Unit III

Engineering as experimentation - engineers as responsible experimenters - Research ethics - Codes of ethics - Industrial Standard - Balanced outlook on law - the challenger case study.

Engineering as Experimentation

Experimentation is commonly recognized as playing an essential role in the design process. Preliminary tests or simulations are conducted from the time it is decided to convert a new engineering concept into its first rough design. Materials and processes are tried out, usually employing formal experimental techniques. Such tests serve as the basis for more detailed designs, which in turn are tested. At the production stage further tests are run, until a finished product evolves. The normal design process is thus iterative, carried out on trial designs with modifications being made on the basis of feedback information acquired from tests. Beyond those specific tests and experiments, however, each engineering project taken as a whole may be viewed as an experiment.

Learning from the Past

Usually engineers learn from their own earlier design and operating results, as well as from those of other engineers, but unfortunately that is not always the case. Lack of established channels of communication, misplaced pride in not asking for information, embarrassment at failure or fear of litigation, and plain neglect often impede the flow of such information and lead to many repetitions of past mistakes. Here are a few examples:

1. The *Titanic* lacked a sufficient number of lifeboats decades after most of the passengers and crew on the steamship *Arctic* had perished because of the same problem.
2. "Complete lack of protection against impact by shipping caused Sweden's worst ever bridge collapse on Friday as a result of which eight people were killed." Thus reported the *New Civil Engineer* on January 24, 1980. Engineers now recommend the use of floating concrete bumpers that can deflect ships, but that recommendation is rarely heeded as seen by the 1993 collapse of the Bayou Canot bridge that cost 43 passengers of the *Sunset Limited* their lives.
3. Valves are notorious for being among the least reliable components of hydraulic systems. It was a pressure relief valve, and a lack of definitive information regarding its open or shut state,

Contrasts with Standard Experiments

- Experimental Control
- Informed Consent
- Knowledge Gained

Table 4–1 Types of standards

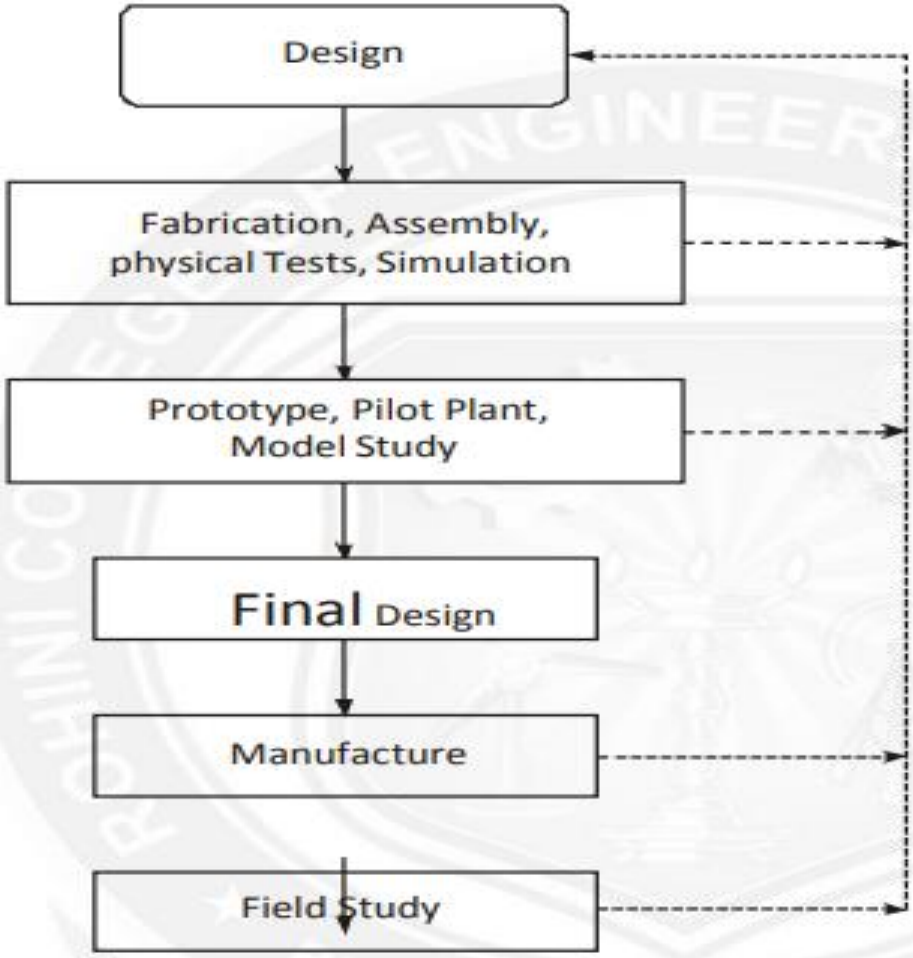
Criterion	Purpose	Selected examples
Uniformity of physical properties and functions	Accuracy in measurement, interchangeability, ease of handling	Standards of weights, screw dimensions, standard time, film size
Safety and reliability	Preparation of injury, death, and loss of income or property	National Electric Code, boiler code, methods of handling toxic wastes
Quality of product	Fair value for price	Plywood grade, lamp life
Quality of personnel and service	Competence in carrying out tasks	Accreditation of schools, professional licenses
Use of accepted procedures	Sound design, ease of communications	Drawing symbols, test procedures
Separability	Freedom from interference	Highway lane markings, radio frequency bands
Quality procedures approved by ISO	Assurance of product acceptance in member countries	Quality of products, work, certificates, and degrees

ISO, International Organization for Standardization

ENGINEERING AS EXPERIMENTATION

- Before manufacturing a product or providing a project, we make several assumptions and trials, design and redesign and test several times till the product is observed to be functioning satisfactorily. We try different materials and experiments. From the test data obtained we make detailed design and retests. Thus, design as well as engineering is iterative process.

Design as an Interactive process



ENGINEERING AS EXPERIMENTATION

- Several redesigns are made upon the feedback information on the performance or failure in the field or in the factory. Besides the tests, each engineering project is modified during execution, based on the periodical feedback on the progress and the lessons from other sources. Hence, the developmentof a product or a project as a whole may be considered as an experiment.

Engineering Project Vs. Standard Experiments

- Contrasts:
  - Experimental control
  - Human touch
  - Informed consent
- Similarities
  - Partial ignorance
  - Uncertainty
  - Continuous monitoring
  - Learning from Past

ENGINEERS AS RESPONSIBLE EXPERIMENTERS

- The engineer, as an experimenter, owe several responsibilities to the society, namely,

1. A conscientious commitment to live by moral values.
2. A comprehensive perspective on relevant information. It includes constant awareness of the progress of the experiment and readiness to monitor the side effects, if any.
3. Unrestricted free-personal involvement in all steps of the project/product development(autonomy). 4. Be accountable for the results of the project (accountability).

Conscientious moral commitment

- Conscientious moral commitment means:

(a) Being sensitive to full range of moral values and responsibilities relevant to the prevailing situation and

(b) the willingness to develop the skill and put efforts needed to reach the best balance possible among those considerations. In short, engineers must possess open eyes, open ears, and an open mind (i.e., moral vision, moral listening, and moral reasoning).

Industrial Standards

- BIS is the National Standard Body of India established under the BIS Act 2016 for the harmonious development of the activities of standardization, marking and quality certification of goods and for matters connected therewith or incidental thereto.
- BIS has been providing traceability and tangibility benefits to the national economy in a number of ways – providing safe reliable quality goods; minimizing health hazards to consumers; promoting exports and imports substitute; control over proliferation of varieties etc. through **standardization**, **certification** and **testing.**
- The Bureau is a Body Corporate consisting of 25 members representing both Central and State governments, Members of Parliament, industry, scientific and research institutions, consumer organizations and professional bodies; with Union Minister of Consumer Affairs, Food and Public Distribution as its President and with Minister of State for Consumer Affairs, Food and Public Distribution as its Vice-President

BIS is involved in various activities as given below:

- Standards Formulation
- Product Certification Scheme
- Compulsory Registration Scheme
- Foreign Manufacturers Certification Scheme
- Hall Marking Scheme
- Laboratory Services
- Laboratory Recognition Scheme
- Sale of Indian Standards
- Consumer Affairs Activities
- Promotional Activities
- Training Services, National & International level
- Information Services

BIS

- BIS has its Headquarters at New Delhi and its 05 Regional Offices (ROs) are at Kolkata (Eastern), Chennai (Southern), Mumbai (Western), Chandigarh (Northern) and Delhi (Central).

Product Certification Scheme

- Indian Standards Institution (ISI) was established on 6 January 1947 as a Registered Society under the Societies Registration Act, 1860.
- In order to confer a statutory status to Indian Standards Institution, a bill was introduced in the Parliament which led to the enactment of the Bureau of Indian Standards Act, 1986. Thus, Bureau of Indian Standards (BIS) came into existence on 1 April 1987, taking over the functions of erstwhile ISI, with broadened scope and vested with more powers.
- Later on in 2016, with the notification of the BIS Act 2016, the Rules and the Regulations framed thereunder, BIS has been authorized to undertake Conformity Assessment of Goods, Article, Services, Systems and Processes as per the relevant Schemes given in the BIS (Conformity Assessment) Regulations, 2018. The Conformity Assessment Schemes are based on the principles laid down in IS/ISO/IEC 17067.

BIS

- **Cement (any variety of cement manufactured or sold in India) such as**
- **Household Electrical goods**
- **Batteries**
- **Automobile Accessories**
- **Cylinder, Valves and Regulator**
- **Medical Equipment**
- **Steel and Iron Products**
- **Electrical Transformers**
- **Electrical Motors**
- **Capacitors**
- **Chemicals, Fertilizers, Polymers & Textiles**
- **Kitchen Appliances**
- **Domestic Water Heaters for use with LPG**
- **Air Conditioner and its related Parts, Hermetic Compressor and Temperature Sensing Controls**
- **Domestic Gas Stoves for use with Liquefied Petroleum Gases**
- **Transparent Float Glass**

- **Domestic Pressure Cooker**
- **Rubber Hose for Liquefied Petroleum Gas (LPG)**
- **Non Electric Toys**
- **Electric Toys**
- **Paper**
- **Cattle Feeds**
- **Automobile Wheel Rim Component**
- **Foot Wear**
- **Press Tool-Punches**
- **Helmet for riders of Two Wheeler Motor Vehicles**
- **Refrigerating Appliances**
- **Centrifugally cast (Spun) iron pipes**
- **Flux Cored (Tubular) Electrodes**
- **Sewing Machine**
- **Water Treatment System**
- **Jute Bag**
- **Plugs and Socket-Outlets and Alternating Current Direct Connected Static Prepayment Meters for Active Energy**

System Certification

- Bureau of Indian Standards has been operating Management Systems Certification Scheme since 1991.
- Initially, BIS started the scheme with Quality Management System Certification (IS/ISO 9001) and over the years it has gradually expanded its activities to various other Management Systems.

FMCS Overview

- **Bureau of Indian Standards (BIS) has been operating a Foreign Manufacturers Certification Scheme (FMCS) since the year 2000 under BIS Act, 2016 and Rules & Regulations framed there under.**
- **Under FMCS, licence is granted to a Foreign Manufacturer for use of Standard Mark on a product that conforms to an Indian Standard..**
- **The Scheme is applicable for grant of licence for all products except Electronics & IT Goods notified by MeitY**
- **The licence is granted by Foreign Manufacturers Certification Department (FMCD) located at BIS Headquarters, New Delhi.**

MeITY

- The Ministry of Electronics and Information Technology is coordinating strategic activities, promoting skill development programmes, enhancing infrastructure capabilities and supporting R&D for India’s leadership position in IT and IT-enabled Services.

MeITY – Revenue Trends

Revenue Trend

Indian IT – ITeS industry has continued to perform its role as the consistent growth driver for the economy. The performance of this sector (Both Exports and Domestic) over the last 5 years is given below:

(in US$ Billion)

Description	2017-18	2018-19	2019-20	2020-21	2021-2 (E)
Exports	126	136	147	152	178
Domestic	41	41	44	45	49
Total Revenue	167	177	191	196	227
YoY Growth %	8.4%	5.98%	7.90%	2.09%	15.5%

Source: NASSCOM , (E) = Estimate

National Policy on Software Products (NPSP) – 2019

- The National Policy on Software Products aims to develop India as the global software product hub, driven by innovation, improved commercialization, sustainable Intellectual Property (IP), promoting technology start-ups and specialized skill sets.
- Further, the Policy aims to align with other Government initiatives such as Start-up India, Make in India and Digital India, Skill India etc., so as to create a robust Indian Software products ecosystem.

Innovation Challenge for Development of Indian Video Conferencing Solution (Software Product)

- A programme of Innovation Challenge for development of Video Conferencing solution has been launched to develop innovative Video Conferencing solution. The initiative is an attempt to promote Indian Software products as envisaged under the National Policy on Software Products. One winner and three runner-ups have been declared under the progarmme. Also, the winning product is being used by the Government through contract.

IT/ Software Export

- Indian technology exports are set to reach $178 billion (excl. hardware exports), a growth of 17.02% and an addition of $26 billion over FY2021:
- **IT services:** At $95 billion, it continues to lead in terms of market share and is also likely to be the best performing segment of FY2021, a y-o-y growth of 18%.
- **BPM:** At $39 billion and a growth rate of 14 % y-o-y, this sector too is accelerating it shift to platform solutions (BPaaS to grow 4X vis-à-vis traditional BPM). Growth drivers include automation-led services in F&A and HR, increased adoption of RPA and analytics.
- **ER&D:** Led by increasing softwarization of equipment & devices ("software-led products") and cloudification, this segment is being driven by cloud engineering, services around data monetization and digital engineering. Historically, this segment has been recording the fastest growth rate; however, for FY2021, it is likely to see a drop in growth rate (17% y-o-y) to touch $36 billion
- **Software products:** Rise in demand for collaborative applications, application platforms, security software, system & service management software, and content workflow & management applications will lead to a 34% growth of this segment to $7 billion.

Functions of Ministry of Electronics and Information Technology

1. Policy matters relating to information technology; Electronics; and Internet (all matters other than licensing of Internet Service Provider).

2. Promotion of internet, IT and IT enabled services.

2A. Promotion of Digital Transactions including Digital Payments.[2]

3. Assistance to other departments in the promotion of E-Governance, E- Commerce, E- Medicine, E- Infrastructure, etc.

4. Promotion of Information Technology education and Information Technology-based education.

5. Matters relating to Cyber Laws, administration of the Information Technology Act. 2000 (21 of 2000) and other IT related laws.

5A. Matters relating to online gaming.[3]

6. Matters relating to promotion and manufacturing of Semiconductor Devices in the country.[4]

7. Interaction in IT related matters with international agencies and bodies e. g. Internet for Business Limited (IFB), Institute for Education in Information Society (IBI) and International Code Council — on line (ICC).

8. Initiative on bridging the Digital Divide: Matters relating to Digital India Corporation.[5]

9. Promotion of Standardization, Testing and Quality in IT and standardization of procedure for IT application and Tasks.

10. Electronics Export and Computer Software Promotion Council (ESC).

11. National Informatics Centre (NIC).

12. Initiatives for development of Hardware/Software industry including knowledge—based enterprises, measures for promoting IT exports and competitiveness of the industry.

13. All matters relating to personnel under the control of the Ministry.[6]

14. Unique Identification Authority of India (UIDAI).[7]

15. Semi-Conductor Laboratory, Mohali.[8]

Case to Discuss

- What's this co-location scam?
- By now, you've probably lapped up everything there is to know about Chitra Ramkrishna, the former CEO and MD of the stock exchange behemoth NSE, and her tryst with a "Himalayan Yogi".

- ***And if you want to take a look at the e-mail exchange, here it is***
- From Yogi to Chitra Ramkrishna
- *“p.s, keep bags ready I am planning a travel to Seychelles next month, will try if you can come with me, before Kanchan goes to london with Kaanchana and Barghava and you to New Zealand with two children. HK is a preferred transit or Singapore for onward journey. In case you need help pi let me know Seshu will do the needful. If you know swimming then we could enjoy a sea bath in Seychelles and rest in the beach. I am asking my tour operator to connect with Kanchan for all of our tickets.”*
- *“Today you are looking Awesome. You must learn different ways to platt your hair which will make your looks interesting and appealing!! Just a free advice, I know you will grab this. Keep March mid a little free.”*

Like that batman quote — "*You Either Die A Hero, Or You Live Long Enough To See Yourself Become The Villain.*"

- NSE seemingly offered some brokers preferential access to data that allowed them to profiteer off of buying and selling stocks at the exchange. By some estimates brokers made off with profits to the tune of 50,000 crores. And despite denying any wrongdoing, both NSE and Chitra Ramkrishna were fined by SEBI.

- Now here's where things start taking a turn. During the investigation, SEBI chanced upon certain confidential e-mails between the then MD of NSE, Chitra Ramkrishna and a certain Yogi with the email id rigyajursama@outlook.com. The e-mails include very specific instructions about appointments, organisational structure, and remuneration. Even about a holiday in Seychelles!

- Okay, another detour. When Ramkrishna became CEO in 2013, she walked in with Subramanian and offered him a mouth-watering salary of ₹1.63 crores. In fact, he was offered to join NSE as a Chief Strategic Advisor.
- He was soon made Group Operating Officer and almost everyone in the company reported to him. But he was never declared as a “key managerial person” at NSE.
- Once again, alarm bells should have gone off considering SEBI (the regulator) explicitly mandates this. But it went under the radar.
- By 2016, Anand Subramanian was one of the most powerful people at NSE. He was working part-time as a consultant and was designated Group Operating Officer and Advisor to the CEO at NSE.
- Also, he was drawing a salary of about ₹4.21 Crores.

Finally

- Theory 1: Chitra Ramkrishna was naive and truly believed that the mystic yogi would help take NSE to new heights. Although you have to wonder, why were the two so invested in Anand Subramanian?
- Theory 2: Chitra Ramkrishna was in cahoots with Anand Subramanian and the Yogi was simply a decoy — set up by the two parties to avoid suspicion.
- Theory 3: Anand Subramanian was the Yogi. He was the puppet master. And Chitra Ramkrishna fell prey to a petty scam. That's all there is to it. Backing this theory—Your very own NSE.
- Theory 4: There is a Yogi. He isn't faceless. He isn't nameless. He is quietly operating in the background. And he was the one who coordinated the entire scheme. This theory is further bolstered by the fact that one e-mail exchange* does allude to a meeting in Seychelles — Between Chitra Ramkrishna, Anand Subramanian and…… the mystic.

Any time Biryani

- If you live in Chennai and haven't heard of the new ATM that dispenses biryani, you're probably living under a rock.
- Bai Veetu Kalyanam or BVK, a popular Chennai biryani chain has launched India's first contactless biryani takeaway that operates like an ATM. All you've got to do is place your order on the screen, swipe your card or scan a QR code to pay and wait. In about 4 minutes, you'll have your hot biryani takeaway packed and ready.

- Bengaluru’s “idlibot” from Freshot inspired BVK to come up with this novel idea. For those of you who have no clue what we’re talking about, Bilekahalli’s idli ATM can dish out hot idlis 24X7. It can make 72 idlis in just 12 minutes. And you can also relish millet, palak or carrot idlis and sides like podi and chutney with your order.

The All India Consumer Products Distributors Federation (AICPDF) has also called out this competition and termed it '**unethical**'.

- Campa Cola has been in the news ever since the Ambanis bought it for a hefty sum of ₹22 crores in August last year. And it has grabbed headlines again this week.
- Reliance is re-launching Campa in its 200 ml avatar for just ₹10. They've only reworked the packaging and are rolling them out in PET bottles instead of the typical 200 ml glass bottles. Pepsi or Coca Cola don't sell 200 ml PET bottles but have 250 ml bottles for ₹20 instead.

- See, Coca-Cola has been following this price-lowering strategy for quite some time. For instance, in 2021 Coke rolled out its 200 ml Coca-Cola, Thums Up and Sprite (glass) bottles at ₹10 in a few selected states, simply because it helped reduce overall costs. Glass bottles are returnable and reused, which means it significantly reduces packaging material costs.
- Earlier these bottles cost ₹12–14. And overall they accounted for less than 10% of Coke's business. Bringing down prices can push up their demand. PET bottles on the other hand require plastic resin, whose costs have been soaring with every fuel price rise.
- And that's why Coke is coaxing its distributors to sell more glass bottles over PET. In fact, it's even waiving off crate deposits that retailers have to pay to store glass bottles.

- The world of cryptocurrency is wild!!! And FTX, the world's second-largest crypto exchange, a company valued at $32 billion just blew up! Almost blew up.

- The story begins with Alameda Research. Founded in 2017 by Sam Bankman-Fried, Alameda began as a proprietary trading firm dabbling in cryptocurrencies. They made money buying and selling crypto. And they made lots of it. Soon Sam decided he wanted more. He didn’t just want to trade cryptocurrencies. He wanted to help others do the same.

- *Binance announced on Twitter that it was backing out of the deal with FTX. It said, "As a result of corporate due diligence, as well as the latest news reports regarding mishandled customer funds and alleged US agency investigations, we have decided that we will not pursue the potential acquisition of FTX. In the beginning, our hope was to be able to support FTX's customers to provide liquidity, but the issues are beyond our control or ability to help."*
- *This is a massive blow for FTX which is in a fix and needs money desperately. And Binance's statement isn't going to assuage any fears of other potential suitors either. For customers of FTX, this is bad news. Really bad news.*

- The Enforcement Directorate (ED) has provisionally attached 750 crores worth of assets belonging to Amway India.
- Yes, Amway. A company that primarily sells beauty and wellness products. If you know them, you know them. If you don’t, well, there’s a reason why you probably haven’t heard of them so far.
- See, you usually don’t find their products in your neighbourhood Kirana stores. Because more often than not, their products are exclusively distributed through a network of maybe 4 million “members” in over 100 countries.
- A network that looks like a pyramid, but one that’s often touted as a multi-level marketing scheme.
- And they’re all built the same way — on a recruitment program that looks something like this.

- But Amway's troubles didn't begin recently. Back in the 1970s, the US Federal Trade Commission (FTC) initiated a formal investigation into the company's business practices. However, after a thorough review, a judge ruled in favour of Amway citing that the company hadn't violated any known US laws.
- Although Amway did incentivize the direct selling agents to enrol new participants, they found that "members" often sold 70% of their stock in a month, to more than 10 customers. This was proof that members weren't hoarding these products. They were retailing them. It was seen as a legitimate enterprise with an explicit focus on "selling" rather than recruiting new agents.
- So they got away with it.
- In India meanwhile, Amway has been in the crosshairs of both the Andhra Pradesh government and the Kerala government. Back in 2008, officials in the undivided state of Andhra Pradesh accused Amway of running a pyramid scheme and banned it from all advertising. In 2013, the Kerala police even arrested Amway India's CEO for financial fraud. Since then there have been many complaints on multiple forums about Amway's business model.

- In 2021 the government drafted new rules to make direct selling companies more accountable. Here's a point from India's Consumer Protection (Direct Selling) Rules, 2021:
- *"Direct selling entity and a direct seller shall not induce consumers to make a purchase based upon the representation that they can reduce or recover the price by referring prospective customers to the direct sellers for similar purchases."*At the time, the notification didn't generate a lot of chatter. But now everybody's looking at it and going — "Wow, this just puts the Amway business model in a lurch."

Standard Law - WTO

- The Standards Law determines principles, rules, measures regarding the establishment, activities, management, and inspection of standards and technical regulations for products, goods, services, processes, and the environment.
- To encourage, improve and ensure the production, services, social economic and environment protection in order to have the quality, efficiency, justice and rights, and the legitimate interests and safety of consumers in manufacturing, and will be a factor in managing the nation's economy and development.

Standard Law

- Purpose
- Standard
- Technical Regulation
- Explanation of Terms
- Policy on Standardization
- Basic Principles for Standards and Technical Regulations
- Principles for formulating Standards and Technical Regulations
- Scope of the Law
- International Cooperation

- Standard is determined a specific characteristics of products, goods, services, processes, the environment, and other matters relating to standards, which are established for the valuation, classification, and quality ratings of these things.

- Technical Regulation is determined ratings, scope, and specific technical characteristics of products, goods, services, processes, the environment, and other matters relating to technical regulation, which are established for use in regulation and inspection to ensure safety, sanitation, health, consumer interests, environmental protection, and the interest and security of the nation.

Standard Mark

- Standards Mark means a products certification mark, management systems, or accreditation systems. The Marks which are established by the National Authority for Science and Technology (NAST) or such other organization as may be assigned.

THE DIGITAL PERSONAL DATA PROTECTION BILL, 2022

- The purpose of this Act is to provide for the processing of digital personal data in a manner that recognizes both the right of individuals to protect their personal data and the need to process personal data for lawful purposes, and for matters connected therewith or incidental thereto.

Application of the Act

- The provisions of this Act shall apply to the processing of digital personal data within the territory of India where: (a) such personal data is collected from Data Principals online; and (b) such personal data collected offline, is digitized.
- The provisions of this Act shall also apply to processing of digital personal data outside the territory of India, if such processing is in connection with any profiling of, or activity of offering goods or services to Data Principals within the territory of India. For the purpose of this sub-section, “profiling” means any form of processing of personal data that analyses or predicts aspects concerning the behaviour, attributes or interests of a Data Principal.

Data Fiduciary

- “Data Fiduciary” is defined as any person who alone or in conjunction with other persons determines the purpose and means of processing of personal data

Application of the Act

- The provisions of this Act shall not apply to: (a) non-automated processing of personal data; (b) offline personal data; (c) personal data processed by an individual for any personal or domestic purpose; and (d) personal data about an individual that is contained in a record that has been in existence for at least 100 years.

Grounds for processing digital personal data

- A person may process the personal data of a Data Principal only in accordance with the provisions of this Act and Rules made thereunder, for a lawful purpose for which the Data Principal has given or is deemed to have given her consent in accordance with the provisions of this Act.