is significant and affects the dependent variable. On the other hand, the adjusted R-squared value decreases when the new term doesn't improve the model fit by a sufficient amount. Thus Adjusted R-squared helps to assess the number of independent variables in a model. It measures the proportion of variation explained by only those independent variables that really help in explaining the dependent variable (Burns et al., 2008).

In this section, the effect on adjusted R-square value has been estimated by adding predictor variables one by one. The contribution of any predictor variable has been considered as significant in case the change in Adjusted R Square value is observed in positive direction.

4.3.1 Number of Significant Independent Variables for Tyre Manufacturing Companies

In this section of the present study, the Criterion Variable is the Overall Satisfaction of Customers in Tyre Manufacturing Companies for which nine predictor variables identified and on which the data has been collected are;

1) Price of Product
2) Incentives offered to customers

3) Quality Management System (QMS) ensuring Quality of the Product

4) Packaging of the Product

5) Order Execution and Delivery of the Product

6) Customer Service of the Supplier

7) Suppliers' Sustainability Performance

8) Company Image of the Supplier

9) Product Stewardship of the Supplier

For this purpose, the responses were collected using seven-point Likert Scale.

1= Very Strongly Disagree (VSD)

2= Strongly Disagree (SD)

3= Disagree (D)

4= Neither Agree nor Disagree (NAD)

5= Agree (A)

6= Strongly Agree (SA)

7= Very Strongly Agree (VSA)

Impact of Quality Management System (QMS) Ensuring Quality of the Product

In the first case of regression, dependent variable is Overall Satisfaction of Customers and predictor variable is Quality Management System (QMS) Ensuring Quality of the Product. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Quality Management System (QMS) Ensuring Quality of the Product on the Overall Satisfaction of Customers in Tyre Manufacturing companies.

Table 4.04 Regression with 'Quality Management System (QMS) Ensuring Quality of the Product' as Single Predictor Variable for Tyre Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.955	.911	.911	.1591	.911	1172.434	1	114	.000

It is observed from the table 4.04, adjusted R square value for Quality Management System (QMS) Ensuring Quality of the Product is positive i.e., 0.911 which indicates that the predictor variable, Quality Management System (QMS) Ensuring Quality of the Product, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H01:   QMS Ensuring Quality of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies

Impact of Order Execution and Delivery of the Product

In this second case of regression, dependent variable is Overall Satisfaction of Customers whereas Order Execution and Delivery of the Product has been added to QMS Ensuring Quality of the Product as the predictor variable. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Order Execution and Delivery of the Product on the Overall Satisfaction of Customers in Tyre Manufacturing companies.

Table 4.05 Regression with 'Order Execution and Delivery of the Product' as Second Predictor Variables for Tyre Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.976	.952	.951	.1175	.952	1122.516	2	113	.000

It is observed from table 4.04 and 4.05, adjusted R square value increases from 0.911 to 0.951 on addition of Order Execution and Delivery of the Product as predictor variable. It indicates that the predictor variable, Order Execution and Delivery of the Product, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H05: Order Execution and Delivery of the Product does not have significant role in satisfaction of customers in Tyre manufacturing companies

Impact of Packaging of the Product

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Packaging of the Product has been added to earlier two predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Packaging of the Product on the Overall Satisfaction of Customers in Tyre Manufacturing companies.

Table 4.06 Regression with 'Packaging of the Product' as Third Predictor Variables for Tyre Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.980	.960	.958	.1085	.960	885.077	3	112	.000

It is observed from table 4.05 and 4.06, adjusted R square value increases from 0.951 to 0.958 on addition of Packaging of the Product as predictor variable. It indicates that the predictor variable, Packaging of the Product, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H02: Packaging of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies

Impact of Product Stewardship of the Supplier

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Product Stewardship of the Supplier has been added to earlier three predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Product Stewardship of the Supplier on the Overall Satisfaction of Customers in Tyre Manufacturing companies.

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Table 4.07 Regression with 'Product Stewardship of the Supplier' as Fourth Predictor Variables for Tyre Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.984	.968	.967	.0963	.968	849.965	4	111	.000

It is observed from table 4.06 and 4.07, adjusted R square value increases from 0.958 to 0.967 on addition of Product Stewardship of the Supplier as predictor variable. It indicates that the predictor variable, Product Stewardship of the Supplier, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H09: Product Stewardship of the Supplier does not have significant role in satisfaction of customers in Tyre manufacturing companies

Impact of Customer Service of the Supplier

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Customer Service of the Supplier has been added to earlier four predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Customer Service of the Supplier on the Overall Satisfaction of Customers in Tyre Manufacturing companies.

Table 4.08 Regression with 'Customer Service of the Supplier' as Fifth Predictor Variables for Tyre Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.986	.972	.971	.0911	.972	763.331	5	110	.000

It is observed from table 4.07 and 4.08, adjusted R square value increases from 0.967 to 0.971 on addition of Customer Service of the Supplier as predictor variable. It indicates that the predictor variable, Customer Service of the Supplier, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H06:   Customer Service of the Supplier does not have significant role in satisfaction of customers in Tyre manufacturing companies

Impact of Suppliers' Sustainability Performance

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Suppliers' Sustainability Performance has been added to earlier five predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Suppliers' Sustainability Performance on the Overall Satisfaction of Customers in Tyre Manufacturing companies.

Table 4.09 Regression with 'Suppliers' Sustainability Performance' as Sixth Predictor Variables for Tyre Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.986	.973	.972	.0897	.973	655.711	6	109	.000

It is observed from table 4.08 and 4.09, adjusted R square value increases from 0.971 to 0.972 on addition of Suppliers' Sustainability Performance as predictor variable. It indicates that the predictor variable, Suppliers' Sustainability Performance, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H07: Suppliers' Sustainability Performance does not have significant role in satisfaction of customers in Tyre manufacturing companies

Impact of Price of Product

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Price of Product has been added to earlier six predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Price of the Product on the Overall Satisfaction of Customers in Tyre Manufacturing companies.

Table 4.10 Regression with 'Price of Product' as Seventh Predictor Variables for Tyre Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.987	.974	.973	.0879	.974	587.152	7	108	.000

It is observed from table 4.09 and 4.10, adjusted R square value increases from 0.972 to 0.973 on addition of Price of Product as predictor variable. It indicates the predictor variable, Price of Product, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H03: Price of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies.

Impact of Company Image of the Supplier

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Company Image of the Supplier has been added to earlier seven predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Company Image of the Supplier on the Overall Satisfaction of Customers in Tyre Manufacturing companies.

Table 4.11 Regression with 'Company Image of the Supplier' as Eighth Predictor Variables for Tyre Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.987	.974	.972	.0882	.974	509.225	8	107	.000

It is observed from table 4.10 and 4.11, there is decrease in adjusted R square value from 0.973 to 0.972 on addition of Company Image of the Supplier as predictor variable. It indicates that the new term, Company Image of the Supplier, doesn't improve the model fit by a sufficient amount. It indicates that the predictor variable, Company Image of the Supplier, has no impact on the dependent variable, Overall Satisfaction which corresponds to the following null hypothesis.

H08:   Company Image the Supplier does not have significant role in satisfaction of customers in Tyre manufacturing companies

Impact of Incentives offered to customers

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Incentives offered to customers has been added to earlier eight predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Incentives offered to customers on the Overall Satisfaction of Customers in Tyre Manufacturing companies.

Table 4.12 Regression with 'Incentives offered to customers' as Ninth Predictor Variables

for Tyre Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.987	.974	.972	.0886	.974	449.234	9	106	.000

It is observed from tables 4.11 and 4.12, there is no change in adjusted R square value i.e., 0.972 on addition of Incentives offered to customers as predictor variable. It indicates that the predictor variable, Incentives offered to customers, has no impact on the dependent variable, Overall Satisfaction which corresponds to the following null hypothesis.

H04: Incentives Offered to Customers do not have significant role in satisfaction of customers in Tyre manufacturing companies

Impact of each predictor variable on the dependent variable for Tyre Manufacturing companies as observed from the tables 4.04 to 4.12 are summarized below.

Table 4.13 Consolidated table on the impact of each predictor variable on the dependent variable for Tyre Manufacturing companies

	Predictor variable	Change in adjusted R square value	Remarks
1	Quality Management System (QMS) Ensuring Quality of the Product	0.911	Positive impact on the dependent variable
2	Order Execution and Delivery of the Product	0.951	Positive impact on the dependent variable
3	Packaging of the Product	0.958	Positive impact on the dependent variable
4	Product Stewardship of the Supplier	0.967	Positive impact on the dependent variable
5	Customer Service of the Supplier	0.971	Positive impact on the dependent variable
6	Suppliers' Sustainability Performance	0.972	Positive impact on the dependent variable
7	Price of Product	0.973	Positive impact on the dependent variable
8	Company Image of the Supplier	0.972	No impact on the dependent variable
9	Incentives offered to customers	0.972	No impact on the dependent variable

Thus, it is observed from the table 4.13 that following factors have positive impact on the Overall Satisfaction of customers in Tyre Manufacturing companies.

a) Quality Management System (QMS) ensuring Quality of the Product,

b) Order Execution and Delivery of the Product,

c) Product Stewardship of the Supplier,

d) Packaging of the Product,

e) Customer Service of the Supplier,

f) Suppliers' Sustainability Performance

g) Price of Product

Whereas, following factors do not have positive impact on the Overall Satisfaction of customers in Tyre Manufacturing companies.

a) Company Image of the Supplier

b) Incentives offered to customers

4.3.2 Number of Significant Independent Variables for Automotive Rubber Component (ARC) Manufacturing Companies

In this section of the present study, the Criterion Variable is the Overall Satisfaction of Customers in ARC Manufacturing Companies for which nine predictor variables identified and on which the data has been collected are;

1. Quality Management System (QMS) ensuring Quality of the Product

2. Order Execution and Delivery of the Product

3. Packaging of the Product

4. Product Stewardship of the Supplier

5. Customer Service of the Supplier

6. Suppliers' Sustainability Performance

7. Price of the Product

8. Company Image of the Supplier

9. Incentives offered to Customers

For this purpose, the responses were collected using seven-point Likert Scale.

1 = Very Strongly Disagree (VSD)

2 = Strongly Disagree (SD)

3 = Disagree (D)

4 = Neither Agree nor Disagree (NAD)

5 = Agree (A)

6 = Strongly Agree (SA)

7 = Very Strongly Agree (VSA)

Impact of 'Quality Management System (QMS) Ensuring Quality of the Product'

In the first case of regression, dependent variable is Overall Satisfaction of Customers and predictor variable is Quality Management System (QMS) Ensuring Quality of the Product. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Quality Management System (QMS) Ensuring Quality of the Product on the Overall Satisfaction of Customers in ARC Manufacturing companies.

Table 4.14 Regression with 'Quality Management System (QMS) Ensuring Quality of the Product' as Single Predictor Variable for ARC Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.906	.821	.820	.2118	.821	528.314	1	115	.000

It is observed from the table 4.14, adjusted R square value is 0.820 which indicates that the predictor variable, Quality Management System (QMS) Ensuring Quality of the Product, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H010: QMS Ensuring Quality of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies.

Impact of Price of the Product

In this second case of regression, dependent variable is Overall Satisfaction of Customers whereas Price of the Product has been added to QMS Ensuring Quality of the Product as the predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Price of the Product on the Overall Satisfaction of Customers in ARC Manufacturing companies.

Table 4.15 Regression with Price of the Product as Second Predictor Variables for ARC Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.939	.881	.879	.1735	.881	422.207	2	114	.000

It is observed from the table 4.14 and 4.15, adjusted R square value increases from 0.820 to 0.879 on addition of Price of the Product as predictor variable. It indicates that the predictor variable, Price of the Product, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H012: Price of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies

Impact of Incentives offered to customers

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Incentives offered to customers has been added to earlier two predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Incentives offered to customers on the Overall Satisfaction of Customers in ARC Manufacturing companies.

Table 4.16 Regression with Incentives offered to customers as Third Predictor Variables for ARC Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.950	.902	.900	.1578	.902	348.623	3	113	.000

It is observed from the table 4.15 and 4.16, adjusted R square value increases from 0.879 to 0.900 on addition of Incentives offered to customers as predictor variable. It indicates that the predictor variable, Incentives offered to customers, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H013: Incentives Offered to Customers do not have significant role in satisfaction of customers in ARC manufacturing companies.

Impact of Customer Service of the Supplier

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Customer Service of the Supplier has been added to earlier three predictor variables. The relevant

portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Customer Service of the Supplier on the Overall Satisfaction of Customers in ARC Manufacturing companies.

Table 4.17 Regression with Customer Service of the Supplier as Fourth Predictor Variables for ARC Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.955	.911	.908	.1513	.911	286.930	4	112	.000

It is observed from the table 4.16 and 4.17, adjusted R square value increases from 0.900 to 0.908 on addition of Customer Service of the Supplier as predictor variable. It indicates that the predictor variable, Customer Service of the Supplier, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H015: Customer Service of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies

Impact of Order Execution and Delivery of the Product

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Order Execution and Delivery of the Product has been added to earlier four predictor variable. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Order Execution and Delivery of the Product on the Overall Satisfaction of Customers in ARC Manufacturing companies.

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Table 4.18 Regression with Order Execution and Delivery of the Product as Fifth Predictor Variables for ARC Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.957	.916	.912	.1480	.916	241.131	5	111	.000

It is observed from the table 4.17 and 4.18, adjusted R square value increases from 0.908 to 0.912 on addition of Order Execution and Delivery of the Product as predictor variable. It indicates that the predictor variable, Order Execution and Delivery of the Product, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H014: Order Execution and Delivery of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies

Impact of Product Stewardship of the Supplier

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Product Stewardship of the Supplier has been added to earlier five predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Product Stewardship of the Supplier on the Overall Satisfaction of Customers in ARC Manufacturing companies.

Table 4.19 Regression with Product Stewardship of the Supplier as Sixth Predictor

Variables for ARC Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.959	.920	.915	.1456	.920	178.936	7	109	.000

It is observed from the table 4.18 and 4.19, adjusted R square value increases from 0.912 to 0.915 on addition of Product Stewardship of the Supplier as predictor variable. It indicates that the predictor variable, Product Stewardship of the Supplier, has positive impact on the dependent variable, Overall Satisfaction which contradicts following null hypothesis.

H018: Product Stewardship of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies

Impact of Suppliers' Sustainability Performance of the Supplier

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Suppliers' Sustainability Performance has been added to earlier six predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Suppliers' Sustainability Performance on the Overall Satisfaction of Customers in ARC Manufacturing companies.

Table 4.20 Regression with Suppliers' Sustainability Performance as Seventh Predictor Variables for ARC Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.959	.920	.915	.1456	.920	178.936	7	109	.000

It is observed from the table 4.19 and 4.20, there is no change in adjusted R square value on addition of Suppliers' Sustainability Performance as predictor variable. It indicates that the predictor variable, Suppliers' Sustainability Performance, has no impact on the dependent variable, Overall Satisfaction which corresponds to the following null hypothesis.

H016: Suppliers' Sustainability Performance does not have significant role in satisfaction of customers in ARC manufacturing companies.

Impact of Packaging of the Product

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Packaging of the Product has been added to earlier seven predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Packaging of the Product on the Overall Satisfaction of Customers in ARC Manufacturing companies.

Table 4.21 Regression with Packaging of the Product as Eighth Predictor Variables for ARC Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.959	.920	.914	.1462	.920	155.261	8	108	.000

It is observed from the table 4.20 and 4.21, adjusted R square value decreases from 0.915 to 0.914 on addition of Packaging of the Product as predictor variable. It indicates that the new term, Packaging of the Product, doesn't improve the model fit by a sufficient amount which corresponds to the following null hypothesis.

H011: Packaging of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies

Impact of Company Image of the Supplier

In the present case of regression, dependent variable is Overall Satisfaction of Customers whereas Company Image of the Supplier has been added to earlier eight predictor variables. The relevant portion of SPSS output sheet is presented in following table to infer whether there is any significant impact of Company Image of the Supplier on the Overall Satisfaction of Customers in ARC Manufacturing companies.

Table 4.22 Regression with Company Image of the Supplier as Ninth Predictor Variables for ARC Manufacturing companies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.959	.920	.913	.1467	.920	137.115	9	107	.000

It is observed from the table 4.21 and 4.22, adjusted R square value decreases from 0.914 to 0.913 on addition of Company Image of the Supplier as predictor variable. It indicates that the new term, Company Image of the Supplier, doesn't improve the model fit by a sufficient amount which corresponds to the following null hypothesis.

H017: Company Image of the supplier does not have significant role in satisfaction of customers in ARC manufacturing companies

Impact of each predictor variable on the dependent variable for ARC Manufacturing companies as observed from the tables 4.14 to 4.22 are summarized as follows.

Table 4.23 Consolidated table on the impact of each predictor variable on the dependent variable for ARC Manufacturing companies

	Predictor variable	Change in adjusted R square value	Remarks
1	Quality Management System (QMS) Ensuring Quality of the Product	0.820	Positive impact on the dependent variable
2	Price of Product	0.879	Positive impact on the dependent variable
3	Incentives offered to customers	0.900	Positive impact on the dependent variable
4	Customer Service of the Supplier	0.908	Positive impact on the dependent variable
5	Order Execution and Delivery of the Product	0.912	Positive impact on the dependent variable
6	Product Stewardship of the Supplier	0.915	Positive impact on the dependent variable
7	Suppliers' Sustainability Performance	0.915	No impact on the dependent variable
8	Packaging of the Product	0.914	No impact on the dependent variable
9	Company Image of the Supplier	0.913	No impact on the dependent variable

Thus, it is observed from the table 4.23 that the following factors have positive impact on Overall Satisfaction of customers in ARC Manufacturing companies.

i.   Quality Management System Ensuring Quality of the Product

ii. Price of the Product

iii. Incentives Offered to Customers

iv. Customer Service of the Supplier

v. Order Execution and Delivery of the Product

vi. Product Stewardship of the Supplier

Whereas following factors do not have positive impact on Overall Satisfaction of customers in ARC Manufacturing companies.

a) Suppliers' Sustainability Performance

b) Packaging of the Product

c) Company Image of The Supplier

4.4 Significance of the Factors Influencing Customer Satisfaction and Hypothesis Testing

Burns et al. (2008) in their book, Business research methods and statistics using SPSS, mentioned that the Variance Inflation Factor (VIF) measures the impact of co-linearity among the Independent Variables in a multiple regression model on the precision of estimation. It expresses the degree to which co-linearity among the predictors degrades the precision of an estimate. Typically, a VIF value greater than 10.0 is of concern.

In order to determine whether there is co-linearity between the predictor variables or not, VIF (Variance Inflation Factor) values were determined for the identified factors in both the cases of Tyre manufacturing companies and ARC manufacturing companies.

4.4.1 Significance of the Factors Influencing Customer Satisfaction and Hypothesis Testing for Tyre Manufacturing Companies

VIF values are shown in the following table for the identified factors which can influence customer satisfaction for the chemical product (Carbon Black) in Tyre Manufacturing companies.

Table 4.24 Regression Analysis for the Factors influencing satisfaction of customers for the product (Carbon Black) in Tyre manufacturing companies

	Coefficients[a]							
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.999	.096		10.388	.000		
	QMS Ensuring Quality of the Product	.254	.044	.277	5.779	.000	.105	9.510
	Order Execution and Delivery of the Product	.218	.040	.248	5.491	.000	.118	8.495
	Packaging of the Product	.113	.028	.139	3.973	.000	.198	5.049
	Product Stewardship of the Supplier	.113	.033	.135	3.438	.001	.155	6.443
	Customer Service of the Supplier	.110	.041	.125	2.706	.008	.112	8.899
	Suppliers' Sustainability Performance	.076	.037	.087	2.049	.043	.133	7.533
	Price of the Product	.043	.019	.049	2.279	.025	.519	1.925
	Company Image of the Supplier	-.004	.017	-.005	-.230	.819	.551	1.813
	Incentives offered to customers	-.005	.013	-.007	-.435	.665	.821	1.219
a. Dependent Variable: Average of Overall Satisfaction								

Source: SPSS Output

It is evident from the 9th column of table 4.24, all the VIF values are between 1.0 to 10.0 indicating that the co-linearity between the predictor variables is not a matter of concern in this case. It means these factors are independent and influence customer satisfaction independent of each other.

Hypothesis on Quality Management System (QMS) Ensuring Quality of the Product (Carbon Black)

H01:   QMS Ensuring Quality of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.24. The significance level set by researches of similar type is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for QMS Ensuring Quality of the Product (Carbon Black) is p=0.000 which is less than $\alpha = 0.050$. So, the null hypothesis is not accepted and alternative hypothesis is accepted.

That means, *QMS Ensuring Quality of the Product (Carbon Black) has significant role in satisfaction of customers in Tyre Manufacturing companies.*

Hypothesis on Packaging of the Product

H02:   Packaging of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.24. The significance level set by researches of similar type is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Packaging of the Product (Carbon Black) is p=0.000 which is less than $\alpha = 0.050$.

So, the null hypothesis is not accepted, and alternative hypothesis is accepted.

That means, *Packaging of the Product (Carbon Black) has significant role in satisfaction of customers in Tyre Manufacturing companies.*

Hypothesis on Price of the Product (Carbon Black)

H03: Price of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.24. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Price of the Product (Carbon Black) is p=0.025 which is less than $\alpha = 0.050$. So, the null hypothesis is not accepted, and alternative hypothesis is accepted.

That means, *Price of the Product (Carbon Black) has significant role in satisfaction of customers in Tyre Manufacturing companies.*

Hypothesis on Incentives offered to customers

H04: Incentives offered to customers do not have significant role in satisfaction of customers in Tyre manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.24. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Incentives offered to customers is p=0.665 which is greater than $\alpha = 0.050$.

So, the null hypothesis is accepted, and alternative hypothesis is not accepted

That means, *Incentives offered to customers do not have significant role in satisfaction of customers in Tyre manufacturing companies.*

Hypothesis on Order Execution and Delivery of the Product (Carbon Black)

H05: Order Execution and Delivery of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.24. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Order Execution and Delivery of the Product (Carbon Black) is $p=0.000$ which is less than $\alpha = 0.050$.

So, the null hypothesis is not accepted, and alternative hypothesis is accepted.

That means, *Order Execution and Delivery of the Product (Carbon Black) has significant role in satisfaction of customers in Tyre manufacturing companies.*

Hypothesis on Customer Service of the Supplier

H06: Customer Service of the Supplier does not have significant role in satisfaction of customers in Tyre manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.24. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Customer Service of the Supplier is $p=0.008$ which is less than $\alpha = 0.050$.

So, the null hypothesis is not accepted, and alternative hypothesis is accepted.

That means, *Customer Service of the Supplier has significant role in satisfaction of customers in Tyre manufacturing companies.*

Hypothesis on Suppliers' Sustainability Performance

H07:   Suppliers' Sustainability Performance does not have significant role in satisfaction of customers in Tyre manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.24. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Suppliers' Sustainability Performance is p=0.043 which is less than $\alpha = 0.050$.

So, the null hypothesis is not accepted, and alternative hypothesis is accepted.

That means, *Suppliers' Sustainability Performance has significant role in satisfaction of customers in Tyre manufacturing companies.*

Hypothesis on Company Image of the supplier

H08:   Company Image of the Supplier does not have significant role in satisfaction of customers in Tyre manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.24. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Company Image of the Supplier is p=0.819 which is greater than $\alpha = 0.050$.

So, the null hypothesis is accepted, and alternative hypothesis is rejected.

That means, *Company Image of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies.*

Hypothesis on Product Stewardship of the Supplier

H09:   Product Stewardship of the Supplier does not have significant role in satisfaction of customers in Tyre manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.24. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Product Stewardship of the Supplier is p=0.001 which is less than $\alpha = 0.050$.

So, the null hypothesis is not accepted, and alternative hypothesis is accepted.

That means, *Product Stewardship of the Supplier has significant role in satisfaction of customers in Tyre manufacturing companies.*

It is evident from the table 4.24 and the above discussion that the factors which are significant in influencing satisfaction of customers in Tyre Manufacturing companies are as follows:

- Quality management System (QMS) Ensuring Quality of the Product (Carbon Black),
- Packaging of the Product (Carbon Black),
- Price of the Product (Carbon Black),
- Order Execution and Delivery of the Product (Carbon Black),
- Customer Service of the Supplier,
- Suppliers' Sustainability Performance
- Product Stewardship of the Supplier

4.4.2 Significance of the Factors Influencing Customer Satisfaction and Hypothesis Testing for ARC Manufacturing Companies

VIF values are shown in the following table for the identified factors which can influence customer satisfaction for the Product (Carbon Black) in ARC Manufacturing companies.

Table 4.25 Regression Analysis for the Factors influencing satisfaction of customers for the product (Carbon Black) in ARC manufacturing companies

		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.812	.165		4.926	.000		
	QMS Ensuring Quality of the Product	.281	.054	.312	5.218	.000	.209	4.787
	Price of the Product	.200	.055	.232	3.631	.000	.182	5.482
	Incentives offered to customers	.127	.049	.144	2.579	.011	.240	4.159
	Customer Service of the Supplier	.109	.053	.122	2.031	.045	.206	4.849
	Order Execution and Delivery of the Product	.111	.050	.120	2.234	.028	.258	3.879
	Product Stewardship of the Supplier	.091	.043	.109	2.140	.035	.286	3.502
	Suppliers' Sustainability Performance	.040	.032	.047	1.243	.217	.531	1.882
	Packaging of the Product	-.006	.036	-.007	-.180	.857	.533	1.878
	Company Image of the Supplier	-.020	.039	-.024	-.525	.600	.360	2.775
a. Dependent Variable: Average of Overall satisfaction								

Source: SPSS Output

It is evident from the 9th column of table 4.25, all the VIF values are between 1.0 to 10.0 indicating that the co-linearity between the predictor variables is not a matter of concern in this case. It means these factors are independent and influence customer satisfaction independent of each other.

Hypothesis on Quality Management System (QMS) Ensuring Quality of the Product (Carbon Black)

H010: QMS Ensuring Quality of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.25. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for QMS Ensuring Quality of the Product (Carbon Black) is p=0.000 which is less than $\alpha = 0.050$. So, the null hypothesis is not accepted, and alternative hypothesis is accepted.

That means, *QMS Ensuring Quality of the Product (Carbon Black) has significant role in satisfaction of customers in ARC Manufacturing companies.*

Hypothesis on Packaging of the Product (Carbon Black)

H011: Packaging of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.25. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Packaging of the Product (Carbon Black) is p=0.857 which is greater than $\alpha = 0.050$.

So, the null hypothesis is accepted, and alternative hypothesis is rejected.

That means, *Packaging of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC Manufacturing companies.*

Hypothesis on Price of the Product (Carbon Black)

H012: Price of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.25. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Price of the Product is p=0.000 which is less than $\alpha = 0.050$.

So, the null hypothesis is not accepted, and alternative hypothesis is accepted.

That means, *Price of the Product (Carbon Black) has significant role in satisfaction of customers in ARC Manufacturing companies.*

Hypothesis on Incentives offered to customers

H013: Incentives offered to customers do not have significant role in satisfaction of customers in ARC manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.25. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Incentives offered to customers is p=0.011 which is less than $\alpha = 0.050$.

So, the null hypothesis is not accepted, and alternative hypothesis is accepted

That means, *Incentives offered to customers has significant role in satisfaction of customers in ARC manufacturing companies.*

Hypothesis on Order Execution and Delivery of the Product (Carbon Black)

H014: Order Execution and Delivery of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.25. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Order execution and delivery of the Product (Carbon Black) is p=0.028 which is less than $\alpha = 0.050$.

So, the null hypothesis is not accepted, and alternative hypothesis is accepted.

That means, *Order Execution and Delivery of the Product (Carbon Black) has significant role in satisfaction of customers in ARC manufacturing companies.*

Hypothesis on Customer Service of the Supplier

H015: Customer Service of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.25. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Customer Service of the Supplier is p=0.045 which is less than $\alpha = 0.050$.

So, the null hypothesis is not accepted, and alternative hypothesis is accepted.

That means, *Customer Service of the Supplier has significant role in satisfaction of customers in ARC manufacturing companies.*

Hypothesis on Suppliers' Sustainability Performance

H016: Suppliers' Sustainability Performance does not have significant role in satisfaction of customers in ARC manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.25. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Suppliers' Sustainability Performance is p=0.217 which is greater than $\alpha = 0.050$.

So, the null hypothesis is accepted, and alternative hypothesis is rejected.

That means, *Suppliers' Sustainability Performance does not have significant role in satisfaction of customers in ARC manufacturing companies.*

Hypothesis on Company Image of the Supplier

H017: Company Image of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.25. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Company Image of the Supplier is p=0.600 which is greater than $\alpha = 0.050$.

So, the null hypothesis is accepted, and alternative hypothesis is rejected.

That means, *Company Image of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies.*

Product Stewardship of the Supplier

H018: Product Stewardship of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies

The exact significant level (p value) is exhibited in 7th Col. (Sig.) of the table 4.25. The significance level set by us is $\alpha = 0.050$ (based on existing researches of similar type). The table reveals that significance level for Product Stewardship of the Supplier is p=0.035 which is less than $\alpha = 0.050$.

So, the null hypothesis is not accepted, and alternative hypothesis is accepted.

That means, *Product Stewardship of the Supplier has significant role in satisfaction of customers in ARC manufacturing companies.*

Thus, it is evident from the table 4.25 and the above discussion, that the factors which are significant in influencing satisfaction of customers in ARC Manufacturing companies are as follows:

- Quality Management System Ensuring Quality of the Product (Carbon Black)
- Price of the Product (Carbon Black)
- Incentives offered to customers
- Order Execution and Delivery of the Product (Carbon Black)
- Customer Service of the Supplier
- Product Stewardship of the Supplier

4.5 Prioritization of the Factors using Standardized Regression Coefficients and Hypotheses Testing

The objective of this section is to prioritize the factors that influence customer satisfaction for the Product (carbon black). We can estimate how strongly each predictor variable influences the dependent variable from the standardized regression coefficient (Beta). The higher the Beta value, the greater is the impact of predictor variable on the dependent variable. In this case, overall satisfaction has been considered as the dependent variable and each of the identified nine factors is considered as predictor variables.

4.5.1 Prioritization of the Factors and Hypotheses Testing for Tyre Manufacturing Companies

The relevant portion of SPSS output sheet is presented in the following table to infer the prioritization of factors influencing satisfaction of customers for the chemical (Carbon Black) in TYRE Manufacturing companies.

Table 4.26 Prioritization of the Factors influencing satisfaction of customers for the product (Carbon Black) in Tyre manufacturing companies

Model		Unstandardized Coefficients		Standardized Coefficients
		B	Std. Error	Beta
1	(Constant)	.999	.096	
	QMS Ensuring Quality of the Product	.254	.044	.277
	Order Execution and Delivery of the Product	.218	.040	.248
	Packaging of the Product	.113	.028	.139
	Product Stewardship of the Supplier	.113	.033	.135
	Customer Service of the Supplier	.110	.041	.125
	Suppliers' Sustainability Performance	.076	.037	.087
	Price of the Product	.043	.019	.049
	Company Image of the Supplier	-.004	.017	-.005
	Incentives offered to customers	-.005	.013	-.007
a. Dependent Variable: Average of Overall satisfaction				

Source: SPSS Output

It is observed from the table 4.26, Beta value for the predictor variable, QMS Ensuring Quality of the Product, is the highest i.e., Beta = 0.277, which exhibits that QMS Ensuring Quality of the Product has the highest impact on the dependent variable, Overall Satisfaction of customers. It is

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followed by Order Execution and Delivery of the Product (Beta value 0.248), Packaging of the Product (Beta value 0.139), Product Stewardship of the Supplier (Beta value 0.135), Customer Service of the Supplier (Beta value 0.125), Suppliers' Sustainability Performance (Beta value 0.087) and Price of the Product (Beta value 0.049).

It was explained in section 4.4.1, Incentives Offered to Customers and Company Image of the Supplier do not have significant impact on the satisfaction of customers in Tyre Manufacturing companies. So, Beta values for these insignificant predictor variables will not be taken into consideration for prioritization of factors.

4.5.2 Prioritization of the Factors and Hypotheses Testing for ARC Manufacturing Companies

The relevant portion of SPSS output sheet is presented in the following table to infer the prioritization of factors influencing satisfaction of customers for the chemical (Carbon Black) in ARC Manufacturing companies.

Table 4.27 Prioritization of the Factors influencing satisfaction of customers for the product (Carbon Black) in ARC manufacturing companies

		Unstandardized Coefficients		Standardized Coefficients
Model		B	Std. Error	Beta
1	(Constant)	.812	.165	
	QMS Ensuring Quality of the Product	.281	.054	.312
	Price of the Product	.200	.055	.232
	Incentives offered to customers	.127	.049	.144
	Customer Service of the Supplier	.109	.053	.122
	Order Execution and Delivery of the Product	.111	.050	.120
	Product Stewardship of the Supplier	.091	.043	.109
	Suppliers' Sustainability Performance	.040	.032	.047
	Packaging of the Product	-.006	.036	-.007
	Company Image of the Supplier	-.020	.039	-.024
Dependent Variable: Average of Overall satisfaction				

Source: SPSS Output

It is observed from the table 4.27, Beta value for the predictor variable, QMS Ensuring Quality of the Product, is the highest i.e., Beta = 0.312, which exhibits that QMS Ensuring Quality of the Product has the highest impact on the dependent variable, Overall Satisfaction of customers. It is followed by Price of the Product (Beta value 0.232), Incentives offered to customers (Beta Value 0.144), Customer Service of the Supplier (Beta value 0.122), Order Execution and Delivery of the Product (Beta value 0.120), Product Stewardship of the Supplier (Beta value 0.109).

It was explained in section 4.4.2, Packaging of the Product (Carbon Black), Suppliers'
Sustainability Performance and Company Image of the Supplier do not have significant impact on
the satisfaction of customers in ARC Manufacturing companies. So, Beta values for these
insignificant predictor variables will not be taken into consideration for prioritization of factors.

As evident from the Beta values mentioned in sections 4.5.1 and 4.5.2, the ranking of factors (1
being the highest rank and 9 being the lowest rank) influencing satisfaction of customers in Tyre
manufacturing companies and ARC manufacturing companies are as follows:

Table 4.28 Ranking of Customer Satisfaction Factors in Two Sectors- Tyre and ARC

Factors Affecting Customer Satisfaction	Sectors under study	
	Carbon Black in Tyre	Carbon Black in ARC
QMS Ensuring Quality of the Product (Carbon Black)	1	1
Order Execution and Delivery of the Product (Carbon Black)	2	5
Packaging of the Product (Carbon Black)	3	8
Product Stewardship of the Supplier	4	6
Customer Service of the Supplier	5	4
Suppliers' Sustainability Performance	6	7
Price of the Product (Carbon Black)	7	2
Company Image of the Supplier	8	9
Incentives Offered to Customers	9	3

From the table 4.28, it is observed that

- QMS Ensuring Quality of the Product (Carbon Black) holds the top rank in influencing the satisfaction of customers in both Tyre manufacturing companies and ARC manufacturing companies. However, the ranking of other factors in Tyre manufacturing companies are quite different from the ranking of these factors in ARC manufacturing companies

- Order Execution and Delivery of the Product (Carbon Black) occupies the second rank in case of Tyre manufacturing company, but it occupies the fifth rank in case of ARC manufacturing company

- Packaging of the Product (Carbon Black) occupies the third rank in case of Tyre manufacturing companies whereas this factor occupies the eighth rank in ARC manufacturing companies

- Product Stewardship of the Supplier occupies the fourth rank in case of Tyre manufacturing companies whereas this factor occupies the sixth rank in ARC manufacturing companies

- Customer Service of the Supplier occupies the fifth rank in case of Tyre manufacturing companies whereas this factor occupies the fourth rank in ARC manufacturing companies

- Suppliers' Sustainability Performance occupies the sixth rank in case of Tyre manufacturing companies whereas this factor occupies the seventh rank in ARC manufacturing companies

- Price of the Product (Carbon Black) occupies the seventh rank in case of Tyre manufacturing companies whereas this factor occupies the second rank in ARC manufacturing companies

- Company Image of the Supplier occupies the eighth rank in case of Tyre manufacturing companies whereas this factor occupies the ninth rank in ARC manufacturing companies

- Incentives offered to customers occupies the ninth rank in case of Tyre manufacturing companies whereas this factor occupies the third rank in ARC manufacturing companies

4.5.3 Spearman's Rank Correlation Test of customer satisfaction factors for Tyre manufacturing companies and ARC manufacturing companies

We can measure the strength and direction of association between two ranked variables by Spearman's correlation coefficient, r_s (https://statistics.laerd.com/statistical-guides/spearmans-rank-order-correlation-statistical-guide.php).

Spearman's correlation coefficient can be calculated from the following formula when the data does not have tied ranks:

$$r_s = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

Where, d_i = difference in paired ranks and n = number of pairs of data.

We can get the critical value for Spearman's Rank Correlation Coefficient (r_s) for 9 pairs of data (n=9) at 0.05 level of significance from the standard table (Levin et al. 2013), as follows:

$$r_s = 0.683; \quad (n = 9, alpha = 0.05)$$

If the value of r_s is greater than the critical value, we can say with 95% certainty that the observed results were not occurred by chance. Which indicates the results are highly significant and we can draw sound conclusions from them. The value of the coefficient (r_s) will be between -1 and +1, where -1 indicates a perfect negative correlation and +1 indicates a perfect positive correlation. A

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value of Spearman's Rank Correlation Coefficient (r_s) between -0.7 to +0.7 is generally not considered as a significant result (https://www.rgs.org/CMSPages/GetFile.aspx?nodeguid=882169d2-8f96-4c55-84f5-fbb7614870e9&lang=en-GB). As mentioned by Levin et al. (2013), for small values of n ($n \leq 30$), the distribution of r_s is not normal and so it is not advisable to use the t-distribution for testing hypotheses for the rank correlation coefficient. For such cases we can use critical values of Spearman correlation coefficient to determine the acceptance or rejection of such hypotheses and the value of alpha considered will be the level of significance for testing these hypotheses.

Spearman correlation coefficients measured on the ranking (ref. Table 4.28) of customer satisfaction factors in two sectors i.e. Tyre manufacturing companies and ARC manufacturing companies are shown in following table.

Table 4.29 Spearman's Ranking Correlation Coefficients on the Customer Satisfaction Factors in Tyre manufacturing companies and ARC manufacturing companies

	Carbon Black in Tyre	Carbon Black in ARC
Carbon Black in Tyre	1.000	0.150
Carbon Black in ARC		1.000

The results of the Spearman correlation, as shown in table 4.29, indicate that there is no significant positive association between the rankings of customer satisfaction factors as per opinion of respondents from Tyre manufacturing companies and ARC manufacturing companies, ($r_s[9]=0.150$, $p < .05$), since r_s is less than the critical value of 0.683

Thus, it is evident that the following null hypothesis is not accepted.

H019: There is no significant difference in the prioritization of factors influencing satisfaction of customers in Tyre manufacturing companies and ARC manufacturing companies

But alternative hypothesis is accepted.

That means, *there is significant difference in the prioritization of factors influencing satisfaction of customers in Tyre manufacturing companies and ARC manufacturing companies.*

4.6 Comparison of Factors Satisfying Customers of Different Functions of Tyre manufacturing companies and ARC manufacturing companies

Hypothesis on comparison of factors satisfying customers of different functions is stated below.

H020: There is no significant difference in satisfaction factors among customers in different functions of Tyre manufacturing companies and ARC manufacturing companies

Responses were collected from the following functions of both Tyre manufacturing and ARC manufacturing companies:

- Purchase
- Technical
- Production
- Quality Assurance
- R&D

These functions were selected mainly because supplier selection is mostly done by Purchase as per feedback from QA, Technical, Production and R&D and the assessment of suppliers is done by these functions. Respondents were asked to give weightage as per their opinion to the following identified factors and also to other factor, if any, which can influence their satisfaction for the Chemical (Carbon Black). The sum of the weightages given to all the factors by each respondent was 100.

1. Weightage of Price of the Product (Carbon Black)
2. Weightage of Incentives Offered to Customers
3. Weightage of QMS Ensuring Quality of the Product (Carbon Black)

4. Weightage of Packaging of the Product (Carbon Black)

5. Weightage of Order Execution and Delivery of the Product (Carbon Black)

6. Weightage of Customer Service of Supplier

7. Weightage of Suppliers' Sustainability Performance

8. Weightage of Company Image of the Supplier

9. Weightage of Product Stewardship of the Supplier

10. Weightage of any other factor, please specify

4.6.1 Ranking of Factors for Different Functions of Tyre Manufacturing Companies

The numbers of respondents from different functions of Tyre manufacturing companies were as follows:

- Number of respondents from Purchase function   : 31

- Number of respondents from Technical   : 33

- Number of respondents from Production   : 08

- Number of respondents from Quality Assurance   : 29

- Number of respondents from R&D   : 15

Since the numbers of responses from the two functions viz. Production and R&D are less as compared to the numbers of respondents from other functions, similar functions based on their nature of job are clubbed together. Thus, respondents of Technical and Production functions are clubbed together, Quality Assurance and R&D functions are clubbed together while Purchase function is kept alone. Now the numbers of respondents from these combined functions are as follows:

- Number of respondents from Purchase function   : 31

- Number of respondents from Technical and Production functions   : 41

- Number of respondents from Quality Assurance and R&D Functions   : 44

Weightages given to the identified factors by the respondents from different functions of Tyre manufacturing companies are shown in the table below followed by bar graphs.

Table 4.30 Mean of Weightages Given to the Identified Factors by Different Functions in Tyre Manufacturing Companies

Factors	Different Functions		
	Purchase	Technical and Production	R&D and QA
QMS Ensuring Quality of the Product (Carbon Black)	21.39	24.93	24.68
Order Execution and Delivery of the Product	12.35	14.98	12.73
Packaging of the Product	11.52	11.71	12.91
Product Stewardship of the Supplier	11.13	9.93	13.84
Customer Service of the Supplier	12.29	11.78	8.80
Suppliers' Sustainability Performance	9.32	9.51	8.84
Price of the Product	12.00	8.00	7.95
Company Image of the Supplier	5.19	5.72	6.23
Incentives Offered to Customers	4.81	3.46	4.02
Total	100	100	100

Figure 4.03 Comparison of Customer Satisfaction Factors for Different Functions in Tyre Manufacturing Companies
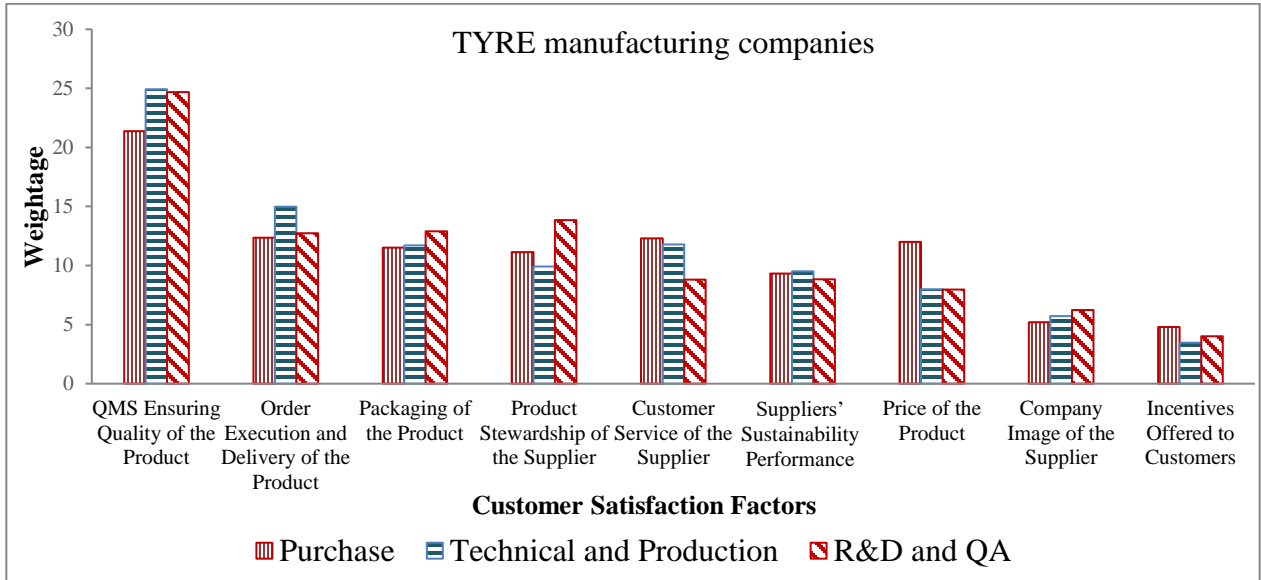
From the table 4.30 and figure 4.03, it is evident that

- Maximum weightage was given to 'QMS Ensuring Quality of the Product' and minimum weightage was given to 'Incentives Offered to Customers' by respondents from all the functions of tyre manufacturing companies

- For QMS Ensuring Quality of the Product, maximum weightage was given by the respondents from Technical and Production function and minimum weightage was given by the respondents from Purchase function

- For Order Execution and Delivery of the Product, maximum weightage was given by the respondents from Technical and Production function and minimum weightage was given by the respondents from Purchase function

- For Packaging of the Product, maximum weightage was given by the respondents from R&D and QA function and minimum weightage was given by the respondents from Purchase function

- For Product Stewardship of the Supplier, maximum weightage was given by the respondents from R&D and QA function and minimum weightage was given by the respondents from Technical and Production function

- For Customer Service of the Supplier, maximum weightage was given by the respondents from Purchase function and minimum weightage was given by the respondents from R&D and QA function

- For Suppliers' Sustainability Performance, maximum weightage was given by the respondents from Technical and Production function and minimum weightage was given by the respondents from R&D and QA function

- For Price of the Product, maximum weightage was given by the respondents from Purchase function and minimum weightage was given by the respondents from R&D and QA function

- For Company Image of the Supplier, maximum weightage was given by the respondents from R&D and QA function and minimum weightage was given by the respondents from Purchase function

- For Incentives Offered to Customers, maximum weightage was given by the respondents from Purchase function and minimum weightage was given by the respondents from Production and Technical function

4.6.1.1 Rank Correlation Test of customer satisfaction factors for Different Functions of Tyre Manufacturing Companies

Ranking of the identified factors as derived from the weightages (Ref. Table 4.30) given by the respondents from different functions of Tyre manufacturing companies are shown in following table.

Table 4.31 Ranking of Customer Satisfaction Factors for Different Functions of Tyre Manufacturing Companies

Factors	Different Functions		
	Purchase	Technical and Production	R&D and QA
QMS Ensuring Quality of the Product	1	1	1
Order Execution and Delivery of the Product	2	2	4
Packaging of the Product	5	4	3
Product Stewardship of the Supplier	6	5	2
Customer Service of the Supplier	3	3	6
Suppliers' Sustainability Relationship	7	6	5
Price of the Product	4	7	7
Company Image of the Supplier	8	8	8
Incentives offered to Customers	9	9	9

From the table 4.31 it is observed that the ranking of factors, as per opinion of respondents from different functions, are as follows.

a) QMS Ensuring Quality of the Product becomes the first priority for all the functions

b) Order Execution and Delivery of the Product comes in second position for Purchase, Technical and Production function, but this factor comes in fourth position for R&D and QA

c) Customer Service of the Supplier comes in third position for Purchase, Technical and Production function, but this factor comes in sixth position for R&D and QA

d) Price of the Product comes in fourth position for Purchase function, but this factor comes in seventh position for Technical, Production, R&D and QA

e) Packaging of the Product comes in fifth position for Purchase, but this factor comes in third position for R&D and QA and fourth position for Technical and Production function

f) Product Stewardship of the Supplier comes in sixth position for Purchase, but this factor comes in second position for R&D and QA and fifth position for Technical and Production function

g) Suppliers' Sustainability Performance comes in seventh position for Purchase, but this factor comes in fifth position for R&D and QA and sixth position for Technical and Production function

h) There is no difference in ranking of other two factors viz. Company Image of the Supplier and Incentives Offered to Customers which come in eighth and ninth position respectively as per opinion of respondents from all the functions of Tyre manufacturing companies.

Spearman's Rank Correlation Coefficient:

As explained in section 4.5.3, we can measure the strength and direction of association between two ranked variables by Spearman's correlation coefficient, r_s.

The critical value for this case, where there are 9 pairs of data ($n = 9$), is 0.683.

Spearman correlation coefficients measured on the ranking of factors influencing satisfaction of customers of different functions in tyre manufacturing companies are shown in the following table.

Table 4.32 Spearman's Ranking Correlation Coefficients for Different Functions in Tyre Manufacturing Companies

	Purchase	Technical and Production	R&D and QA
Purchase	1.000	0.900	0.617
Technical and Production		1.000	0.800
R&D and QA			1.000

Thus, the results of the Spearman correlation, as shown in table 4.32 indicate that

- There is significant positive association of the ranking of customer satisfaction factors for Purchase function with the ranking for Technical and Production Functions of Tyre manufacturing companies, ($r_s[9]$=0.900, p < 0.05), since r_s is greater than the critical value of 0.683. Hence, these groups have similar perception relative ranking of factors of customer satisfaction.

- There is significant positive association of the ranking of customer satisfaction factors for Technical and Production Functions with the ranking for R&D and QA function of Tyre manufacturing companies, ($r_s[9]$=0 .800, p < .05), since r_s is greater than the critical value of 0.683. Hence, these groups have similar perception relative ranking of factors of customer satisfaction.

- There is no significant positive association of the ranking of customer satisfaction factors for Purchase Function with the ranking for R&D and QA function of Tyre manufacturing companies, (r_s[9]=0 .617, p < .05), since r_s is marginally less than the critical value of 0.683 . Hence, these groups do not have similar perception relative ranking of factors of customer satisfaction.

However, for the majority of the cases, there is significant positive association among the ranking of customer satisfaction factors as per opinion of respondents from the different functions of tyre manufacturing companies.

4.6.2 Ranking of Factors for Different Functions of ARC Manufacturing Companies

The numbers of respondents from different functions of ARC manufacturing companies were as follows:

- Number of respondents from Purchase function   : 43
- Number of respondents from Technical   : 32
- Number of respondents from Production   : 15
- Number of respondents from Quality Assurance   : 19
- Number of respondents from R&D   : 08

Since the numbers of responses from the three functions viz. Production, Quality Assurance and R&D are less as compared to the numbers of respondents from other functions, similar functions based on their nature of job are clubbed together. Thus, respondents of Technical and Production functions are clubbed together, Quality Assurance and R&D functions are clubbed together while Purchase function is kept alone. Now the numbers of respondents from these functions are as follows:

- Number of respondents from Purchase function : 43

- Number of respondents from Technical and Production functions : 47

- Number of respondents from Quality Assurance and R&D Functions : 27

Weightages given to the identified factors by the respondents from different functions of ARC manufacturing companies are shown in the table below followed by bar graphs.

Table 4.33 Mean of Weightages Given to the Identified Factors by Different Functions in ARC Manufacturing Companies

Factors	Different Functions		
	Purchase	Technical and Production	R&D and QA
QMS Ensuring Quality of the Product	20.58	23.94	26.48
Price of the Product	19.70	17.77	18.07
Incentives Offered to Customers	12.07	11.96	11.11
Customer Service of the Supplier	11.65	11.85	10.70
Order Execution and Delivery of the Product	10.49	9.68	9.70
Product Stewardship of the Supplier	8.19	7.60	7.04
Suppliers' Sustainability Performance	7.07	6.92	6.23
Packaging of the Product	5.84	5.64	5.81
Company Image of the Supplier	4.42	4.66	4.85
Total	100	100	100

Figure 4.04 Comparison of Customer Satisfaction Factors for Different Functions in ARC Manufacturing Companies
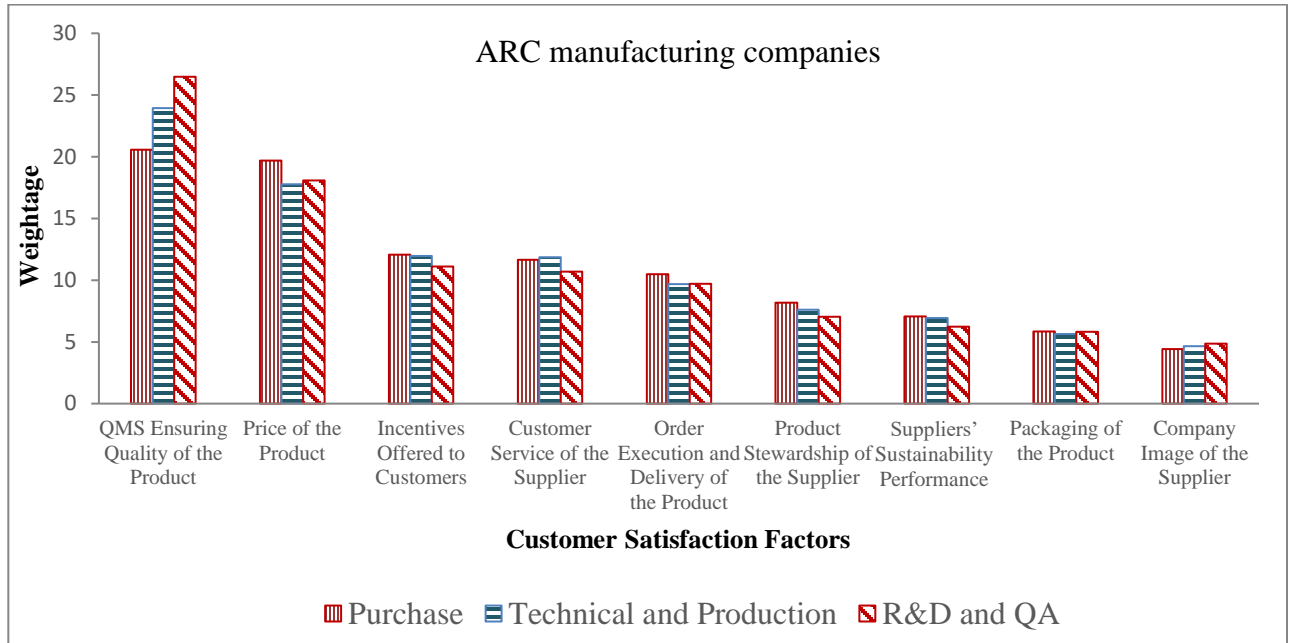
From the table 4.33 and figure 4.04, it is evident that

● Maximum weightage was given to QMS Ensuring Quality of the Product and minimum weightage was given to Company Image of the Supplier by respondents from all the functions of ARC manufacturing companies

● For QMS Ensuring Quality of the Product, maximum weightage was given by the respondents from R&D and QA function and minimum weightage was given by the respondents from Purchase function

● For Price of the Product, maximum weightage was given by the respondents from Purchase function and minimum weightage was given by the respondents from Technical and Production function

- For Incentives Offered to Customers, maximum weightage was given by the respondents from Purchase function and minimum weightage was given by the respondents from R&D and QA function

- For Customer Service of the Supplier, maximum weightage was given by the respondents from Technical and Production function and minimum weightage was given by the respondents from R&D and QA function

- For Order Execution and Delivery of the Product, maximum weightage was given by the respondents from Purchase function and minimum weightage was given by the respondents from Technical and Production function

- For Product Stewardship of the Supplier, maximum weightage was given by the respondents from Purchase function and minimum weightage was given by the respondents from R&D and QA function

- For Suppliers' Sustainability Performance, maximum weightage was given by the respondents from Purchase function and minimum weightage was given by the respondents from R&D and QA function

- For Packaging of the Product, maximum weightage was given by the respondents from Purchase function and minimum weightage was given by the respondents from Technical and Production function

- For Company Image of the Supplier, maximum weightage was given by the respondents from R&D and QA function and minimum weightage was given by the respondents from Purchase function

Thus, it is observed that the weightages given to each of the identified factors are different for respondents of different functions of ARC manufacturing companies.

4.6.2.1 Rank Correlation Test for Different Functions of ARC Manufacturing Companies

Ranking of the identified factors as derived from the weightages (Ref. Table 4.33) given by the respondents from different functions of ARC manufacturing companies are shown in following table.

Table 4.34 Ranking of Customer Satisfaction Factors for Different Functions of ARC Manufacturing Companies

Factors	Different Functions		
	Purchase	Technical and Production	R&D and QA
QMS Ensuring Quality of the Product	1	1	1
Price of the Product	2	2	2
Incentives Offered to Customers	3	3	3
Customer Service of the Supplier	4	4	4
Order Execution and Delivery of the Product	5	5	5
Product Stewardship of the Supplier	6	6	6
Suppliers' Sustainability Performance	7	7	7
Packaging of the Product	8	8	8
Company Image of the Supplier	9	9	9

From the table 4.34 it is observed that the ranking of factors, as per opinion of respondents from different functions, are as follows.

    a) QMS Ensuring Quality of the Product becomes the first priority for all the functions

    b) Price of the Product comes in second position for all the functions

c) Incentives Offered to Customers comes in third position for all the functions

d) Customer Service of the Supplier comes in fourth position for all the functions

e) Order Execution and Delivery of the Product comes in fifth position for all the functions

f) Product Stewardship of the Supplier comes in sixth position for all the functions

g) Suppliers' Sustainability Performance comes in seventh position for Purchase, Technical and Production functions but this factor comes in eighth position for R&D and QA functions

h) Packaging of the Product comes in eighth position for Purchase, Technical and Production functions but this factor comes in seventh position for R&D and QA functions

i) Company Image of the Supplier which comes in ninth position for all the functions of ARC manufacturing companies.

Thus, it is observed that the rankings of all the identified factors are same though the weightages given by respondents of different functions of ARC manufacturing companies are different.

Spearman's Rank Correlation Coefficient:

As explained in section 4.5.3, we can measure the strength and direction of association between two ranked variables by Spearman's correlation coefficient, r_s.

The critical value for this case, where there are 9 pairs of data ($n = 9$), is 0.683.

Spearman correlation coefficients measured on the ranking of factors influencing satisfaction of customers of different functions in ARC manufacturing companies are shown in the following table.

Table 4.35 Spearman's Ranking Correlation Coefficients for Different Functions of ARC Manufacturing Companies

	Purchase	Technical and Production	R&D and QA
Purchase	1.000	1.000	1.000
Technical and Production		1.000	1.000
R&D and QA			1.000

Thus, the results of the Spearman correlation, as shown in table 4.35 indicate that

- There is significant positive association of the ranking of customer satisfaction factors for Purchase function with the ranking for Technical and Production Functions of ARC manufacturing companies, ($r_s[9]$=1.000, $p < 0.05$), since r_s is greater than the critical value of 0.683

- There is significant positive association of the ranking of customer satisfaction factors for Technical and Production Functions with the ranking for R&D and QA function of ARC manufacturing companies, ($r_s[9]$=1.000, $p < .05$), since r_s is greater than the critical value of 0.683

- There is significant positive association of the ranking of customer satisfaction factors for Purchase Function with the ranking for R&D and QA function of ARC manufacturing companies, ($r_s[9]$=1.000, $p < .05$), since r_s is greater than the critical value of 0.683

Thus on an overall basis r_s is greater than the critical value of 0.683 and hence we can conclude that there is significant positive association among the ranking of customer satisfaction factors as per opinion of respondents from Purchase function, Technical and Production Functions, R&D and QA function of ARC manufacturing companies. These groups have similar perception relative

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ranking of factors of customer satisfaction.

Thus, from the sections 4.6.1 and 4.6.2, it is evident that there is no significant difference in ranking of customer satisfaction factors as per opinion of respondents from different functions of Tyre manufacturing companies and ARC manufacturing companies.

Thus, the following null hypothesis is accepted.

H020: *There is no significant difference in prioritization of satisfaction factors among the customers in different functions of Tyre manufacturing companies and ARC manufacturing companies.*

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4.7 Comparison of Factors Satisfying Customers for Different Industrial Chemical Products

Hypothesis on comparison of factors satisfying customers for various industrial chemicals is stated below:

H021: There is no resemblance in the prioritization of satisfaction factors among customers for different industrial chemical products.

A small survey was conducted on total number of respondents of 65, in which industrial customers of various chemical products were asked to give their opinion on the significance of following identified factors which can influence their satisfaction with the supply. This survey was in addition to the survey already conducted for carbon black customers in Tyre manufacturing company and ARC manufacturing company.

1. Weightage of Price of the Product

2. Weightage of Incentives Offered to Customers

3. Weightage of QMS Ensuring Quality of the Product

4. Weightage of Packaging of the Product

5. Weightage of Order Execution and Delivery of the Product

6. Weightage of Customer Service of the Supplier

7. Weightage of Suppliers' Sustainability Performance

8. Weightage of Company Image of the Supplier

9. Weightage of Product Stewardship of the Supplier

10. Weightage on any other factor, please specify

Respondents were selected as per convenience from the following industries:

- Tyre Manufacturing Companies

- Automotive Rubber Components (ARC) Manufacturing Companies

- Lead –Acid Battery Manufacturing Company

- Precipitated Silica Manufacturing Company

- Carbon Black Manufacturing Company

- Steam Power Plants (CPP)

Following industrial chemical products are procured by the aforesaid industries as their raw material:

- Carbon Black

- Zinc Oxide

- Stearic Acid

- Sulfur

- Sulphuric Acid

- Sodium Silicate

- Hydrochloric Acid

- Sodium Hydroxide

- Potassium Carbonate

- Potassium Nitrate

The weightages given to different factors influencing satisfaction of various customers who buy different types of chemicals are represented one by one in the following graphs. The sum of the weightages given to all the factors by each respondent was 100.

Figure 4.05 represents the weightages given to the identified factors by the respondents from various Automotive Rubber Component (ARC) manufacturing companies which reflects the influence of each of these factors to satisfy these customers for carbon black. Total number of respondents in this case was 117.

Figure 4.05 Customer Satisfaction Factors for Carbon Black

in ARC Manufacturing Companies
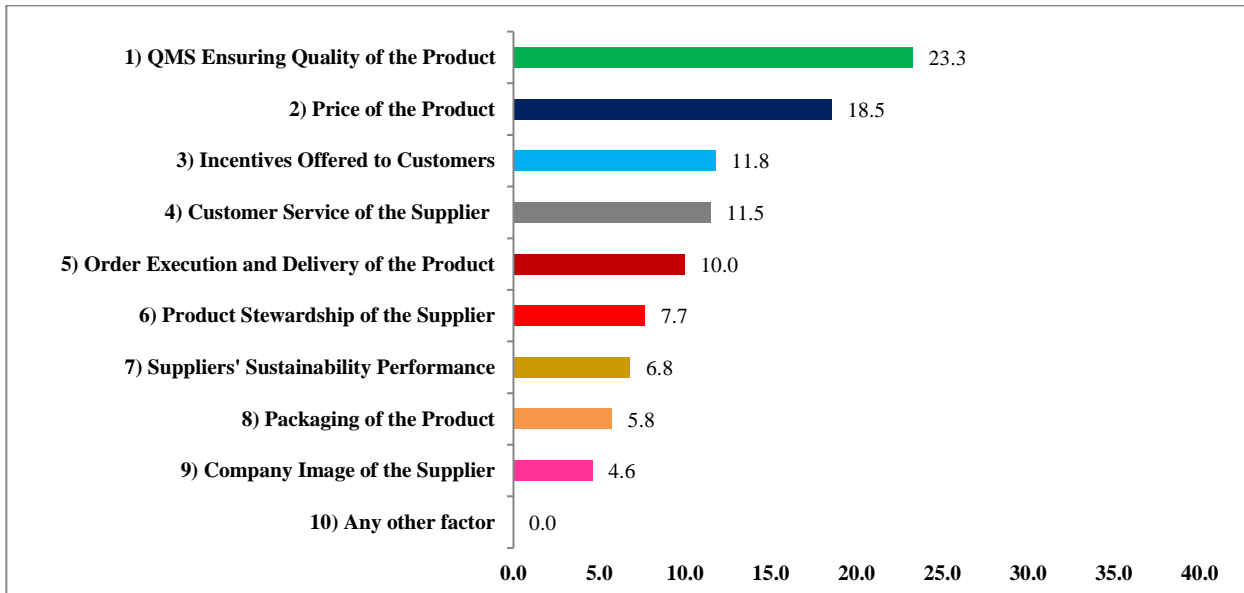
Factor	Value
1) QMS Ensuring Quality of the Product	23.3
2) Price of the Product	18.5
3) Incentives Offered to Customers	11.8
4) Customer Service of the Supplier	11.5
5) Order Execution and Delivery of the Product	10.0
6) Product Stewardship of the Supplier	7.7
7) Suppliers' Sustainability Performance	6.8
8) Packaging of the Product	5.8
9) Company Image of the Supplier	4.6
10) Any other factor	0.0

It is observed from the above graphs that the factor which plays the most important role in influencing customer satisfaction in ARC manufacturing companies for carbon black is the 'QMS ensuring Quality of the Product (Carbon Black)'. The factor which plays the second important role is Price of the Product, which is followed by Incentives Offered to Customers, Customer Service of the Supplier, Order Execution and Delivery of the Product, Product Stewardship of the Supplier, Suppliers' Sustainability Performance, Packaging of the Product. The factor which plays the least important role in influencing customer satisfaction in ARC manufacturing companies for carbon black is Company Image of the Supplier. No other factor, apart from the aforesaid ones, was proposed by the respondents from ARC manufacturing companies which can influence their satisfaction level.

Figure 4.06 represents the weightages given to the identified factors by the respondents from various Tyre manufacturing companies which reflects the influence of each of these factors to satisfy these customers for carbon black. Total number of respondents in this case was 116.
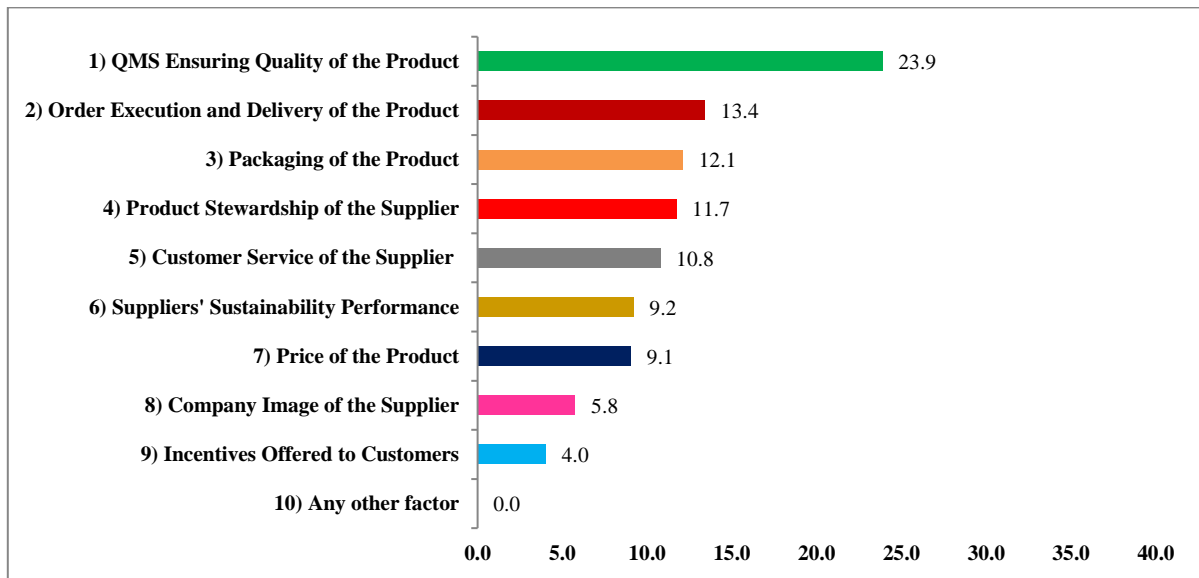
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Figure 4.06 Customer Satisfaction Factors for Carbon Black

in Tyre Manufacturing Companies

It is observed from the above graphs that the factor which plays the most important role in influencing customer satisfaction in tyre manufacturing companies for carbon black is the 'QMS ensuring Quality of the Product (Carbon Black)'. The factor which plays the second important role is Order Execution and Delivery of the Product, which is followed by Packaging of the Product, Product Stewardship of the Supplier, Customer Service of the Supplier, Suppliers' Sustainability Performance, Price of the Product, Company Image of the Supplier. The factor which plays the least important role in influencing customer satisfaction in tyre manufacturing companies for carbon black is Incentives offered to customers. No other factor, apart from the aforesaid ones, was proposed by the respondents from Tyre manufacturing companies which can influence their satisfaction level.

Figure 4.07 represents the weightages given to the identified factors by the respondents from Tyre manufacturing companies which reflects the influence of each of these factors to satisfy these

customers for Stearic Acid. Total number of respondents in this case was 3.

Figure 4.07 Customer Satisfaction Factors for Stearic Acid
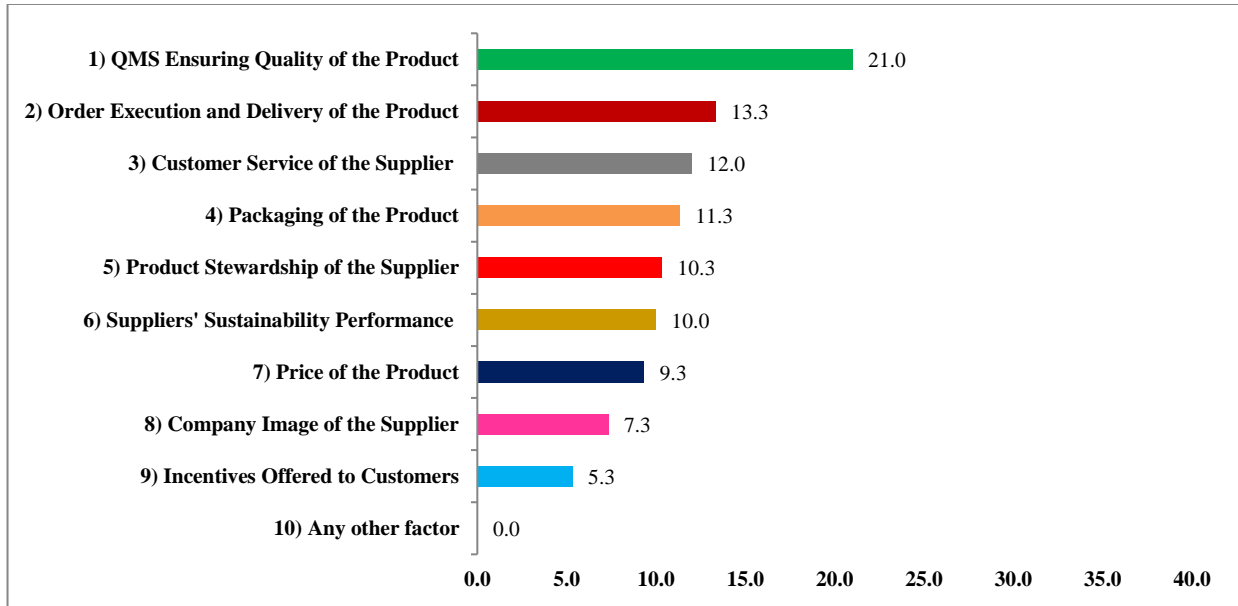
in Tyre manufacturing companies

It is observed from the above graphs that the factor which plays the most important role in influencing customer satisfaction in Tyre manufacturing companies for Stearic Acid is the 'QMS ensuring Quality of the Product (Stearic Acid)'. The factor which plays the second important role is Order Execution and Delivery of the Product, which is followed by Customer Service of the Supplier, Packaging of the Product, Product Stewardship of the Supplier, Suppliers' Sustainability Performance, Price of the Product, Company Image of the Supplier. The factor which plays the least important role in influencing customer satisfaction in Tyre manufacturing companies for Stearic Acid is Incentives offered to customers. No other factor, apart from the aforesaid ones, was proposed by the respondents from Tyre manufacturing companies which can influence their satisfaction level.

Figure 4.08 represents the weightages given to the identified factors by the respondents from Tyre

manufacturing companies which reflects the influence of each of these factors to satisfy these customers for Sulfur. Total number of respondents in this case was 3.

Figure 4.08 Customer Satisfaction Factors for Sulfur
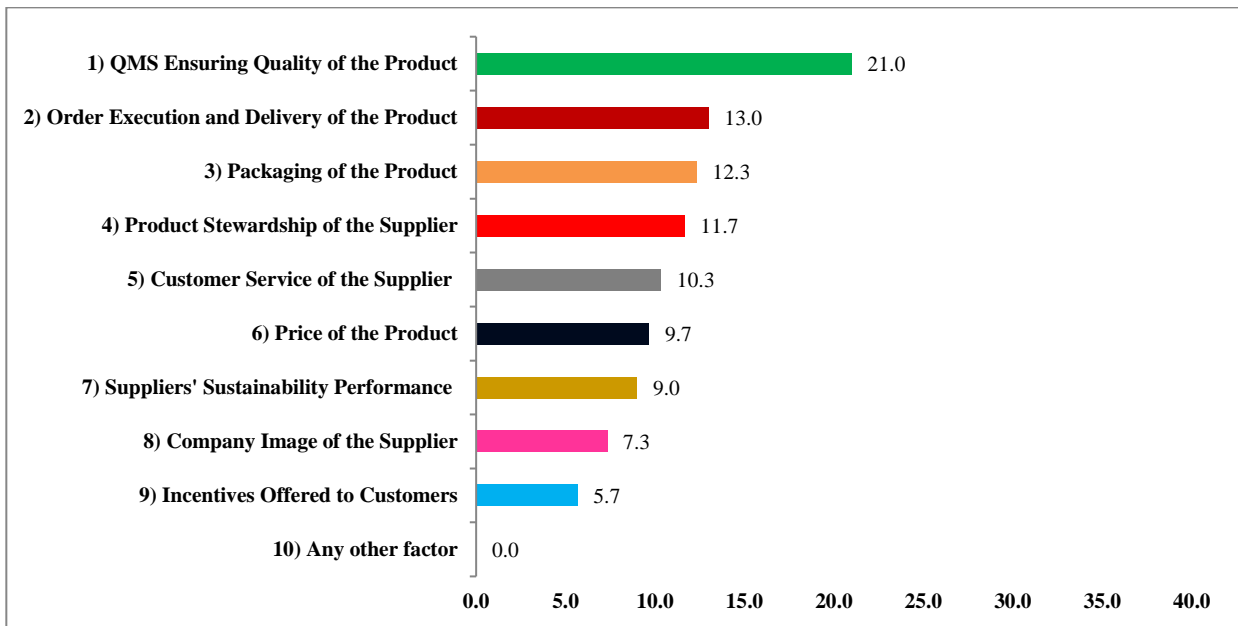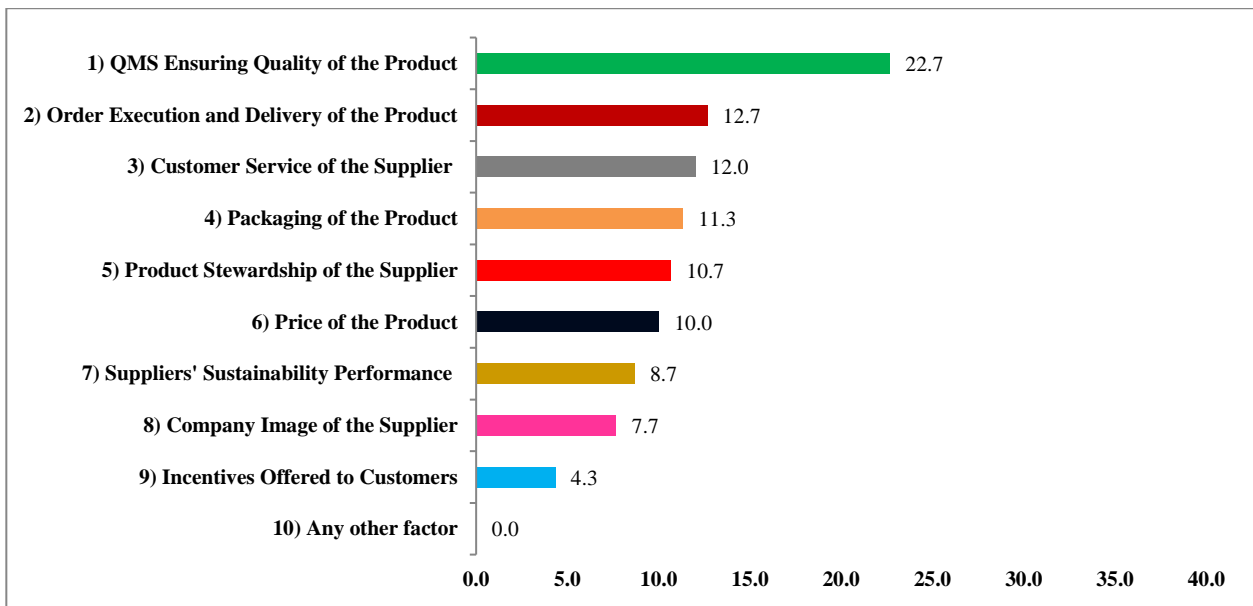
in Tyre manufacturing companies

It is observed from the above graphs that the factor which plays the most important role in influencing customer satisfaction in Tyre manufacturing companies for Sulfur is the 'QMS ensuring Quality of the Product (Sulfur)'. The factor which plays the second important role is Order Execution and Delivery of the Product, which is followed by Packaging of the Product, Product Stewardship of the Supplier, Customer Service of the Supplier, Price of the Product, Suppliers' Sustainability Performance, Company Image of the Supplier. The factor which plays the least important role in influencing customer satisfaction in Tyre manufacturing companies for Sulfur is Incentives offered to customers. No other factor, apart from the aforesaid ones, was proposed by the respondents from Tyre manufacturing companies which can influence their satisfaction level.

Figure 4.09 represents the weightages given to the identified factors by the respondents from Tyre manufacturing companies which reflects the influence of each of these factors to satisfy these customers for Zinc Oxide. Total number of respondents in this case was 3.

Figure 4.09 Customer Satisfaction Factors for Zinc Oxide
in Tyre manufacturing companies

It is observed from the above graphs that the factor which plays the most important role in influencing customer satisfaction in Tyre manufacturing companies for Zinc Oxide is the 'QMS ensuring Quality of the Product (Zinc Oxide)'. The factor which plays the second important role is Order Execution and Delivery of the Product, which is followed by Customer Service of the Supplier, Packaging of the Product, Product Stewardship of the Supplier, Price of the Product, Suppliers' Sustainability Performance, Company Image of the Supplier. The factor which plays the least important role in influencing customer satisfaction in Tyre manufacturing companies for Zinc Oxide is Incentives offered to customers. No other factor, apart from the aforesaid ones, was

proposed by the respondents from Tyre manufacturing companies which can influence their satisfaction level.

Figure 4.10 represents the weightages given to the identified factors by the respondents from Tyre manufacturing companies which reflects the influence of each of these factors to satisfy these customers for Rubber Process Oil. Total number of respondents in this case was 3.

Figure 4.10 Customer Satisfaction Factors for Rubber Process Oil
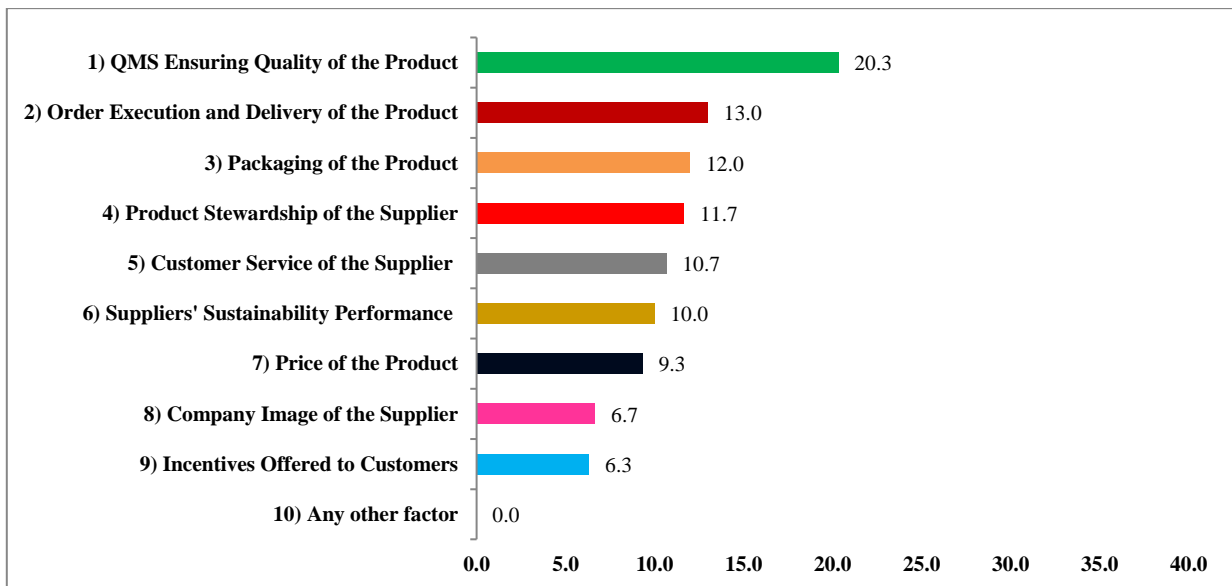**in Tyre manufacturing companies**

It is observed from the above graphs that the factor which plays the most important role in influencing customer satisfaction in Tyre manufacturing companies for Rubber Process Oil is the 'QMS ensuring Quality of the Product (Rubber Process Oil)'. The factor which plays the second important role is Order Execution and Delivery of the Product, which is followed by Packaging of the Product, Product Stewardship of the Supplier, Customer Service of the Supplier, Suppliers' Sustainability Performance, Price of the Product, Company Image of the Supplier. The factor which plays the least important role in influencing customer satisfaction in Tyre manufacturing

companies for Rubber Process Oil is Incentives offered to customers. No other factor, apart from the aforesaid ones, was proposed by the respondents from Tyre manufacturing companies which can influence their satisfaction level.

Figure 4.11 represents the weightages given to the identified factors by the respondents from Precipitated Silica manufacturing companies which reflects the influence of each of these factors to satisfy these customers for Sodium Silicate. Total number of respondents in this case was 2.

Figure 4.11 Customer Satisfaction Factors for Sodium Silicate
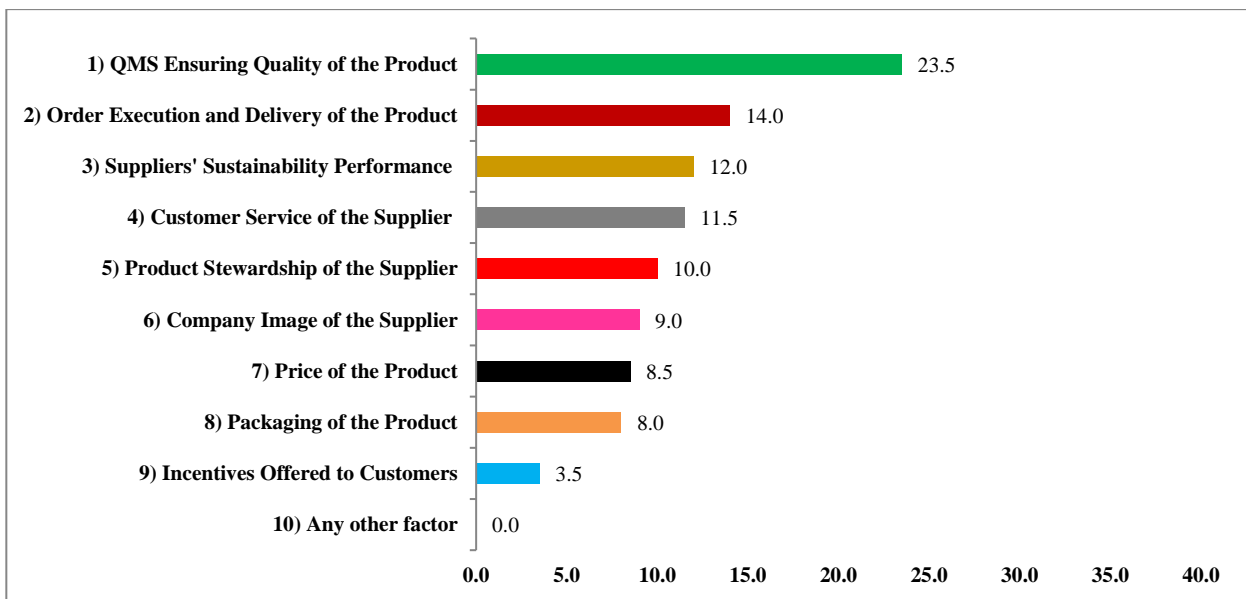**in Precipitated Silica manufacturing companies**

It is observed from the above graphs that the factor which plays the most important role in influencing customer satisfaction in Precipitated Silica manufacturing companies for Sodium Silicate is the 'QMS ensuring Quality of the Product (Sodium Silicate)'. The factor which plays the second important role is Order Execution and Delivery of the Product, which is followed by Suppliers' Sustainability Performance, Customer Service of the Supplier, Product Stewardship of the Supplier, Company Image of the Supplier, Price of the Product, Packaging of the Product. The

factor which plays the least important role in influencing customer satisfaction in Precipitated Silica manufacturing companies for Sodium Silicate is Incentives offered to customers. No other factor, apart from the aforesaid ones, was proposed by the respondents from Precipitated Silica manufacturing companies which can influence their satisfaction level.

Figure 4.12 represents the weightages given to the identified factors by the respondents from Precipitated Silica Manufacturing Company which reflects the influence of each of these factors to satisfy these customers for Sulfuric Acid. Total number of respondents in this case was 2.

Figure 4.12 Customer Satisfaction Factors for Sulfuric Acid
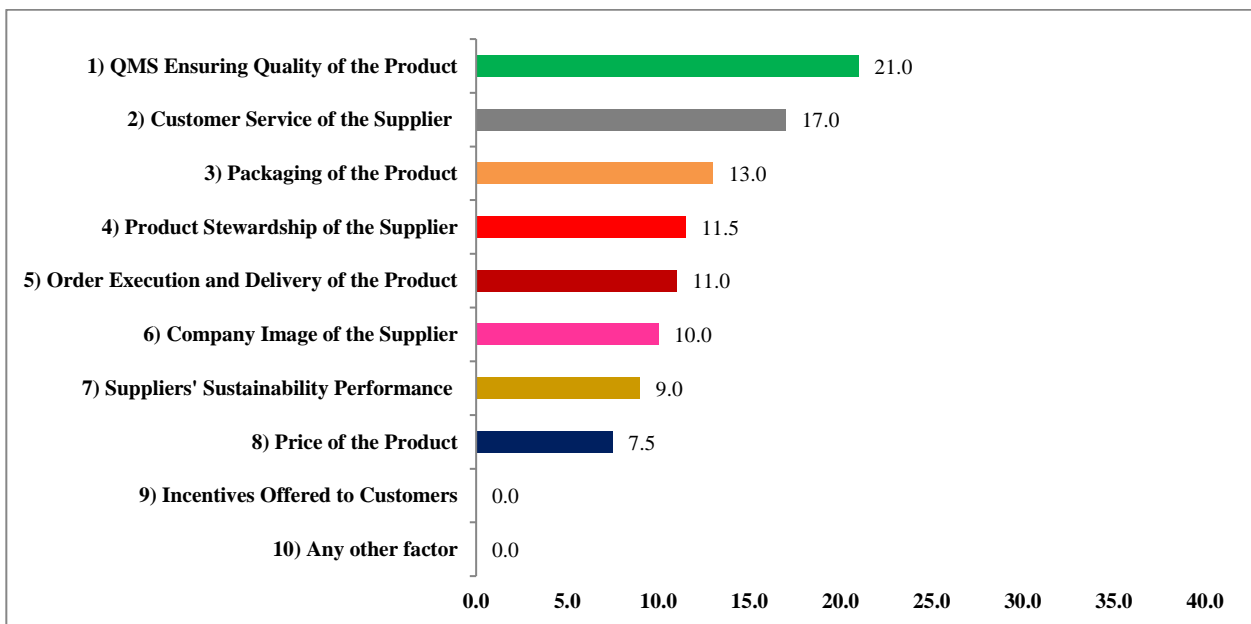**in Precipitated Silica Manufacturing Company**

It is observed from the above graphs that the factor which plays the most important role in influencing customer satisfaction in Precipitated Silica Manufacturing Company for Sulfuric Acid is the 'QMS ensuring Quality of the Product (Sulfuric Acid)'. The factor which plays the second important role is Customer Service of the Supplier, which is followed by Packaging of the Product, Product Stewardship of the Supplier, Order Execution and Delivery of the Product, Company

Image of the Supplier, Suppliers' Sustainability Performance, Price of the Product. The factor which plays the least important role in influencing customer satisfaction in Precipitated Silica Manufacturing Company for Sulfuric Acid is Incentives offered to customers for which no weightage has been given. No other factor, apart from the aforesaid ones, was proposed by the respondents from Precipitated Silica Manufacturing Company which can influence their satisfaction level.

Figure 4.13 represents the weightages given to the identified factors by the respondents from Lead Acid Automotive Battery Manufacturing Company which reflects the influence of each of these factors to satisfy these customers for Sulfuric Acid. The total number of respondents was 2.

Figure 4.13 Customer Satisfaction Factors for Sulfuric Acid
in Lead Acid Automotive Battery Manufacturing Company

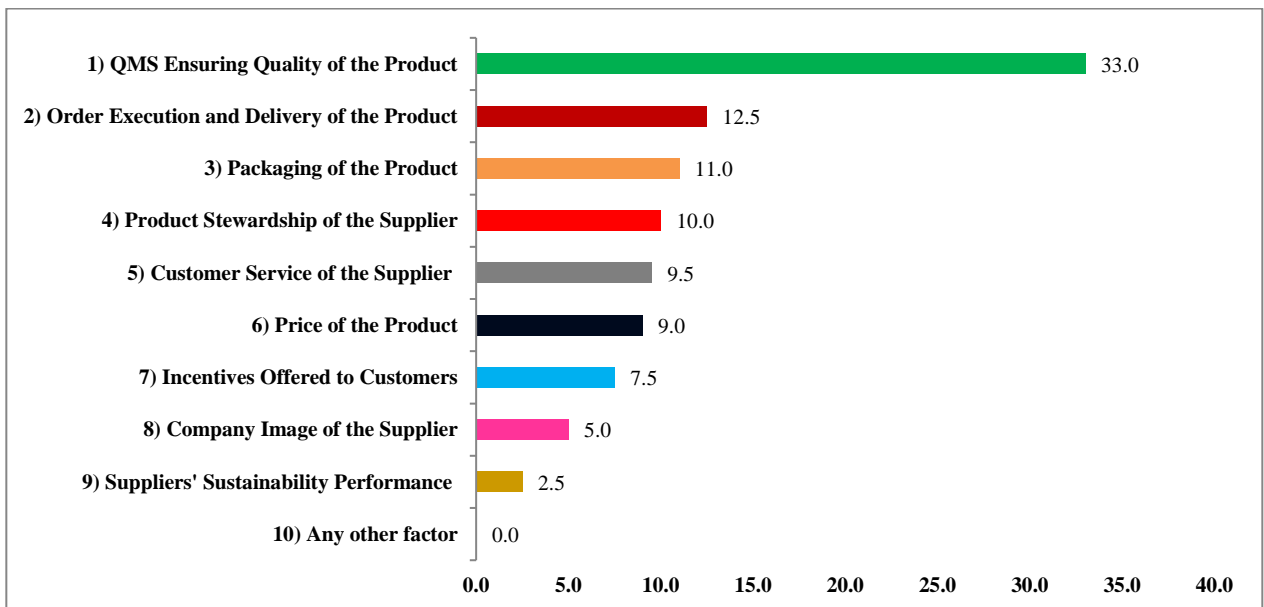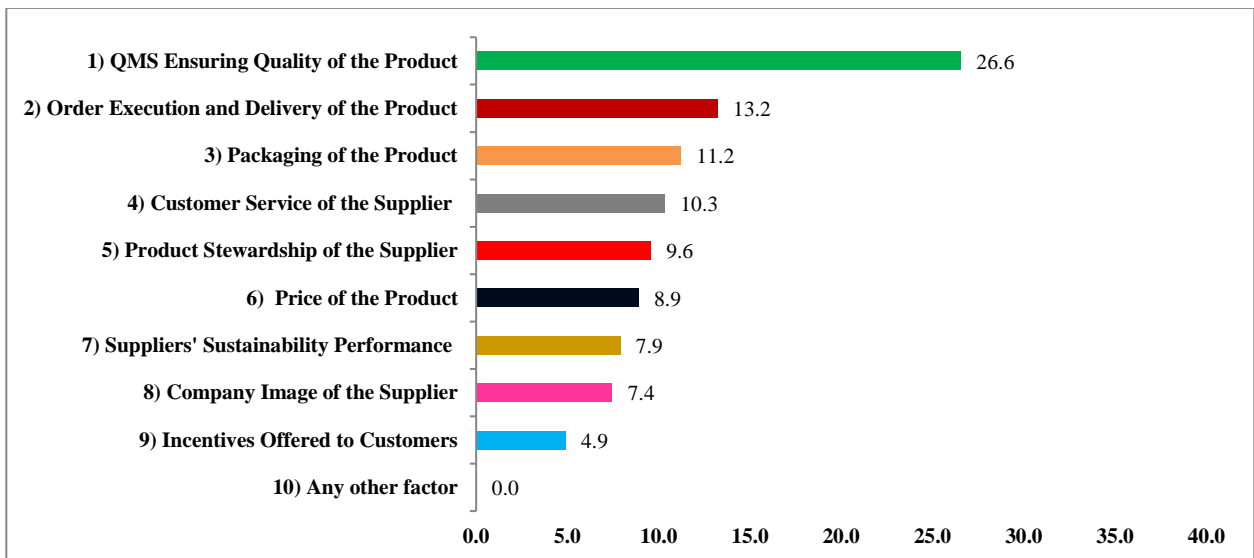It is observed from the above graphs that the factor which plays the most important role in influencing customer satisfaction in Automotive Battery Manufacturing Company for Sulfuric Acid is the 'QMS ensuring Quality of the Product (Sulfuric Acid)'. The factor which plays the

second important role is Order Execution and Delivery of the Product, which is followed by Packaging of the Product, Product Stewardship of the Supplier, Customer Service of the Supplier, Price of the Product, Incentives offered to customers, Company Image of the Supplier. The factor which plays the least important role in influencing customer satisfaction in Automotive Battery Manufacturing Company for Sulfuric Acid is Suppliers' Sustainability Performance. No other factor, apart from the aforesaid ones, was proposed by the respondents from Automotive Battery Manufacturing Company which can influence their satisfaction level.

Figure 4.14 represents the weightages given to the identified factors by the respondents from Steam Power Plants (CPP of capacity 10 MW to 32 MW) which reflects the influence of each of these factors to satisfy these customers for Sulfuric Acid. Total number of respondents in this case was 9.

**Figure 4.14 Customer Satisfaction Factors for Sulfuric Acid
in Steam Power Plants (CPP)**

It is observed from the above graphs that the factor which plays the most important role in influencing customer satisfaction in Steam Power Plants (CPP) for Sulfuric Acid is the 'QMS ensuring Quality of the Product (Sulfuric Acid)'. The factor which plays the second important role

is Order Execution and Delivery of the Product, which is followed by Packaging of the Product, Customer Service of the Supplier, Product Stewardship of the Supplier, Price of the Product, Suppliers' Sustainability Performance, Company Image of the Supplier. The factor which plays the least important role in influencing customer satisfaction in Steam Power Plants (CPP) for Sulfuric Acid is Incentives offered to customers. No other factor, apart from the aforesaid ones, was proposed by the respondents from Steam Power Plants (CPP) which can influence their satisfaction level.

Figure 4.15 represents the weightages given to the identified factors by the respondents from Steam Power Plants (CPP of capacity 10 MW to 32 MW) which reflects the influence of each of these factors to satisfy these customers for Hydrochloric Acid. Total number of respondents in this case was 9.

Figure 4.15 Customer Satisfaction Factors for Hydrochloric Acid
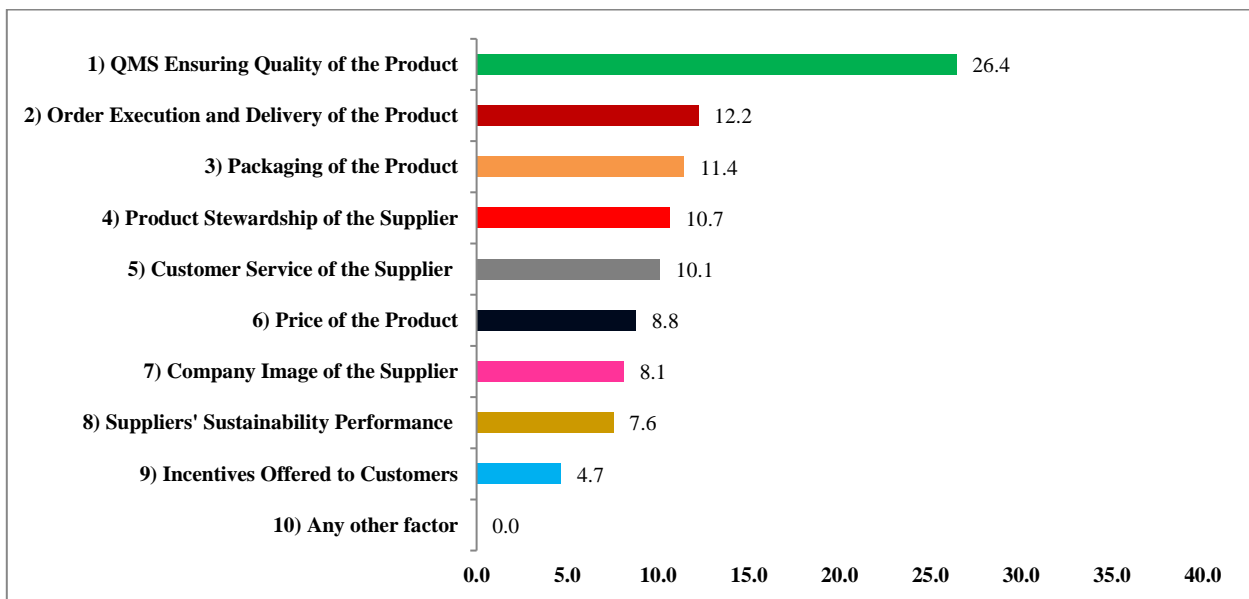**in Steam Power Plants (CPP)**

It is observed from the above graphs that the factor which plays the most important role in influencing customer satisfaction in Steam Power Plants (CPP) for Hydrochloric Acid is the 'QMS

ensuring Quality of the Product (Hydrochloric Acid)'. The factor which plays the second important role is Order Execution and Delivery of the Product, which is followed by Packaging of the Product, Product Stewardship of the Supplier, Customer Service of the Supplier, Price of the Product, Company Image of the Supplier, Suppliers' Sustainability Performance. The factor which plays the least important role in influencing customer satisfaction in Steam Power Plants (CPP) for Hydrochloric Acid is Incentives offered to customers. No other factor, apart from the aforesaid ones, was proposed by the respondents from Steam Power Plants (CPP) which can influence their satisfaction level.

Figure 4.16 represents the weightages given to the identified factors by the respondents from Steam Power Plants (CPP of capacity 10 MW to 32 MW) which reflects the influence of each of these factors to satisfy these customers for Sodium Hydroxide. Total number of respondents in this case was 9.

Figure 4.16 Customer Satisfaction Factors for Sodium Hydroxide in Steam Power Plants (CPP)
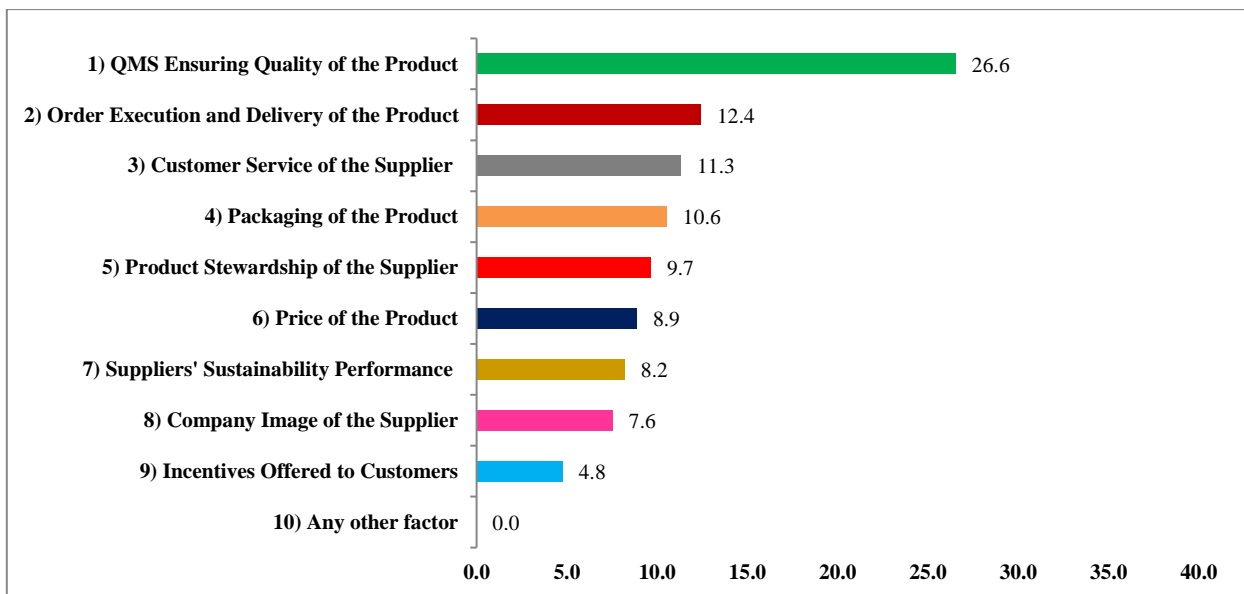

It is observed from the above graphs that the factor which plays the most important role in

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influencing customer satisfaction in Steam Power Plants (CPP) for Sodium Hydroxide is the 'QMS ensuring Quality of the Product (Sodium Hydroxide)'. The factor which plays the second important role is Order Execution and Delivery of the Product, which is followed by Customer Service of the Supplier, Packaging of the Product, Product Stewardship of the Supplier, Price of the Product, Suppliers' Sustainability Performance, Company Image of the Supplier. The factor which plays the least important role in influencing customer satisfaction in Steam Power Plants (CPP) for Sodium Hydroxide is Incentives offered to customers. No other factor, apart from the aforesaid ones, was proposed by the respondents from Steam Power Plants (CPP) which can influence their satisfaction level.

Figure 4.17 represents the weightages given to the identified factors by the respondents from Carbon Black Manufacturing Plants which reflects the influence of each of these factors to satisfy these customers for Potassium Nitrate. Total number of respondents in this case was 10.

Figure 4.17 Customer Satisfaction Factors for Potassium Nitrate in Carbon Black Manufacturing Plant

It is observed from the above graphs that the factor which plays the most important role in

influencing customer satisfaction in Carbon Black Manufacturing Plants for Potassium Nitrate is the 'QMS ensuring Quality of the Product (Potassium Nitrate)'. The factor which plays the second important role is Order Execution and Delivery of the Product, which is followed by Customer Service of the Supplier, Suppliers' Sustainability Performance, Product Stewardship of the Supplier, Packaging of the Product, Price of the Product, Company Image of the Supplier. The factor which plays the least important role in influencing customer satisfaction in Carbon Black Manufacturing Plants for Potassium Nitrate is Incentives offered to customers. No other factor, apart from the aforesaid ones, was proposed by the respondents from Carbon Black Manufacturing Plants which can influence their satisfaction level.

Figure 4.18 represents the weightages given to the identified factors by the respondents from Carbon Black Manufacturing Plants which reflects the influence of each of these factors to satisfy these customers for Potassium Carbonate. Total number of respondents in this case was 10

**Figure 4.18 Customer Satisfaction Factors for Potassium Carbonate
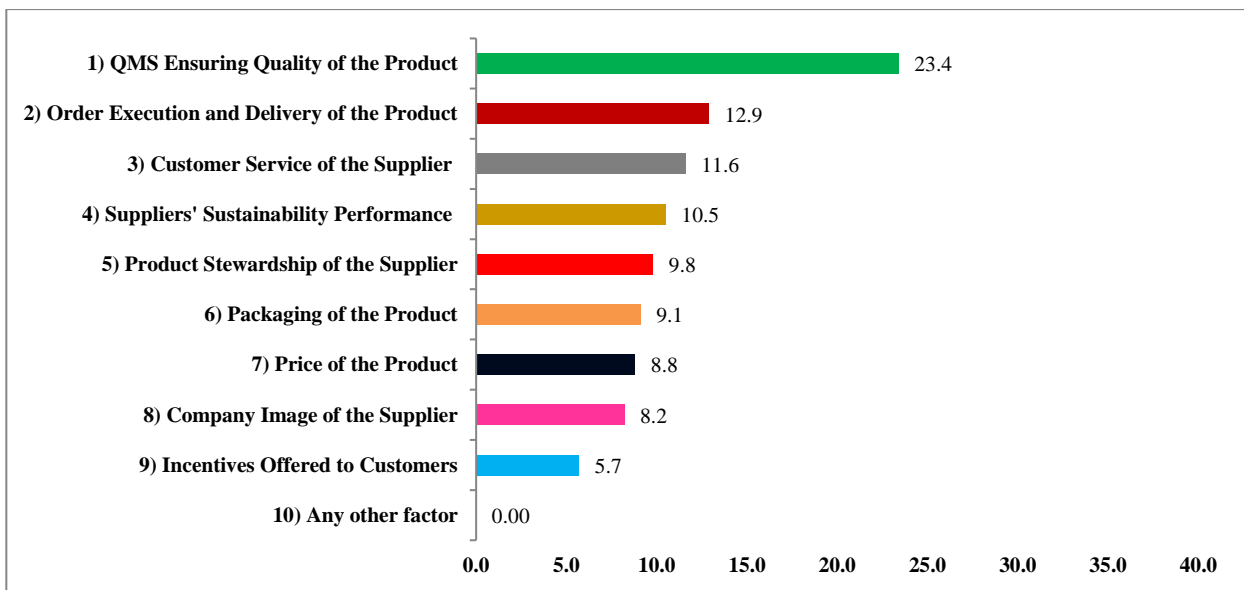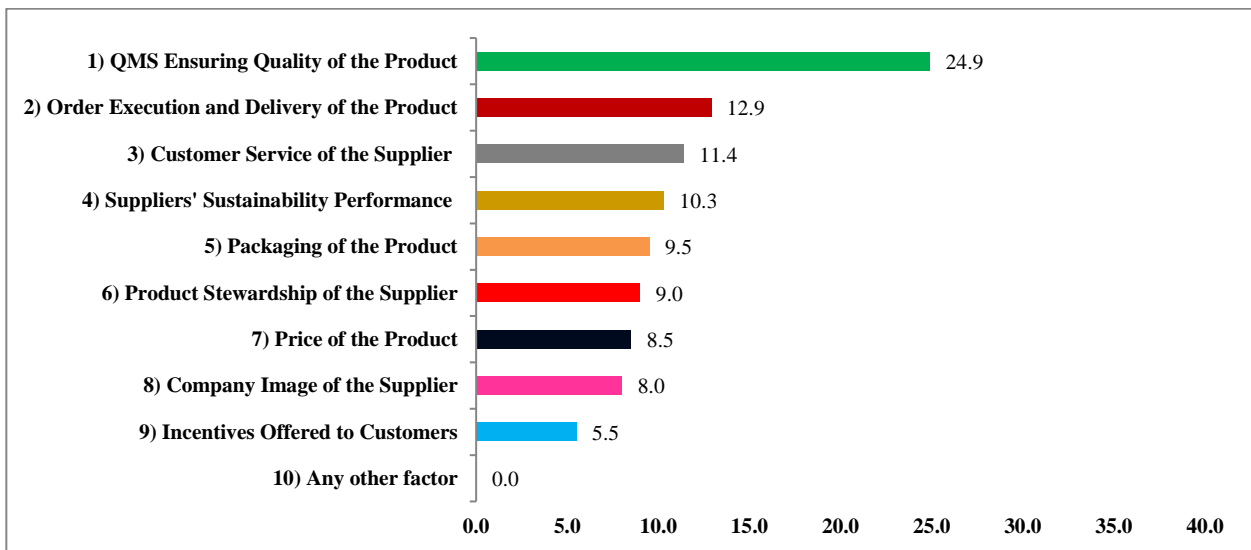in Carbon Black Manufacturing Plants**

It is observed from the above graphs that the factor which plays the most important role in influencing customer satisfaction in Carbon Black Manufacturing Plants for Potassium Carbonate is the 'QMS ensuring Quality of the Product (Potassium Carbonate)'. The factor which plays the second important role is Order Execution and Delivery of the Product, which is followed by Customer Service of the Supplier, Suppliers' Sustainability Performance, Packaging of the Product, Product Stewardship of the Supplier, Price of the Product, Company Image of the Supplier. The factor which plays the least important role in influencing customer satisfaction in Carbon Black Manufacturing Plants for Potassium Carbonate is Incentives offered to customers. No other factor, apart from the aforesaid ones, was proposed by the respondents from Carbon Black Manufacturing Plants which can influence their satisfaction level.

4.7.1 Rank Correlation Test on the Factors Satisfying Customers of Different Chemicals

The rankings of identified factors influencing satisfaction of customers for various industrial chemical products as derived from the weightages explained in figures 4.05 to 4.18, are summarized in the following table.

Table 4.36 Ranking of Customer Satisfaction Factors for Different Chemicals

Different Chemicals procured as Raw Material	Factors Influencing Satisfaction of Customers for Different Chemicals								
	QMS Ensuring Quality of the Product	Price of the Product	Incentives Offered to Customers	Customer Service of the Supplier	Order Execution and Delivery of the Product	Product Stewardship of the Supplier	Suppliers' Sustainability Performance	Packaging of the Product	Company Image of the Supplier
Carbon Black for ARC	1	2	3	4	5	6	7	8	9
Carbon Black for Tyre	1	7	9	5	2	4	6	3	8
Stearic Acid for Tyre	1	7	9	3	2	5	6	4	8
Sulfur for Tyre	1	6	9	5	2	4	7	3	8
Zinc Oxide for Tyre	1	6	9	3	2	5	7	4	8
Rubber Process Oil for Tyre	1	7	9	5	2	4	6	3	8
Sodium Silicate for Precipitated Silica	1	7	9	4	2	5	3	8	6
Sulfuric Acid for Precipitated Silica	1	8	9	2	5	4	7	3	6
Sulfuric Acid for Lead-Acid Automotive Battery	1	6	7	5	2	4	9	3	8
Sulfuric Acid for Steam Power Plants	1	6	9	4	2	5	7	3	8
Hydro-chloric Acid for Steam Power Plants	1	6	9	5	2	4	8	3	7
Sodium Hydroxide for Steam Power Plants	1	6	9	3	2	5	7	4	8
Potassium Nitrate for Carbon Black	1	7	9	3	2	5	4	6	8
Potassium Carbonate for Carbon Black	1	7	9	3	2	6	4	5	8

\# No other factor, apart from identified nine factors, was proposed by any customer

From the table 4.36, it is evident that

1   The factor which plays the most important role in satisfaction of customers of all the industrial chemical products under the study is 'QMS ensuring Quality of the Product'

2   The factor which comes to the bottom of the ranking as per opinion of the customers of majority of the chemicals (twelve out of fourteen cases studied) is 'Incentives offered to customers'

3   'Order Execution and Delivery of the Product' comes in 2nd rank for the customers of majority of the chemicals (twelve out of fourteen chemicals studied)

4   'Packaging of the Product' occupies the 3rd or 4th rank for customers of majority of the chemicals (ten out of fourteen chemicals studied)

5   'Product Stewardship of the Supplier' occupies the 4th or 5th rank for majority of the chemicals (twelve out of total fourteen chemicals studied)

6   'Customer Service of the Supplier' comes between 3rd and 5th rank for majority of the chemicals (thirteen out of total fourteen chemicals studied)

7   'Price of the Product' occupies the 6th or 7th for majority of the chemicals (twelve out of total fourteen chemicals studied)

8   'Suppliers' Sustainability Performance' comes in 3rd to 7th rank for customers of majority of the chemicals under study (twelve out of total fourteen cases studied)

9   'Company Image of the Supplier' comes in penultimate (8th) rank for majority of the chemicals (ten out of total fourteen chemicals studied)

10   No other factor, apart from the identified nine factors, was proposed by the customers of all the chemicals under the study, which can influence their satisfaction level

From the above discussion it is observed that there is some resemblance in satisfaction factors among customers for different industrial chemical products.

Spearman's Rank Correlation Coefficient:

In order to quantify the strength of correlation among the rankings of customer satisfaction factors for different chemicals, Spearman's ranking correlation coefficients (r_s) were measured on the rankings of factors influencing satisfaction of customers for each pair of chemicals under the study and these coefficients are shown in the following table.

Abbreviations used in table 6.31:

CB	: Carbon Black
SPP	: Steam Power Plant
HCL	: Hydrochloric Acid
H2SO4	: Sulfuric Acid
K2CO3	: Potassium Carbonate
KNO3	: Potassium Nitrate
LA	: Lead Acid
NaOH	: Sodium Hydroxide
Ppt	: Precipitated
RPO	: Rubber Process Oil
ZNO	: Zinc Oxide

Table 4.37 Spearman's Ranking Correlation Coefficients for Different Chemicals

	CB for ARC	CB for Tyre	Stearic Acid for Tyre	Sulfur for Tyre	ZNO for Tyre	RPO for Tyre	Sodium Silicate for Ppt. Silica	H2SO4 for Ppt. Silica	H2SO4 for LA Battery	H2SO4 for SPP	HCL Acid for SPP	NaOH for SPP	KNO3 for CB	K2CO3 for CB
CB for ARC	1.000	0.150	0.250	0.233	0.333	0.150	0.200	0.050	0.367	0.267	0.200	0.333	0.283	0.250
CB for Tyre		1.000	0.950	0.983	0.933	1.000	0.667	0.800	0.883	0.967	0.950	0.933	0.850	0.867
Stearic Acid for Tyre			1.000	0.933	0.983	0.950	0.750	0.850	0.833	0.967	0.900	0.983	0.933	0.950
Sulfur for Tyre				1.000	0.950	0.983	0.600	0.783	0.933	0.983	0.983	0.950	0.800	0.817
ZNO for Tyre					1.000	0.933	0.683	0.833	0.883	0.983	0.933	1.000	0.883	0.900
RPO for Tyre						1.000	0.667	0.800	0.883	0.967	0.950	0.933	0.850	0.867
Sodium Silicate for Ppt. Silica							1.000	0.533	0.400	0.617	0.550	0.683	0.917	0.867
H2SO4 for Ppt. Silica								1.000	0.717	0.817	0.800	0.833	0.717	0.733
H2SO4 for LA Battery									1.000	0.917	0.950	0.883	0.633	0.650
H2SO4 for SPP										1.000	0.967	0.983	0.833	0.867
HCL for SPP											1.000	0.933	0.733	0.750
NaOH for SPP												1.000	0.883	0.900
KNO3 for CB													1.000	0.983
K2CO3 for CB														1.000

The critical value of Spearman's ranking correlation coefficient for this case, where there are 9 pairs of data ($n = 9$), is 0.683.

From the table 4.37, it is evident that,

- ▪ Total number of pairs of different chemicals for which ranking correlation coefficients were calculated   :   91

- ▪ Total number of values of Spearman's correlation coefficient greater than 0.683   :   69

- ▪ Percentage of values greater than 0.683   :   76%

Thus, it is observed that in 76% cases there is significant positive association among the rankings of customer satisfaction factors for different types of industrial chemical products.

From table 4.36 and 4.37, it is evident that relative importance of various factors is very much similar for various chemical products. Importance of these factors may not be very much product specific. Factors are same for all the chemicals and there is minor difference in ranking.

4.7.2 Comparison of Customer Satisfaction Factors for Carbon Black and Non-Carbon Black Industrial Chemical Products

As mentioned in the beginning of section 4.7, sixty-five (65) respondents were selected from the customers of non-carbon black industrial chemical products and a small survey was conducted to know the opinion of these respondents on the significance of aforesaid nine identified factors which can influence their satisfaction with the supply.

Mean of the weightages given to identified customer satisfaction factors for carbon black and for non-carbon black industrial chemical products were calculated as shown in the following table.

Table 4.38 Mean of Weightages Given to the Identified Factors by Customers of Industrial Chemical Products

Factors	Industrial Chemical Products	
	Carbon Black	Other Chemicals
QMS ensuring Quality of the Product	23.6	24.2
Price of the Product	13.8	8.9
Order Execution and Delivery of the Product	11.7	12.8
Customer Service of the Supplier	11.1	11.5
Product Stewardship of the Supplier	9.7	10.4
Packaging of the Product	8.9	10.9
Suppliers' Sustainability Performance	8.0	8.8
Incentives offered to customers	7.9	4.9
Company Image of the Supplier	5.2	7.7
Total	100	100

Based on the weightages shown in table 4.38, rankings of the factors for carbon black and non-carbon black industrial chemical products were derived and shown in the following table.

Table 4.39 Ranking of Identified Customer Satisfaction Factors for Carbon Black and Non-Carbon Black Industrial Chemical Products

Factors	Industrial Chemical Products	
	Carbon Black	Other Chemicals
QMS ensuring Quality of the Product	1	1
Price of the Product	2	6
Order Execution and Delivery of the Product	3	2
Customer Service of the Supplier	4	3
Product Stewardship of the Supplier	5	5
Packaging of the Product	6	4
Suppliers' Sustainability Performance	7	7
Incentives offered to customers	8	9
Company Image of the Supplier	9	8

Spearman's Rank Correlation Coefficient:

In order to quantify the strength of correlation among the rankings of customer satisfaction factors for different chemicals, Spearman's ranking correlation coefficients (r_s) were measured on the rankings of factors influencing satisfaction of customers for carbon black and for non-carbon black industrial chemical products and these coefficients are shown in the following table.

Table 4.40 Spearman's Ranking Correlation Coefficients for Carbon Black and Non Carbon Black Industrial Chemical Products

	Carbon Black	Other Chemicals
Carbon Black	1.000	0.901
Other Chemicals		1.000

The critical value for this case, where there are 9 pairs of data ($n = 9$), is 0.683.

As shown in third column of table 4.40, Spearman's Ranking Correlation Coefficient ($r_s[9]=0.901$, $p < 0.05$) is greater than the critical value of 0.683. So, we can conclude that there is significant positive association of the ranking of customer satisfaction factors for Carbon Black with the ranking for Non carbon Black Industrial Chemical Products.

Thus, from the sections 4.7.1 and 4.7.2, it is evident that there is resemblance in prioritization of customer satisfaction factors as per opinion of customers of different industrial chemical products. Hence, the following null hypothesis is not accepted.

H021: There is no resemblance in prioritization of satisfaction factors among customers for different industrial chemical products.

But alternative hypothesis is accepted.

That means, *there is resemblance in the prioritization of satisfaction factors among customers for different industrial chemical products.*

4.8 Summary of the Results of Hypotheses Testing

The results of testing of all the hypotheses are summarized in the following table.

Table 4.41 Summary of the Results of Hypotheses Testing

Hypotheses	Hypothesis Testing Criteria fulfilled	Remarks
H01: QMS Ensuring Quality of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies	p=0.000 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *QMS Ensuring Quality of the Product (Carbon Black) has significant role in satisfaction of customers in Tyre Manufacturing companies*
H02: Packaging of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies	p=0.000 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *Packaging of the Product (Carbon Black) has significant role in satisfaction of customers in Tyre Manufacturing companies*
H03: Price of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies	p=0.025 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *Price of the Product (Carbon Black) has significant role in satisfaction of customers in Tyre Manufacturing companies*
H04: Incentives Offered to Customers do not have significant role in satisfaction of customers in Tyre manufacturing companies	p=0.665 which is greater than α= 0.050	Null hypothesis is accepted i.e., *Incentives offered to customers do not have significant role in satisfaction of customers in Tyre manufacturing companies.*
H05: Order Execution and Delivery of the Product (Carbon Black) does not have significant role in satisfaction of customers in Tyre manufacturing companies	p=0.000 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *Order Execution and Delivery of the Product (Carbon Black) has significant role in satisfaction of customers in Tyre manufacturing companies*
H06: Customer Service of the Supplier does not have significant role in satisfaction of customers in Tyre manufacturing companies	p=0.008 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *Restriction of hazardous chemicals in carbon black has significant role in satisfaction of customers*
H07: Suppliers' Sustainability Performance does not have significant role in satisfaction of customers in Tyre manufacturing companies	p=0.043 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *Suppliers' Sustainability Performance has significant role in satisfaction of customers in Tyre manufacturing companies.*
H08: Company Image the Supplier does not have significant role in satisfaction of customers in Tyre manufacturing companies	p=0.819 which is greater than α= 0.050	Null hypothesis is accepted i.e., *Company Image of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies*

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Hypotheses	Hypothesis Testing Criteria fulfilled	Hypotheses
H09: Product Stewardship of the Supplier does not have significant role in satisfaction of customers in Tyre manufacturing companies	p=0.001 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *Product Stewardship of the Supplier has significant role in satisfaction of customers in Tyre manufacturing companies.*
H010: QMS Ensuring Quality of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies	p=0.000 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *QMS Ensuring Quality of the Product (Carbon Black) has significant role in satisfaction of customers in ARC Manufacturing companies*
H011: Packaging of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies	p=0.857 which is greater than α= 0.050	Null hypothesis is accepted i.e., *Packaging of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC Manufacturing companies.*
H012: Price of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies	p=0.000 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *Price of the Product (Carbon Black) has significant role in satisfaction of customers in ARC Manufacturing companies.*
H013: Incentives Offered to Customers do not have significant role in satisfaction of customers in ARC manufacturing companies	p=0.011 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *Incentives offered to customers has significant role in satisfaction of customers in ARC manufacturing companies.*
H014: Order Execution and Delivery of the Product (Carbon Black) does not have significant role in satisfaction of customers in ARC manufacturing companies	p=0.028 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *Order Execution and Delivery of the Product (Carbon Black) has significant role in satisfaction of customers in ARC manufacturing companies.*
H015: Customer Service of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies	p=0.045 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *Customer Service of the Supplier has significant role in satisfaction of customers in ARC manufacturing companies*
H016: Suppliers' Sustainability Performance does not have significant role in satisfaction of customers in ARC manufacturing companies	p=0.217 which is greater than α= 0.050	Alternative hypothesis is accepted i.e., *Suppliers' Sustainability Performance does not have significant role in satisfaction of customers in ARC manufacturing companies*

Hypotheses	Hypothesis Testing Criteria fulfilled	Remarks
H017: Company Image of the supplier does not have significant role in satisfaction of customers in ARC manufacturing companies	p=0.600 which is greater than α= 0.050	Null hypothesis is accepted i.e., *Company Image of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies*
H018: Product Stewardship of the Supplier does not have significant role in satisfaction of customers in ARC manufacturing companies	p=0.035 which is less than α = 0.050	Alternative hypothesis is accepted i.e., *Product Stewardship of the Supplier has significant role in satisfaction of customers in ARC manufacturing companies.*
H019: There is no significant difference in the prioritization of factors influencing satisfaction of customers in Tyre manufacturing companies and ARC manufacturing companies	Ranking of factors done from the standardized regression coefficient (Beta). Spearman's Rank Correlation Coefficient (r_s) is less than the critical value of 0.683 for 9 pairs of data (n=9) at 0.05 level of significance	Alternative hypothesis is accepted i.e., *There is significant difference in the prioritization of factors influencing satisfaction of customers in Tyre manufacturing companies and ARC manufacturing companies*
H020: There is no significant difference in the prioritization of satisfaction factors among the customers in different functions of Tyre manufacturing companies and ARC manufacturing companies	Ranking of factors done from the weightages given to the identified factors by different functions in Tyre manufacturing companies and ARC manufacturing companies. Spearman's Rank Correlation Coefficient (r_s) greater than the critical value of 0.683 for 9 pairs of data (n=9) at 0.05 level of significance	Null hypothesis is accepted i.e., *There is no significant difference in prioritization of satisfaction factors among the customers in different functions of Tyre manufacturing companies and ARC manufacturing companies.*
H021: There is no resemblance in the prioritization of satisfaction factors among customers for different industrial chemical products.	Ranking of factors done from the weightages given to the identified factors by customers of different industrial chemical products. Spearman's Rank Correlation Coefficient (r_s) greater than the critical value of 0.683 for 9 pairs of data (n=9) at 0.05 level of significance	Alternative hypothesis is accepted i.e., *There is resemblance in prioritization of satisfaction factors among customers for different industrial chemical products.*

4.9 Testing of Validity of Research Findings through Expert Interview

Since all the factors, which can affect the satisfaction of customers of various industrial chemical products, were examined through the responses collected in survey only, it was felt necessary that views of some experts need to be captured to validate the findings from the data analyses and to get their insights on the reasons of such findings.

4.9.1 Rationale for Expert Interview

It has been suggested by several authors in their studies to conduct interview as a part of the research to gain an understanding of the viewpoint of respondents captured in other methods and the rationale behind such viewpoint. According to King, N. (2004), the observations from other methods like survey data can be compared with the opinions of interviewee. This process of triangulation helps in enhancing the validity and credibility of the research findings. The experts chosen for the current interview have spent considerable amount of time in handling industrial chemical products. So, it is expected that they have a fair idea to explain the viewpoint of respondents captured in the survey.

The interview questions were chosen to focus mainly on their observations related to the following points:

a. The factors which can influence the satisfaction of customers for industrial chemical products

b. The relative importance of these factors influencing satisfaction of customers for various industrial chemical products in different applications

c. The relative importance of above factors influencing satisfaction of customers of various functional departments of manufacturing companies which use industrial chemical products as raw material

The guidelines and questions for the expert interview is included in *Appendix A-4*.

4.9.2 Sampling and Data Collection

There were several rounds of discussion with the supervisor on the theme of the interview for the current study and then it was finalized. To validate the findings of current study, a sample size of 7 (seven) experts was decided in consultation with the supervisor. These experts were chosen based on their overall industrial experience of 20 (twenty) years minimum and an experience of 15(fifteen) years minimum in handling industrial chemical products.

The profile of the experts in terms of their position and experience in handling industrial chemical products is shown in the table below.

Table 4.42 Profile of the Experts selected for the Interview

Sl. No.	Current Role	Age (in years)	Experience in current industry	Overall experience of handling industrial chemical products
1	Head (GM)-Marketing of a Carbon Black manufacturing company	51	About 17 years	Around 25 years
2	Head (GM)-Technical Services of a Carbon Black manufacturing company	51	Around 26 Years	Around 26 Years
3	Head (GM) - Technical Services of a Precipitated Silica manufacturing company	58	Around 15 Years	Around 27 years
4	GM -R&D of a Tyre manufacturing company	60	Around 25 years	Around 31 years
5	Head (GM) -Purchase of a Tyre manufacturing company	56	Around 24 years	Around 30 years
6	GM-Purchase of an ARC manufacturing company	55	Around 25 Years	Around 25 Years
7	Head-Technical of a Lead Acid battery Manufacturing company	58	Around 15 Years	Around 34 Years

The profile of the interviewees indicates their vast experience in handling industrial chemical products. These experts are working either as Head of some functional departments or in senior management position at manufacturing industries which use industrial chemical products as raw material. So, it is expected that their views on the findings of the current study will be more insightful.

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Interview was conducted either face to face in case of local interviewees or over telephone for the nonlocal interviewees. These interviewees were first given a brief introduction about the theme of the research and its objective. Thereafter, a structured interview guideline along with the questionnaire were handed over to them or sent through email. Once the responses are collected from them, they were again interviewed either face to face or over telephone to get further clarification on their views and insights.

4.9.3   Analysis of Interview Data

Based on the feedback in pilot survey and discussion with the professional of chemical industries, customer satisfaction factors for industrial chemical products were identified and these were verified through the expert interview. Furthermore, analysis of survey responses resulted in certain correlations which were validated through this expert interview.

The information captured in the expert interview have been analyzed and the results are presented against the following points.

a) **Identification of factors which can influence the satisfaction of customers of industrial chemical products**

The factors identified in the study for the satisfaction of customers of industrial chemical products are i) Price of the Product ii) Incentives offered to customers iii) QMS ensuring Quality of the Product iv) Packaging of the Product v) Order execution and delivery of the product vi) Customer service of the supplier vii) Company image of the supplier viii) Suppliers' Sustainability Performance ix) Product stewardship of the supplier. The interviewees were asked about the adequacy of these identified factors to influence satisfaction of customers of industrial chemical products.

One of the experts pointed out,

"Customer satisfaction factors which are common for most of the manufacturing companies are Quality, Price, On-time delivery, Customer service, Packaging and Company image of the supplier. The introduction of Quality Management System (QMS) to ensure right quality of the product in place of 'Quality of Product' has added more value to this study as customers are more interested in the development of 'System' at their suppliers' end to ensure consistency in quality, so that they can reduce the cost of inspection of incoming raw material and reduce generation of defects. On an overall basis these nine factors considered in the study cover most of the influencers of customer satisfaction in B2B context".

Another expert added,

"In addition to considering some common customer satisfaction factors in B2B context, there are some new entrants like Suppliers' Sustainability Performance and Product Stewardship of the Supplier which were also addressed in the study. Suppliers' Sustainability Performance and Product Stewardship of the Supplier are now gaining prominence as all the manufacturing companies are now focusing on reduction of the impact of their operations on the environment and assessing their suppliers on sustainability criteria. I don't think any other factor needs to be addressed for the study of customer satisfaction in B2B scenario".

One of the experts opined that,

"Some common customer satisfaction factors along with some modified ones like Quality Management System (QMS) ensuring Quality of the Product, and some new ones like Suppliers' Sustainability Performance, Product Stewardship of the Supplier, Incentives (rewards, gifts, favorable credit terms etc.) offered to the customers were also analyzed. The customer satisfaction factors, so identified, are adequate for the industrial chemical

products".

Other interviewees are also of the opinion that the nine factors considered in the study cover mostly the requirements and expectations of customers for industrial chemical products.

Thus, the experts have a unanimous opinion on the adequacy of the identified factors to influence satisfaction of customers in B2B context.

b) **Relationship of ranking of factors influencing satisfaction of customers in Tyre manufacturing companies and ARC manufacturing companies:**

The study has identified that there is a significant difference in the prioritization of factors influencing satisfaction of customers in Tyre manufacturing companies and ARC manufacturing companies as shown in the following table. The interviewees were asked to give their opinion on this result.

Factors Affecting Customer Satisfaction	Sectors under study	
	Carbon Black in Tyre	Carbon Black in ARC
QMS Ensuring Quality of the Product (Carbon Black)	1	1
Order Execution and Delivery of the Product (Carbon Black)	2	5
Packaging of the Product (Carbon Black)	3	8
Product Stewardship of the Supplier	4	6
Customer Service of the Supplier	5	4
Suppliers' Sustainability Performance	6	7
Price of the Product (Carbon Black)	7	2
Company Image of the Supplier	8	9
Incentives Offered to Customers	9	3

The reason behind the difference in the ranking of factors influencing satisfaction of

customers in Tyre manufacturing companies and ARC manufacturing companies was explained by the experts.

One of the experts pointed out,

"Quality cannot be compromised for price or other factors and development of QMS to ensure right Quality of product is the topmost priority for most of the customers of industrial chemical products".

According to that expert,

"Big and ethical companies like Tyre manufacturing companies follow a code of conduct which includes anti-bribery and anti-corruption policies. Apart from that, big tyre companies go for long term contract with their suppliers on price and volume of raw material which reduces the significance of rewards for repeated purchase. So, 'Incentives Offered to Customers' is not significant in influencing satisfaction of Tyre manufacturers.

Because of the long-term contract and application of formula pricing of product linked with the price of raw material, the importance of 'Price of the product' also is comparatively less for Tyre manufacturing companies".

On the contrary, another expert mentioned,

"There are many smaller companies of automotive rubber components (ARC) who do not go for long term contracts with their suppliers, and they generally search for lower price and incentives (discounts etc.) for their purchases. So, Price of the product and Incentives offered to customers are expected to occupy higher rank in case of ARC manufacturing companies".

This explains the reasons for the wide gap in the ranking of 'Price of the product' and 'Incentives offered to customers' as the factors to influence satisfaction of customers in these two sectors.

The views of the experts were captured on the 'Order execution and delivery of the product'.

In the own word of one of the interviewees,

"For manufacturers who produce high volume of products like Tyre manufacturing companies, management of high volume of raw material (e.g., industrial chemical product) inventory is a

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challenging task and that's why smooth order execution and on time delivery of raw material is an important factor for their satisfaction.'

According to another interviewee, 'Order execution and delivery of the product' is also important for ARC manufacturing companies, but the management of raw material (e.g., industrial chemical product) inventory is not that much challenging for the companies producing smaller volume of products. This explains the reason behind comparatively lower ranking of 'Order execution and delivery of the product' for ARC manufacturing companies than that of Tyre manufacturing companies.

One of the interviewees pointed out,

"*Most of the Tyre manufacturing companies are in close watch of the OEMs in terms of audit, visit etc. and so, they are more concerned about the Packaging (i.e., cleanliness, leakage-free packing etc.) of the industrial chemical product.*"

According to one of the interviewees,

"*Minimization of impact of the product on safety, health and environment, and adhering to the regulatory requirements on the restriction of hazardous substances in the raw material is expected by most of the manufacturing companies*" which explains the closer ranking of 'Product Stewardship of the Supplier' for ARC manufacturing companies and Tyre manufacturing companies.

As per another interviewees,

"*Customers of manufacturing companies always expects effective resolution of their complaints, prompt response of salespeople of suppliers, technical support from supplier end and therefore, the factor 'Customer Service of the Supplier' is given higher ranking for both ARC manufacturing companies and Tyre manufacturing companies*".

One of the interviewees pointed out,

"*Companies have started focusing on their sustainability performance because of the pressure from customers, investors, and regulatory bodies. They are now forced to reduce the impact of their operations on the environment. Awareness is increasing on the sustainable procurement to*

ensure sustainability of their firm and it has direct linkage with Suppliers' Sustainability Performance. This explains the reason for higher ranking of Suppliers' Sustainability Performance for both these sectors.''

As pointed out by one of the experts,

"As long as other factors are taken care of by the suppliers, 'Company Image of the Supplier' does not play any important role to satisfy the customers of both the Tyre manufacturing companies and ARC manufacturing companies".

c) **Relationship of prioritization of satisfaction factors among the customers in different functions of Tyre manufacturing companies and ARC manufacturing companies:**

The study has identified that there is no significant difference in prioritization of satisfaction factors among the customers in different functions of Tyre manufacturing companies and ARC manufacturing companies. The interviewees were asked to give their opinion on this result. The reason behind the positive correlation is explained by the experts.

In the own words of one interviewee:

"Customers of organized companies are disciplined and believe in teamwork. They do their regular activities keeping in view of the business objectives and the objectives of all the individual functions are aligned with the business objectives. So, it is expected that the prioritization of requirements expressed in these factors will be more or less similar for all the functions".

According to another interviewee,

"In manufacturing companies, employees of different functions are involved in various Cross

Functional Team (CFT) activities to achieve a common goal. In doing so, their mindset becomes aligned to the business objectives. When the requirement of prioritization come, they give priority to business objectives rather than functional objectives".

Thus, it is evident from the views of industry experts that the employees in manufacturing companies mostly work for a common goal of business which explains why there is no significant difference in prioritization of satisfaction factors among the customers in different functions of Tyre manufacturing companies and ARC manufacturing companies.

d) **Relationship of prioritization of satisfaction factors among customers for different industrial chemical products:**

The study has identified that there is resemblance in prioritization of satisfaction factors among customers for different industrial chemical products. In 76% cases of the different industrial chemical products studied, significant positive association was found among the rankings of customer satisfaction factors for different types of industrial chemical products. The reason behind the resemblance in the prioritization of satisfaction factors among customers for different industrial chemical products was explained by the experts.

According to one of the experts,

"Since all these industrial chemical products are used as raw materials in industrial production processes to produce chemical and chemical related useful products, the prioritization of different requirements of customers for these industrial chemical products will not vary to a great extent".

In the own word of one of the interviewees,

"For industrial chemical products, Quality of the product occupies the top rank and

implementation of QMS is the best way to ensure consistent quality. Quality parameters may vary from one product to another product depending on the type of that chemical product and the application.

Big and Ethical companies generally do not give importance to 'incentives' in terms of discounts or rewards for repeated purchase.

All the customers expect hassle-free order processing and on-time delivery of the product to ensure proper inventory management at their end, which explains the reason for higher rank of the factor 'Order execution and delivery of the product'.

Customers of industrial chemical products always expect prompt service from the supplier which includes on-time resolution of complaints with effective corrective and preventive actions, quick response of salespeople, technical support etc. as and when required. This explains the reason for the higher ranking of 'Customer service of the supplier'.

For the transportation of any chemical, packaging is important to ensure no leakage, no pollution, cleanliness; accuracy of bag weight is important as it affects the formulation in manufacturing.

Importance of the 'Price of the product' may vary from one customer to another customer. There are some big customers producing higher volume of products prefer long term contract with the suppliers and in many cases the price is linked to the price of raw material popularly known as 'formula pricing', which is not changed on the spot. On the other hand, there are some customers who always look for the cheaper products and they go for the market prevailing price.

Product stewardship demonstrated by reduction of the impact of the product on environment and health of the people handling the product is gaining importance across the globe because of the pressure from regulatory bodies and from the investors who monitors the ESG performance of the company.

Sustainability is now one of the focus areas of most companies and it is dependent on sustainable

procurement which in turn depends on supplier's sustainability performance.

'Company image of the supplier' may be an important factor to influence the new customers but it not significant for satisfaction of existing customers unless other factors are taken care of".

Another interviewee pointed out,

"As the industrial chemical products are used as raw material in the manufacturing of other products, the order of significance of different requirements of customers will be more or less same; however, the degree of significance of each these requirements may vary from one customer to another customer to some extent".

The purpose of this expert opinion survey was to validate the findings of the research study. Experts endorsed that the identified factors which can influence the satisfaction of customers of industrial chemical products are adequate. On the other hand, the findings on the difference in ranking of the customer satisfaction factors among Tyre manufacturing companies and ARC manufacturing companies was explained and established by the experts. The finding on the positive correlation of the rankings of satisfaction factors among the customers of different functions of Tyre manufacturing companies and ARC manufacturing companies was also endorsed by the experts. Finally, the positive correlation of the ranking of satisfaction factors among most of the customers for different industrial chemical products was also established by the experts.

4.10 Summary

In this chapter a description about the analysis of data collected by using the questionnaire and the findings are presented. At first, reliability analysis was done by measuring Cronbach's Alpha for all the independent and dependent variables to understand the internal consistency between items in a scale. Common Method Bias was tested by Harman's single-factor (one-factor) test. Next the effect on adjusted R-square value was estimated by adding predictor variables one by one and thereby the number of independent variables which have impact in the regression model was assessed. Then regression analysis was done to understand the significance of each of the identified factors in influencing customer satisfaction and thereby hypotheses testing was done. Prioritization or ranking of the factors was done by using Standardized Regression Coefficients for the identified factors in case of Tyre manufacturing companies and ARC manufacturing companies. The correlation of these two sets of rankings was tested by Spearman's Rank Correlation test and thereby another set of hypotheses were tested. A correlation of the rankings of factors satisfying customers of different functions was tested by Spearman's Rank Correlation test on the rankings of identified factors derived from the weightage given to each of these factors by the respondents of different functions of Tyre manufacturing and ARC manufacturing companies. In the same way, a correlation of the ranking of factors satisfying customers for different industrial chemical products was tested by Spearman's Rank Correlation test on the rankings of identified factors derived from the weightage given to each of these factors by the customers of various industrial chemical products and thereby the remaining set of hypotheses were tested.

CHAPTER 5

RESULTS, DISCUSSION AND CONCLUSION

Result and Discussion

5.1 Overview

While details of data analyses and their findings with respect to the factors influencing consumer satisfaction for industrial chemical products have been discussed in previous sections, the highlights of the findings and comparison of those with that of the existing literatures are discussed in this section.

5.2   Summary of Research Findings

The findings of the research on customer satisfaction factors for different industrial chemical products are summarized below.

5.2.1   Customer Satisfaction Factors for Carbon Black

It has been observed from the section 4.3.1, the factors which were found to have positive impact on the Overall Satisfaction of customers in Tyre manufacturing companies are QMS ensuring Quality of the Product, Order Execution and Delivery of the Product, Product Stewardship of the Supplier, Packaging of the Product, Customer Service of the Supplier, Suppliers' Sustainability Performance and Price of the Product. Whereas the factors which were found with no positive impact on the Overall Satisfaction of customers in Tyre manufacturing companies are Incentives Offered to Customers, Company Image of the Supplier. It was also evident from the section 4.4.1, these factors are independent and influence customer satisfaction independent of each other.

It is observed from the sections 4.3.2, the factors which were found to have positive impact

on Overall Satisfaction of customers in ARC Manufacturing companies are QMS ensuring Quality of the Product, Price of the Product, Incentives Offered to Customers, Customer Service of the Supplier, Order Execution and Delivery of the Product, Product Stewardship of the Supplier. Whereas the factors which were found with no positive impact on Overall Satisfaction of customers in ARC Manufacturing companies are Suppliers' Sustainability Performance, Packaging of the Product, Company Image of the Supplier. It was also evident from the section 4.4.2, these factors are independent and influence customer satisfaction independent of each other.

Prioritization of the factors using Standardized Regression Coefficients as explained in sections 4.5.1 and 4.5.2 shows that QMS ensuring Quality of the Product comes at the top in influencing the satisfaction of customers for both Tyre manufacturing companies and ARC manufacturing companies. However, it is quite evident that the degree of significance of rest of the factors investigated was found to vary from one group of customers (Tyre) to another group of customers (ARC). Order Execution and Delivery of the Product comes second in case of Tyre manufacturing company, but it comes fifth in case of ARC manufacturing company. Packaging of the Product is coming third in case of Tyre manufacturing companies whereas this factor occupies the eighth rank in ARC manufacturing companies. Product Stewardship of the Supplier comes fourth in case of Tyre manufacturing companies whereas this factor comes sixth in ARC manufacturing companies. Ranking of Customer Service of the Supplier is very close for these two sectors. It comes fifth for Tyre manufacturing companies whereas this factor comes fourth for ARC manufacturing companies. Suppliers' Sustainability Performance also occupies closer ranking for these two sectors. It occupies sixth rank in case of Tyre manufacturing companies whereas this factor occupies the seventh

rank in ARC manufacturing companies. There is wide gap in the ranking of Price of the Product which occupies the seventh rank in case of Tyre manufacturing companies and second rank in ARC manufacturing companies. Company Image of the Supplier occupies closer rank for these two sectors. It comes eighth in case of Tyre manufacturing companies whereas this factor occupies the ninth rank in ARC manufacturing companies. Incentives Offered to Customers comes last in case of Tyre manufacturing companies whereas this factor comes third in ARC manufacturing companies. Thus, there is significant difference in the prioritization of factors influencing satisfaction of customers in Tyre manufacturing companies and ARC manufacturing companies as evident from the spearman correlation coefficient in section 4.5.3.

From the results of data analyses, it is evident that the customers of industrial chemical products do not want to compromise on quality for price or any other factor. It is also observed that major customers like Tyre manufacturers are less willing to get the incentives in their purchasing process as evident from the lowest weightage given to Incentives Offered to Customers i.e. discount, rewards etc. For Tyre manufacturers, price of industrial chemical products is more or less fixed on long term basis and in many cases price of the product for these customers is linked to the raw material price which is popularly known as Formula Pricing. On the contrary, smaller organizations like small manufacturers of automotive rubber components (ARC) search for comparatively lower price which explains the wide gap in the ranking of Price as a factor for satisfaction of customers in these two sectors. Packaging (i.e. cleanliness, consistency in weight, leakage-free packing etc.) of the industrial chemical product is given importance by major customers, particularly those like Tyre manufacturing companies, who are in close watch of the OEMs in terms of audit, visit etc.

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Product Stewardship of the Supplier to minimize the health, safety, environmental, and social impacts of their product is an expectation of sensitive customers. Restriction of proportion of SVHC (Substances of Very High Concern) in the industrial chemical product e.g. lead, mercury, cadmium, hexavalent chromium, PAH (Polycyclic Aromatic Hydrocarbon) etc. is a regulatory requirement and a matter of concern for almost all the industries globally which is evident from the closer ranking of this factor for these two sectors. Order execution and delivery has been given importance by most of the respondents particularly the high-volume producing industries like Tyre customers as it directly impacts the production at their end. Suppliers' Sustainability Performance is an indicator of sustainable procurement for the customers who are committed to implement sustainability practices at their end to achieve the target of reducing the impact of their operations on climate change. The increasing awareness on sustainability is evident from the higher ranking given to Suppliers' Sustainability Performance by the respondents of these two sectors. The rankings of Customer Service of the Supplier and Company Image of the Supplier for Tyre manufacturing companies are closer to the respective rankings of these factors for ARC manufacturing companies as per opinion of the respondents from these two sectors. No other factor, apart from the aforesaid ones, which can influence their satisfaction, was suggested by the respondents. It indicates all the respondents agree that these factors, as described above, can ensure their satisfaction on the supplier.

Responses were collected from the different functions viz. Purchase, Technical, Production, Quality Assurance, R&D of both Tyre manufacturing and ARC manufacturing companies. It was observed that the numbers of responses from Production, R&D, Technical and Quality Assurance functions are less as compared to the numbers of responses from purchase

function. Respondents from similar functions based on their nature of job are clubbed together. Thus, respondents from Technical and Production functions are clubbed together, respondents from Quality Assurance and R&D functions are clubbed together while respondents from Purchase function are kept alone.

With reference to section 4.6.1, the ranking of factors, as derived from the weightages given to the identified factors by respondents of different functions of Tyre manufacturing companies are as follows. QMS ensuring Quality of the Product comes first irrespective of the functions of the respondents. Order execution and delivery comes in second position as per opinion of respondents from Purchase, Technical and Production functions, and this factor comes in fourth position for R&D and QA functions. Customer Service of the Supplier comes in third position for Purchase, Technical, Production functions, and sixth position for R&D and QA. Price of the Product occupies the fourth position for Purchase function, but this factor comes in seventh position for Technical, Production, R&D and QA functions. Packaging of the Product holds the fifth position for Purchase function, third position for R&D and QA functions and fourth position for Technical and Production functions. Product Stewardship of the Supplier comes in sixth position for Purchase function, second position for R&D and QA functions and fifth position for Technical and Production functions. Suppliers' Sustainability Performance comes seventh as per respondents from Purchase function, fifth as per respondents from R&D and QA and sixth as per Technical and Production functions. No difference is observed in the ranking of other two factors viz. Company Image of the Supplier and Incentives Offered to Customers which come in eighth and ninth position respectively as per opinion of respondents from all the functions of Tyre manufacturing companies.

The difference in prioritization of customer satisfaction factors, whatever small observed among respondents of different functions of tyre manufacturing companies, can be explained according to Sheth (1973, p. 52) who mentioned that each function has unique interests and orientations and therefore, each of them may consider different criteria in judging a supplier. According to Einar et al. (2011), the different roles in the customer organization influence overall customer satisfaction; purchasing people would likely to give more importance on the commercial aspects than product-related information, while the engineers give more importance to product-related information over the commercial issues.

It is also observed from Spearman's Ranking Correlation Coefficients, there is significant positive association among the ranking of customer satisfaction factors as per opinion of respondents from Purchase function, Technical and Production Functions, R&D and QA function of Tyre manufacturing companies.

With reference to section 4.6.2, the ranking of factors, as derived from the weightages given by the respondents from different functions of ARC manufacturing companies are as follows. QMS ensuring Quality of the Product is the topmost priority for all the functions. Respondents from all the functions are interested in lower Price of the product and in getting discounts, rewards etc. incentives as evident from the second and third rank of Price of the Product and Incentives Offered to Customers respectively. Customer Service of the Supplier occupies the fourth position, Order Execution and Delivery of the Product occupies the fifth position, Product Stewardship of the Supplier occupies the sixth position, Suppliers' Sustainability Performance occupies the seventh position, Packaging of the Product comes

in eighth position and Company Image of the Supplier occupies the last position as per opinion of respondents from all the functions of ARC manufacturing companies. Thus, we cannot find any difference in the prioritization of customers satisfaction factors as per opinion of respondents of different functions of ARC manufacturing companies. However, the weightages given to different factors by these respondents vary to some extent.

It is also observed from Spearman's Ranking Correlation Coefficients, there is significant positive association among the ranking of customer satisfaction factors as per opinion of respondents from Purchase function, Technical and Production Functions, R&D and QA function of ARC manufacturing companies.

Thus, it is evident there is no significant difference in prioritization of satisfaction factors among the customers in different functions of Tyre manufacturing companies and ARC manufacturing companies.

5.2.2   Customer Satisfaction Factors for Other Industrial Chemical Products

In the next step, another survey was conducted on industrial customers of few other industrial chemical products in which they were asked to give weightages on the identified factors to indicate the impact of these factors in influencing their satisfaction with the supply. They were also asked to mention other factors, if any, which can influence their satisfaction on the supply. This survey was in addition to the survey already conducted for carbon black customers in Tyre manufacturing company and ARC manufacturing company. Total number of respondents from other industrial chemical products was 65.

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Respondents were selected as per convenience from a) Tyre Manufacturing Companies b) Automotive Rubber Components (ARC) Manufacturing Companies c) Lead –Acid Battery Manufacturing Company d) Precipitated Silica Manufacturing Company e) Carbon Black Manufacturing Company f) Steam Power Plants (CPP). Industrial chemical products which are procured by the aforesaid industries as their raw material apart from Carbon Black are Zinc Oxide, Stearic Acid, Sulfur, Sulphuric Acid, Sodium Silicate, Hydrochloric Acid, Sodium Hydroxide, Potassium Carbonate, Potassium Nitrate

From the responses given by the customers of industrial chemical products (refer table 4.36), it is observed that the factor which plays the most significant role in shaping customer satisfaction in general, involves the 'QMS ensuring Quality of the Product'. 'Incentives Offered to Customers (i.e., credit limit, credit period, discount, reward etc.) related to supply of the chemical' plays the least important role in satisfaction of customers of the industrial chemical products as per opinion of the customers of 86% of the chemicals (twelve out of fourteen cases studied). Price and Commercial Terms are realized as transient features whereas the impact of quality is sustained long after the attraction or the pain of Price and Commercial Terms are subsided. Thus, it is not surprising that quality is on top of the list of factors under investigation to shape the satisfaction of industrial customers. It also in agreement with the findings of Joseph et al. (2016) that financial bonds should not be treated as the only mechanism for customer satisfaction because it can be easily imitated.

'Order Execution and Delivery of the Product' comes second for the customers of 86% of the chemicals (twelve out of fourteen chemicals studied) and 'Packaging of the Product'

comes third or fourth as per opinion of the customers of 71% of the chemicals (ten out of fourteen chemicals studied). 'Product Stewardship of the Supplier' occupies the 4th or 5th rank for 86% of the chemicals (twelve out of total fourteen chemicals studied). 'Customer Service of the Supplier' ranks between 3rd and 5th rank for 93% of the chemicals (thirteen out of total fourteen chemicals studied). 'Price of the Product' occupies the 6th or 7th rank for 86% of the chemicals (twelve out of total fourteen chemicals studied), Suppliers' Sustainability Performance' comes in 3rd to 7th rank as per opinion of the customers of 86% of the chemicals (twelve out of fourteen chemicals studied). 'Company Image of the Supplier' comes in penultimate (8th) rank for 71% of the chemicals (ten out of total fourteen chemicals studied). No other factor, apart from the identified nine factors, which can influence their satisfaction level was proposed by the customers of all the industrial chemicals under the study.

Thus, it is observed that there is some resemblance in the ranking of satisfaction factors for customers for different industrial chemical products. It is evident (refer table 4.37) from the Spearman Correlation Coefficients calculated on 91 pairs of rankings of customer satisfaction factors as per opinion of customers of industrial chemical products under the study, that in 76% cases there is significant positive association among the rankings of customer satisfaction factors for different types of industrial chemical products. Thus, it is observed that relative importance of various factors is very much similar for various industrial chemical products. Importance of these factors may not be very much product specific. Factors are same for all the chemical products and there is minor difference in ranking.

It is also observed that the association of the ranking of customer satisfaction factors for Carbon Black with the ranking for Non carbon Black selected Industrial Chemical Products under study is significantly positive. Thus, we can conclude that there is resemblance in prioritization of satisfaction factors among customers for different industrial chemical products.

5.3 Managerial Implications

Customer centricity is the key to success for any business organization, and improving the satisfaction of customers is an important goal of business practices today. With this background, the findings of this research work provide several key insights for company managers. Specifically,

a) Factors which can influence the satisfaction of customers of industrial chemical products are same for all the chemical products, only the degree of significance of these factors is found to vary from one customer to another customer to some extent

b) Among the nine factors under investigation, 'QMS ensuring Quality of the Product' is recognized as the most significant factor in influencing satisfaction of customers of industrial chemical products. It indicates that customers are also of the opinion that Quality cannot be compromised for any other factor and consistent quality can be ensured through the development of system. Quality requirement for a chemical product may vary from one customer to another customer depending on the application. So, companies need to work meticulously

to develop and implement QMS in fulfilling the specific requirement of their

customers on the quality of product consistently

c) 'Order Execution and Delivery of the Product' is considered as the second or

third priority for the customers as any deviation from the agreed delivery

schedule (quantity and time) may impact production at customer end which may

result in failure in delivery schedule for their customers; thus, suppliers need to

ensure On Time In Full (OTIF) quantity of delivery

d) 'Customer Service of the Supplier' which includes resolution of complaints,

response time, technical support in improvement of product performance at

customer end etc. is also considered with the higher ranking (3rd or 4th) as usual

to shape customer satisfaction; so, the suppliers should ensure salespeople are

knowledgeable enough to capture the specific requirements by interacting with

the customers and respond on time and they should be backed by knowledgeable

technical people to provide technical support as per requirement of customers

e) Higher ranking (5th rank) of 'Product Stewardship of the Supplier of the Chemical

Product' as per opinion of most of the customers reflects rising concern about the

safety aspects and environmental impact of the product; Substances of Very High

Concern(SVHC), PAH etc. in the industrial chemical product is a matter of global

concern from Environment (one of the pillar of ESG) point of view and so, the

restriction of these hazardous substances in the chemical product by working on

the use of environment friendly raw material and improvement in manufacturing technology must be in the priority list of suppliers

f) 'Packaging of the Product' is also considered in the list of important factors (6th for carbon black and 4th for other chemicals) influencing satisfaction of customers which necessitates suppliers to ensure the basic requirements of cleanliness and zero leakage at the time of receipt of product at customer end, weight of each bag within the acceptable limit and identification visibility.

g) 'Price of the Product' occupy comparatively lower ranks than ''QMS Ensuring Quality of the Product' as per opinion of most of the customers indicating that customers are not interested in compromising Quality for Price; however there are some customers who opined for higher ranking (2nd for carbon black and 6th for other chemicals) of 'Price of the Product' as they look for lower price of raw material to reduce the cost of production which ultimately impact the bottom line of their business

h) 'Suppliers' Sustainability Performance' which fulfils the criteria of 'Sustainable Procurement' for the customers, occupies 7th rank as per opinion of most of the customers. Sustainability performance is gaining momentum with the disruption in the usual balance of nature and the worsening effect of our activities on the climate change. All the manufacturing industries are being encouraged to adopt the practice of reduce, reuse and recycle non-biodegradable materials and natural resources, implement Water, Energy, Solid Waste and Green House Gas management systems and publish sustainability report (e.g. GRI based reporting),

implement Environment Management Systems and Occupational Health and Safety Management Systems, and to take actions to mitigate Environmental, Social and Governance (ESG) related risks. Customers have started pushing their suppliers to improve their ESG performance

i) Company Image of the Supplier' which describes industry leadership of the supplier, competency in meeting specific requirements of customers consistently, having loyal customer base, having speed and agility in responding to market needs etc. occupy comparatively lower rank as per opinion of most of the customers indicating that these parameters may be attractive for the new customers, but the existing customers are more interested in fulfilling the requirements as described in point numbers (b) to (h) of this section

j) Most of the customers are least interested in favorable credit terms, discount, rewards etc. which is reflected by the lowest ranking of Incentives Offered to Customers as per opinion of most of the customers

The prioritization of the identified factors will help the suppliers in making a proper strategy to fulfill the requirements or expectation of their customers and thereby improve the satisfaction level of these customers, which in turn will influence their loyalty and buying behavior for raw material like carbon black and other industrial chemical products.

Moreover, though the influence of sustainability factor is found to be less on overall customer satisfaction in this particular study, it is now getting global attention. It may be

mentioned that it is the new dimension added in this research work and it may be important consideration in subsequent research as it gains more importance and is understood in proper perspective specially for chemical industry.

5.4 Limitations of the Research

In spite of the utmost care taken in every stage of current research, there are some scopes of improvements, which are also potentially fruitful areas for further research.

- It is very difficult to establish fundamental relationship between variables from the current study as it is of cross-sectional type involving collection of data at a specific point of time (as mentioned in chapter 5, data were collected during the period from 2019 to 2021) and thus presents a static view of the relationship

- Another potential limitation of current study is that the sample was drawn from a single country (i.e. India), which introduces a risk in generalization.

- The current study dealt with only on one side of the supplier-customer relationships i.e. respondents were selected from the customer end only and it could have been collected from the supplier end also (dyadic perspective)

- In the current study, different factors influencing satisfaction of customers were considered holistically and in doing so, some of the major aspects of each of these factors might have missed

5.5 Recommendation of Future Research

The quest for knowledge, solutions to problems and research questions leading to continual improvement in the quality of research results in the progress of human civilization. Whereas the limitations of current research are highlighted in the previous section, an outline for future research to pursue, in the domain of customer satisfaction for industrial chemical products, is given below.

- In order to establish the fundamental relationship between variables as speculated in present cross-sectional study and to increase confidence in the nature and power of theory, the research can be replicated over several time periods in terms of longitudinal study by assessing how the relative importance of the satisfaction factors changes over time; as for example, several targets were announced in COP 26 at Glasgow summit in November,2021 to mitigate climate change and thereafter awareness on sustainability is increasing day by day which may impact the ranking of satisfaction factor on sustainability

- Future research could benefit from verifying the generalization of our finding in more diverse settings i.e. in other countries as the awareness about sustainability may be more in developed countries which may impact the ranking of the factors influencing satisfaction of the customers

- The current study focuses only on the customer; future studies may be done from a dyadic perspective by incorporating data collected from the respondents of both suppliers' organization and customers' organization

- In the future, there is a scope to conduct a study by capturing the opinion of customers of a single industrial product on the different aspects of one particular factor e.g. different parameters of quality of that particular product to influence customer satisfaction or different parameters of ESG to influence customer satisfaction and so on

- Future research could also focus on samples consisting of 'real' loyal customers and estimate the effect of customer satisfaction on increase in the market share in the domain of loyal customers and on the retention of customers

- The study could be replicated in different industries, other than already studied in this research, to complement this study

- Future study could be conducted to examine how pull factors affect customer satisfaction

- Future research could also focus on some of the challenges faced by the marketing teams of these industrial chemical products in their quest to ensure that their organizations attract and retain customers.

5.6 Conclusion

The thesis highlights the factors which are significant in influencing the satisfaction of customers of carbon black and other industrial chemical products in India. In addition to addressing the common customer satisfaction factors like Price of product, Quality of the product, Incentives offered to customers, Order Execution and Delivery of the Product, Company Image, Packaging of the Product, Customer Service of the Supplier, some new dimensions such as Product stewardship of the supplier, Quality Management System (QMS) ensuring Quality of the product, Suppliers' Sustainability Performance etc. were also explored. Sustainability, Product Stewardship etc. are now gaining attention across the globe and it is expected more and more research will be done on these dimensions in near future. It also explains the prioritization of identified factors as per opinion of the customers of various industrial chemical products and how the order of importance of these identified factors changes as per the change in functional role of respondents. Identification and prioritization of these factors influencing satisfaction of customers of industrial chemical product will enable the suppliers in making a proper strategy to fulfill the requirements and expectation of their customers and thereby improve the satisfaction level of these customers.

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Reports

1. Notch Consulting – Carbon Black World Data Book 2021 – August 2021
2. Presentation of findings - Domestic Customer Retention Survey 2012 of a Carbon Black Manufacturing Company in India

APPENDICES

A-1. Key to Abbreviations and Technical Terms

Sl.No.	Abbreviations and Technical Terms	Explanation
1	**CAS**	C.A.S. No. is a unique numerical identifier assigned by Chemical Abstracts Service (CAS) to every chemical substance described in the open scientific literature, including organic and inorganic compounds, minerals, isotopes, alloys and non-structured minerals.
2	**Colloidal Size**	A colloid is typically a two-phase system (solid-liquid, liquid-liquid, gas-liquid) consisting of a continuous phase (the dispersion medium) and dispersed phase (the particles or emulsion droplets). The particle size of the dispersed phase typically ranges from 1 nanometer to 1 micrometer.
3	**Aggregate**	The primary units of carbon black are aggregates, which are formed when primary particles collide and fuse together in the combustion zone of the reactor
4	**Agglomerate**	Several aggregates of carbon black may be held together by weak forces to form agglomerates
5	**Thermal decomposition**	Chemical decomposition of a substance caused by heat
6	**Hydrocarbon**	A compound of hydrogen and carbon
7	**Structure (Carbon Black)**	Structure is the three-dimensional arrangement of primary particles in the aggregate of carbon black
8	**KTPY**	Kilo-Tons Per Year
9	**CAGR**	Compound Annual Growth Rate is a useful measure of growth over multiple time periods
10	**ASTM**	American Society for Chemical and Materials is an international organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems and services.
11	**Molded Goods**	Form or shape given to a rubber product by pouring / injecting the rubber compound in fluid state into a mold (a hollow form or matrix)
12	**Extruded Goods**	Rubber product with a shape given by forcing rubber compound through a die
13	**Thermal Oxidative Decomposition**	Thermal decomposition in presence of oxygen
14	**Aromatic**	Hydrocarbon having a slightly sweet odor (hence the term aromatic) and are characterized by a ring structure. It contains a higher proportion of carbon to hydrogen than other compounds

Sl.No.	Abbreviations and Technical Terms	Explanation
15	**Tread**	Rubber on the circumference of Tyre that makes contact with the road
16	**Carcass**	The inner body of a pneumatic Tyre, resisting by its tensile strength the pressure of the air within the Tyre and protected by the tread and other parts.
17	**Pyrolysis**	Reaction involving molecular breakdown of larger molecules into smaller molecules in presence of heat. Pyrolysis is also known as thermal cracking.
18	**Polymerization**	Chemical process that combines several monomers (one molecular unit) to form a polymeric compound.
19	**Dehydrogenation**	Chemical reaction that removes hydrogen from an organic molecule (composed of carbon atoms and atoms of other elements)
20	**Rolling resistance**	The force resisting the motion when a body (Tyre etc.) rolls on a surface.
21	**Flex resistance**	The relative ability of a rubber article to withstand dynamic bending stress
22	**Cut growth resistance**	How well a rubber product resists the growth of any cuts when under tension

A-2. QUESTIONNAIRE USED FOR THE PILOT SURVEY

Online Google Forms questionnaire used in pilot survey

CUSTOMER SATISFACTION SURVEY

Please start with the survey now, by answering the questions below:

*Required

1. **1. Your Name:**

   _____

2. **2. Your contact number / email id:**

   _____

3. **3. Name of Industry / company you currently work for:**

   _____

4. **4. Location of your manufacturing unit: ***

   _____

Please click on the appropriate circle from the options given below the question numbers 5 to 13

5. **5. Which range includes your age? ***
   Mark only one oval.
   - ⬭ 20 - 30 years
   - ⬭ 31 - 40 years
   - ⬭ 41 - 50 years
   - ⬭ 51-60 years
   - ⬭ More than 60 years

6. **6.What is your academic/professional qualification ? ***
   Mark only one oval.
   - ⬭ Under graduation
   - ⬭ Graduation
   - ⬭ Post graduation
   - ⬭ Other: _____

7. **7.What is the business structure of your organisation** *
   Mark only one oval.

   ◯ Sole proprietorship

   ◯ Partnership

   ◯ Private Limited Company

   ◯ Public Limited Company

   ◯ Other: _____

8. **8.What are the main products of your current industry?** *
   Mark only one oval.

   ◯ Tyre

   ◯ Automotive rubber component

9. **9.What is your total experience in similar industry?** *
   Mark only one oval.

   ◯ 1-10 years

   ◯ 11 to 20 years

   ◯ 21-30 years

   ◯ >30 years

10. **10.Functional department to which you currently belong** *
    Mark only one oval.

    ◯ Purchase

    ◯ Quality Assurance

    ◯ Production / Technical

    ◯ Any other

11. **11.How much quantity (approximately) of carbon black is purchased by your company per month?** *
    Mark only one oval.

    ◯ 1 to 10 MT

    ◯ 11 to 50 MT

    ◯ 51 to 100 MT

    ◯ >100 MT

12. **12.What is the time period aimed at your company for keeping inventory of carbon black?** *
Mark only one oval.

- ⬭ 7 days
- ⬭ 8-15 days
- ⬭ 16-30 days
- ⬭ 31 to 60 days
- ⬭ More than 60 days

13. **13. Which of the following, in your opinion, best describes your level of involvement in the decision on purchasing carbon black from a supplier?** *
Mark only one oval.

- ⬭ Very high
- ⬭ High
- ⬭ Less
- ⬭ Very less

14. **14. Please select from the options given below which you think are the significant factors to influence your satisfaction with a carbon black supplier (Multiple options can be selected)** *
Tick all that apply.

- ☐ a) Quality of carbon black
- ☐ b) Packaging of carbon black
- ☐ c) Price of carbon black
- ☐ d) Commercial attributes(other than price) of carbon black
- ☐ e) Order execution and delivery of carbon black
- ☐ f) Customer service of carbon black supplier
- ☐ g) Reputation of carbon black supplier
- ☐ h) Long term relationship with the supplier of carbon black
- ☐ Other: _____

*Kindly read following instruction for answering question numbers 15 to 24.

Rate the options given below as per your agreement / disagreement based on a 6- point scale, where '6' stands for 'strongly agree' and '1' stands for 'strongly disagree'. No situation or any of its option can be left unattended.

15. 15. Please give your opinion on 'Price of carbon black' as a factor to influence your satisfaction *

Mark only one oval per row.

	1. Strongly disagree	2. Disagree	3. Slightly Disagree	4. Slightly Agree	5. Agree	6.Strongly agree
a) I don't mind paying more for the carbon black of our desired quality	◯	◯	◯	◯	◯	◯
b) I am less willing to buy carbon black from a supplier if the price is higher for whatever may be the reason	◯	◯	◯	◯	◯	◯
c) I am willing to pay higher price for carbon black to maintain long term relationship with a supplier	◯	◯	◯	◯	◯	◯
d) I don't mind paying more to purchase carbon black from a supplier of good repute	◯	◯	◯	◯	◯	◯
e) It is worth paying more for carbon black if we get desired service before, during and after a purchase from the supplier	◯	◯	◯	◯	◯	◯
f) It is very difficult for a person like me to comment on price of carbon black	◯	◯	◯	◯	◯	◯
g) I don't mind paying more if on-time delivery of carbon black is ensured	◯	◯	◯	◯	◯	◯

16. **16.Please give your opinion on 'Commercial attributes(other than price) of carbon black' as a factor to influence your satisfaction** *

Mark only one oval per row.

	1. Strongly disagree	2. Disagree	3. Slightly disagree	4. Slightly agree	5. Agree	6. Strongly agree
a) I would prefer a carbon black supplier offering good credit terms	⬭	⬭	⬭	⬭	⬭	⬭
b) I would expect reconciliation of accounts on regular basis from supplier end	⬭	⬭	⬭	⬭	⬭	⬭
c) I would prefer advance communication on price revision	⬭	⬭	⬭	⬭	⬭	⬭
d) I am interested in receiving correct invoice on time	⬭	⬭	⬭	⬭	⬭	⬭
e) Issuing of credit notes is expected from supplier end	⬭	⬭	⬭	⬭	⬭	⬭
f) Financial incentives like discounts, coupons etc. are not important for us	⬭	⬭	⬭	⬭	⬭	⬭
g) It is very difficult for a person like me to comment on commercial attributes of carbon black	⬭	⬭	⬭	⬭	⬭	⬭

CUSTOMER SATISFACTION SURVEY

17. 17. Please give your opinion on "Quality of carbon black" as a factor to influence your satisfaction *

Mark only one oval per row.

	1.Strongly disagree	2.Disagree	3. Slightly Disagree	4. Slightly Agree	5. Agree	6. Strongly agree
a) I would prefer carbon black with all the quality parameters meeting the specification	⭕	⭕	⭕	⭕	⭕	⭕
b) Consistency in quality of carbon black from lot to lot is very important for our finished product	⭕	⭕	⭕	⭕	⭕	⭕
c) My expectation from a carbon black supplier is to meet our specific requirements on quality	⭕	⭕	⭕	⭕	⭕	⭕
d) I am interested in getting the desired quality of our product with the use of carbon black	⭕	⭕	⭕	⭕	⭕	⭕
e) I prefer carbon black which can be easily processed at our end	⭕	⭕	⭕	⭕	⭕	⭕
f) I am less concerned about the quality of carbon black	⭕	⭕	⭕	⭕	⭕	⭕
g) I believe that quality cannot be compromised for price	⭕	⭕	⭕	⭕	⭕	⭕

18. 18.Please give your opinion on "Packaging of carbon black" as your satisfaction factor *

Mark only one oval per row.

	1. Strongly disagree	2.Disagree	3. Slightly Disagree	4.Slightly Agree	5. Agree	6. Strongly agree
a) I would prefer carbon black in standard packaging	⭕	⭕	⭕	⭕	⭕	⭕
b) It is expected that carbon black supplier will ensure no damage/ leakage of bags during receipt at our end	⭕	⭕	⭕	⭕	⭕	⭕
c) I am less concerned about the packaging of carbon black	⭕	⭕	⭕	⭕	⭕	⭕
d) It is expected that accuracy of bag weight will be maintained	⭕	⭕	⭕	⭕	⭕	⭕
e) Proper identification and coding on carbon black bags are very important	⭕	⭕	⭕	⭕	⭕	⭕

19. **19. Please give your opinion on "Order execution / delivery" of carbon black as a factor to influence your satisfaction ***

Mark only one oval per row.

	1. Strongly disagree	2.Disagree	3. Slightly Disagree	4. Slightly Agree	5. Agree	6. Strongly agree
a) Real time information on order/ delivery status is expected from the supplier	◯	◯	◯	◯	◯	◯
b) I would like to get advance intimation of deviation in order execution from the supplier	◯	◯	◯	◯	◯	◯
c) I am less concerned about order execution and delivery of carbon black	◯	◯	◯	◯	◯	◯
d) I would expect adherence to delivery against total ordered quantity as per schedule	◯	◯	◯	◯	◯	◯
e) It is expected that a carbon black supplier will ensure smooth order execution	◯	◯	◯	◯	◯	◯
f) I would prefer a carbon black supplier who has the flexibility to meet our emergency requirement	◯	◯	◯	◯	◯	◯
g) I would expect supplier to deliver carbon black as per our requirement to ensure lean inventory at our end	◯	◯	◯	◯	◯	◯

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20. **20. Please give your opinion on the "support of Sales Representatives of carbon black supplier" as a factor to influence your satisfaction** *

Mark only one oval per row.

	1.Strongly disagree	2.Disagree	3.Slightly Disagree	4.Slightly Agree	5. Agree	6. Strongly agree
a) It is desirable that the sales representatives will be provided with higher degree of empowerment to take decision on price and delivery terms	◯	◯	◯	◯	◯	◯
b) I would expect sales representatives will be able to explain their product portfolio and capability	◯	◯	◯	◯	◯	◯
c) It is expected that sales representative will ensure material availability as per our requirement	◯	◯	◯	◯	◯	◯
d) Sales representative is expected to facilitate resolution of our problem / complaint	◯	◯	◯	◯	◯	◯
e) It is desirable that the sales representatives will keep frequent contact with us even after a purchase	◯	◯	◯	◯	◯	◯
f) It is desirable that sales representatives will be able to capture our requirement / issues in general	◯	◯	◯	◯	◯	◯
g) Support of of sales representatives of carbon black suppliers is not important for us	◯	◯	◯	◯	◯	◯

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CUSTOMER SATISFACTION SURVEY

21. **21.Please give your opinion on "Technical service of carbon black supplier" as a factor to influence your satisfaction ***

Mark only one oval per row.

	1. Strongly disagree	2. Disagree	3. Slightly Disagree	4. Slightly Agree	5. Agree	6.Strongly agree
a) It is expected that technical people of supplier will understand and meet our technical requirements related to carbon black	◯	◯	◯	◯	◯	◯
b) I would expect assistance from technical services team of carbon black supplier in our product quality improvement / new grade development	◯	◯	◯	◯	◯	◯
c) Technical service of carbon black supplier is not important for us	◯	◯	◯	◯	◯	◯
d) Adequate R&D facility of a carbon black supplier for development of new product / customised product is very important for us	◯	◯	◯	◯	◯	◯
e) I am interested in a carbon black supplier who has a strong technical knowledge base in the field	◯	◯	◯	◯	◯	◯

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22. 22.Please give your opinion on "Efficient Complaint Handling System" as a factor to influence your satisfaction *

Mark only one oval per row.

	1. Strongly disagree	2. Disagree	3. Slightly Disagree	4. Slightly Agree	5. Agree	6. Strongly agree
a) I would expect prompt response to our complaints from the supplier	◯	◯	◯	◯	◯	◯
b) I would like to get innovative solutions from the supplier to resolve our problem	◯	◯	◯	◯	◯	◯
c) It is expected that the people handling the complaint(related to carbon black) shall have sufficient knowledge on carbon black and its application	◯	◯	◯	◯	◯	◯
d) It is desirable that the supplier will follow up to ensure that the problem has been solved accurately and satisfactorily.	◯	◯	◯	◯	◯	◯
e) Structured root cause analysis of the complaint and implementation of corrective action with horizontal deployment are expected from the supplier	◯	◯	◯	◯	◯	◯

23. **23. Please give your opinion on "Reputation of carbon black supplier" as customer satisfaction factor ***

Mark only one oval per row.

	1. Strongly disagree	2. Disagree	3. Slightly Disagree	4. Slightly Agree	5. Agree	6. Strongly agree
a) It is desirable that our carbon black supplier is a leading company in the sector	◯	◯	◯	◯	◯	◯
b) I would like a carbon black supplier with global standard in quality, technology, capacity and outlook	◯	◯	◯	◯	◯	◯
c) It is expected that a carbon black supplier will show overall speed and agility in responding to market needs	◯	◯	◯	◯	◯	◯
d) I would prefer a carbon black supplier who is highly recommended by its' customers	◯	◯	◯	◯	◯	◯
e) Credibility of carbon black supplier is important to me	◯	◯	◯	◯	◯	◯
f) I would prefer a carbon black supplier who has wide portfolio of different carbon black grades	◯	◯	◯	◯	◯	◯
g) Reputation of carbon black supplier is not important for us	◯	◯	◯	◯	◯	◯

24. **24. Please give your opinion on "Long Term Relationship with carbon black supplier" as the factor to influence your satisfaction ***

Mark only one oval per row.

	1.Strongly disagree	2. Disagree	3. Slightly disagree	4. Slightly agree	5.Agree	6. Strongly agree
a) Long term relationship with a carbon black suppler is preferable, as less variation in quality is expected from the same supplier	◯	◯	◯	◯	◯	◯
b) The same supplier can better understand our specific requirements	◯	◯	◯	◯	◯	◯
c) The existing supplier do not need further approval	◯	◯	◯	◯	◯	◯
d) Changing from one supplier to another would cost us too much.	◯	◯	◯	◯	◯	◯
e) I would prefer to maintain long term relationship with carbon black supplier as It is difficult for us to find a replacement for the current supplier.	◯	◯	◯	◯	◯	◯
f) I am not willing to maintain long term relationship with any supplier as the old supplier may take everything for granted	◯	◯	◯	◯	◯	◯

Thank you very much for your time and support.

Kinsuk Mukherjee [Regd No: fms-iuj/phd15/syn-regd/012/17]

Powered by
Google Forms

A-3. Questionnaire used for Final survey (Offline mode)

**SURVEY ON SATISFACTION OF CUSTOMERS OF
INDUSTRIAL CHEMICAL PRODUCTS**

Dear Sir/Madam,

I am conducting an independent survey on the factors influencing satisfaction of customers of industrial chemical products. I shall be grateful if you could spend hardly 15 minutes of your time to complete the questionnaire in a simple Word format and send the completely filled-in format through return mail. The questions to be answered from your point of view only. There is no right or wrong answer for any situation intended in the survey. The individual response will be treated in the strictest confidence and the data from this study will be reported in the aggregate for academic purpose only.

Kinsuk Mukherjee

Divisional Head- Technical Services, PCBL Limited

& Research Scholar-ICFAI University, Jharkhand [Regd No: fms-iuj/phd15/syn-regd/012/17]

Section-A

1)	Your Name**(Optional)**	
2)	Your contact number and email id**. (Optional)**	
3)	Name and location of the Industry / company you currently work for **(Optional)**	
4)	What is your academic/professional qualification? [(a)Under Graduation/ (b) Graduation and above]	
5)	**What are the main products of your current industry? [(a) Tyre / (b) Automotive rubber component / (c) other (Please specify)]**	
6)	What is your total experience (in years) in similar industry?	
7)	**Functional department to which you currently belong? [Purchase / QA / Production / Technical / R&D / Any other(Please specify)**	
8)	How much quantity (MT approx.) of chemical (please specify) is procured by your company per month?	

Section-B

9) Based on your judgment, please put weightage (%) to following factors to indicate the significance of these factors in influencing your satisfaction towards the supplier of chemical product. (The sum of all the weightages must be 100)

Satisfaction Factors	Weightage
i. Price of the Product	
ii. Incentives offered to customers	
iii. QMS ensuring Quality of the Product	
iv. Packaging of the Product	
v. Order Execution and Delivery of the Product	
vi. Customer Service of the Supplier	
vii. Suppliers' Sustainability Performance	
viii. Company Image of the Supplier	
ix. Product Stewardship of the Supplier	
Other factor, if any (please specify):	
Total	**100**

Section-C

Kindly read following instructions for answering questions 10-19
• Please indicate how strongly you agree or disagree to the following statements on a seven-point scale, where 1=Very Strongly Disagree (VSD), 7= Very Strongly Agree (VSA).
• Only one rating can be chosen against a statement
• Please give your rating to all the statements

10) Please give your opinion on **' Price of the Product'** as a factor to influence your satisfaction	1	2	3	4	5	6	7
a) I always look for the lower price while purchasing raw material							
b) I don't mind paying more for high standard packaging of chemical product							
c) I am willing to pay more in purchasing raw material from a supplier for its' brand image							
d) I don't mind paying more for the raw material of our desired quality							

11) Please give your opinion on '**Incentives offered to customers'** as a factor to influence your satisfaction	1	2	3	4	5	6	7
a) I prefer a supplier offering longer credit period							
b) I prefer a supplier offering higher credit limit							
c) I am not interested in getting discount in price while purchasing.							
d) I won't prefer a supplier for offering rewards for repeated purchase							

12) Please give your opinion on " **QMS ensuring Quality of the Product** " as a factor to influence your satisfaction	1	2	3	4	5	6	7
a) I consider certification on international QMS standard (e.g., ISO9001) is a mandatory requirement to ensure consistency in quality							
b) I am not interested in batch-to-batch quality consistency in addition to the quality parameters of each batch within the specification limits							
c) I would prefer a supplier who can meet our specific requirement on product quality consistently							
d) I am interested to deal with a supplier who adopts risk-based approach in taking preventive measure in their operations							
e) I prefer a supplier who conducts internal audits to verify the conformance of QMS and systematic management review							

13) Please give your opinion on "**Packaging of the Product** " as a factor to influence your satisfaction	1	2	3	4	5	6	7
a) I would prefer to deal with a supplier who uses biodegradable or recycled material in packaging and recycle the bags after the use							
b) I am **not** concerned about Identification Visibility of batch number and color code on packaging bags							
c) I am **not** interested in checking individual bag weight as long as total weight of consignment is within the specification							
d) I believe maintaining cleanliness and zero leakage of chemicals from the bags at the time of receipt at our end is a mandatory requirement for a supplier							

14) Please give your opinion on "**Order Execution and Delivery of the Product"** as a factor to influence your satisfaction	1	2	3	4	5	6	7
a) I will prefer a supplier who maintains a higher percentage of OTIF (On Time in Full) in delivering material							
b) I consider real time information on order and delivery status from supplier end is an important criterion of good supplier							
c) I **don't** consider 'flexibility to meet sudden augmentation in demand' as an important criterion for being a preferred supplier							
d) I would prefer a supplier delivering the chemical product 'Just in time' to reduce our inventory holding cost							

15) Please give your opinion on the "**Customer Service of the Supplier**" as a factor to influence your satisfaction	1	2	3	4	5	6	7
h) I am **less** interested in getting technical assistance from the supplier of chemical product for improvement of our product performance							
i) I consider product knowledge is a mandatory requirement of sales representative of supplier to capture our requirement							
j) I am interested in frequent interaction with the technical personnel of supplier for solutions to wide variety of our needs							
k) I consider responsiveness of sales representatives of supplier to our needs is important criterion for being a preferred supplier							
l) I am concerned about the resolution time of our complaints							

16) Please give your opinion on "**Suppliers' Sustainability Performance**" as a factor to influence your satisfaction	1	2	3	4	5	6	7
a) I would prefer a supplier who has robust systems to reduce, reuse and recycle non-biodegradable materials and natural resources							
b) I **don't believe** ISO certification on Environment Management Systems and Occupational Health and Safety Management Systems is a mandatory requirement of a supplier							
c) I consider a company's resilience to long term Environmental, Social and Governance (ESG) risk is an important criterion for being a sustainable supplier							
d) I would prefer a supplier having a robust system of Water, Energy, Solid Waste and Green House Gas management and publishing third party assessed sustainability report (e.g., GRI based reporting)							

17) Please give your opinion on "**Company Image of the Supplier**" as a factor to influence your satisfaction	1	2	3	4	5	6	7
a) I am interested in dealing with a supplier who has a loyal customer base							
b) I am not willing to give preference to a supplier for their company image							
c) I prefer to deal with a supplier which shows overall speed and agility in responding to the market needs							
d) I like to procure chemical product from a company who is not just a supplier, but an industry leader							
e) I prefer to deal with a supplier who does not indulge in unfair or illegal trade practice							

18) Please give your opinion on '**Product Stewardship of the Supplier'** as a factor to influence your satisfaction	1	2	3	4	5	6	7
a) I would prefer a supplier who takes the responsibility of their product from Cradle to Grave to reduce the impact on environment and health							
b) I believe that restriction of PAH (Polycyclic Aromatic Hydrocarbon) in the chemical product is **not** an important factor for being our preferred supplier							
c) I am **less** interested to know the proportion of SVHC (Substances of Very High Concern) in the chemical product we purchase							
d) I consider it is the responsibility of supplier to disclose ecological information (toxicity, persistence, degradability, etc.) in the Safety Data Sheet of the product they supply							

19) Please give your opinion on your '**Overall Satisfaction with Current Supplier of Chemical'**	1	2	3	4	5	6	7
g) On an overall basis I am satisfied with our current supplier							
h) I am satisfied with the ease of doing business with the current supplier.							
i) I would like to purchase the chemical product from the current supplier again.							
j) I would like to recommend our current supplier to an associate.							

Thank you very much for your time and support.

Kinsuk Mukherjee [Regd No: fms-iuj/phd15/syn-regd/012/17]

A-4 Expert Interview Guidelines & Questions

Expert Interview for the study of critical factors affecting satisfaction of customers for industrial chemical products

Dear Sir/Madam,

A research study is being carried out by the undersigned on the 'C**ritical factors affecting satisfaction of customers for industrial chemical products'**. Based on the feedback received in pilot survey and further discussion with the professionals of chemical industries, the factors identified for the analysis of satisfaction of customers for industrial chemical products are a) Price of the Product b) Incentives offered to customers c) QMS ensuring Quality of the Product d)Packaging of the Product e) Order execution and delivery of the product f) Customer service of the supplier g) Company image of the supplier h) Suppliers' Sustainability Performance i) Product stewardship of the supplier. Responses were collected through survey questionnaire from the respondents of different functions of various manufacturing companies who use industrial chemical products. Selected Industrial Chemical products which are procured by the respondents include Carbon Black, Sulphuric Acid, Potassium Carbonate, Potassium Nitrate, Hydrochloric Acid, Sodium Hydroxide, Rubber Process Oil (RPO), Zinc Oxide, Sulfur, Stearic Acid, Sodium Silicate. Respondents were selected from various functions (Technical, Production, QA, R&D, Purchase) of manufacturing companies in India like a) Major Tyre manufacturing companies across India b) Major Automotive Rubber Component (ARC) manufacturing companies across India c) Lead–Acid Battery manufacturing company d) Precipitated Silica manufacturing company e) Steam Power plants f) Carbon Black manufacturing company. Ranking of the identified factors has been done on the basis of the responses in the survey. We would also like to get your insights on the reasons of such findings. Kindly spend some of your valuable time in responding to the following questions on the basis of your vast experience in handling industrial chemical products in your respective organization. The responses of this survey will be strictly used for academic purposes only.

<div align="center">

Kinsuk Mukherjee

Head (GM)- ME and Sustainability, PCBL Limited &

Research Scholar- ICFAI University, Jharkhand

[Regd No: fms-iuj/phd15/syn-regd/012/17]

</div>

Name   :

Designation   :

Current Organisation   :

Current Functional Department   :

Overall Industrial Experience in years   :

Experience in handling industrial chemical products in years :

Your insights are required on the following observations which resulted from the study:

a) The factors identified in the study for the satisfaction of customers of industrial chemical products are a) Price of the Product b) Incentives offered to customers c) QMS ensuring Quality of the Product d) Packaging of the Product e) Order execution and delivery of the product f) Customer service of the supplier g) Company image of the supplier h) Suppliers' Sustainability Performance i) Product stewardship of the supplier. **What is your opinion on the adequacy of these identified factors to influence satisfaction of customers of industrial chemical products?**

b) The study has identified that there is a there is significant difference in the prioritization of factors influencing satisfaction of customers in Tyre manufacturing companies and ARC manufacturing companies as shown in following table. **What is your opinion on this result?**

Factors Affecting Customer Satisfaction	Sectors under study	
	Carbon Black in Tyre	Carbon Black in ARC
QMS Ensuring Quality of the Product (Carbon Black)	1	1
Order Execution and Delivery of the Product (Carbon Black)	2	5
Packaging of the Product (Carbon Black)	3	8
Product Stewardship of the Supplier	4	6
Customer Service of the Supplier	5	4
Suppliers' Sustainability Performance	6	7
Price of the Product (Carbon Black)	7	2
Company Image of the Supplier	8	9
Incentives Offered to Suppliers	9	3

c) The study has identified that there is no significant difference in prioritization of satisfaction factors among the customers in different functions of Tyre manufacturing companies and ARC manufacturing companies. **What is your opinion on this result?**

d) The study has identified that there is resemblance in prioritization of satisfaction factors among customers for different industrial chemical products. In 76% cases of the different industrial chemical products studied, significant positive association was found among the rankings of customer satisfaction factors for different types of industrial chemical products. **What is your opinion on this result?**

Thank You for your valuable time

A-5. PUBLICATIONS AND PRESENTATIONS BY THE SCHOLAR IN THE RESEARCH AREA

Publications:

1. Mukherjee, K. (2021). Factors affecting satisfaction of customers in business-to-business context. *IUJ Journal of Management*, *9*(1), 45–54, June 2021. EOI. http://eoi.citefactor.org/10.11224/IUJ.09.01.03[Ma1]

Paper Presentations:

Mukherjee, Kinsuk (2019, November). *Factors to satisfy customers of carbon black in India* [Paper presentation]. 6th International Conference on Multidisciplinary Innovation and Research, Kuala Lumpur, Malaysia

Mukherjee, Kinsuk (2023, February). *Role of manufacturing companies in ecological sustainability in the industrial region* [Paper presentation]. 6th Edition of Discussion Forum on Ecological Sustainability in the Industrial Region organized by The Bengal Chamber Commerce and Industry in partnership with West Bengal Pollution Control Board, Asansol Engineering College, West Bengal, India