

# INTERMEDIATE EXAMINATION

June 2023

P-9(OMSM)  
Syllabus 2022

## OPERATIONS MANAGEMENT AND STRATEGIC MANAGEMENT

Time Allowed: 3 hours

Full Marks: 100

*The figures in the margin on the right side indicate full marks.*

*All Sections are Compulsory. Each section contains instructions regarding the number of questions to be answered within the section.*

*All working notes must form part of the answer.*

*Wherever necessary, candidates may make appropriate assumptions and clearly State them in the respective answer.*

### Section-A

#### Operations Management

Answer Question No. 1 which is compulsory and any three from Question Nos. 2, 3, 4 and 5.

1. (a) **Choose the correct answer from the given alternatives (You may write only the Roman numeral and the Alphabet chosen for your answer):** 1×8=8
- (i) With reference to the aspects of customer service under Operations Management, if Primary consideration focuses on “Movement of a given, requested or acceptable specification”, it’s corresponding Principal function will be:
- (A) Manufacture
  - (B) Transport
  - (C) Supply
  - (D) Service
- (ii) Which one of the following forecasting is more useful in production planning?
- (A) Short-term
  - (B) Medium-term
  - (C) Long-term
  - (D) None of the above
- (iii) In which one of the following layouts, similar type of machines and services (i.e. facilities) are located together?
- (A) Product or Line layout
  - (B) Process layout
  - (C) Group layout
  - (D) Fixed layout

- (iv) Point-rating method is closely associated with
- (A) Transportation
  - (B) Simulation
  - (C) Queuing system
  - (D) Job Evaluation
- (v) The ratio of Actual Production to the Standard Production is referred to as:
- (A) Standardization
  - (B) Simplification
  - (C) Productivity
  - (D) Actual Yield
- (vi) Which one of the following is the project management software program?
- (A) MS PowerPoint
  - (B) MS Excel
  - (C) MS Project
  - (D) MS Access
- (vii) The type of spare parts which although acknowledged to have a long life or a small chance of failure, would cause a long shutdown of equipment because it would take a long time to get a replacement for them, are known as
- (A) Insurance spares
  - (B) Rotable spares
  - (C) Regular spares
  - (D) Capital spares
- (viii) Which of the following is not the method used for Operations Research problems?
- (A) Analytical method
  - (B) Simulation method
  - (C) Trail and error method
  - (D) None of the above
- (b) **State whether the following statements are 'true' or 'false' (You may write only the Roman numeral and whether 'True' or 'False' without copying the statements into the answer books):** 1×4=4
- (i) The term Operations Management is more used for a system where tangible goods are produced.
  - (ii) Aggregate planning is an Intermediate term planning decision.
  - (iii) The first and foremost stage of Design Thinking is Prototype.
  - (iv) The ISO Standards are reviewed every 10 years and revised if needed.

(c) **Fill in the blanks:** (You may write only the Roman numeral and the content filling the blank) 1×3=3

- (i) Operations management is concerned essentially with the utilization of \_\_\_\_\_.
- (ii) A \_\_\_\_\_ can be considered as a means of graphically depicting all the operations involved in a Project.
- (iii) The two types of maintenance costs need to be balanced: Cost of premature replacement and Cost of \_\_\_\_\_.

2. (a) **List down** various major decision areas under Production and Operations management. (Any Ten) 5

(b) (i) **Discuss** with appropriate examples, various properties of aggregate planning. 4

(ii) The Sales of CTV (₹ In Million) of SONTON LTD. for the 5 years are given below:

Year	2014	2016	2018	2020	2022
Sales of CTV (₹ In Million)	18	21	23	27	16

**Required:**

**Estimate** the Trend values of Sales of CTV for the years of 2021, 2024 and 2026. 6

3. (a) The Design Thinking can be thought of as a five stage process. Are these stages performed in a sequential order?

**Examine** each stage of Design Thinking. 7

(b) Below table shows the time remaining (number of days until due date) and the work remaining (number of days still required to finish the work) for 5 jobs which were assigned the letters A to E as they arrived to the shop.

Job	Number of days until due date	Number of days of work remaining
A	6	3
B	4	8
C	2	5
D	8	6
E	7	2

**Required:**

Sequence the jobs according to priority established by

- (i) Early Due Date (EDD) Rule
- (ii) Least Slack (LS) Rule
- (iii) Longest Processing Time (LPT) Rule
- (iv) Critical Ratio Rule

2×4=8

4. (a) A factory of SPON LTD. manufactures 3 products which are processed through 3 different production stages. The time required to manufacture one unit of each of the three products and the daily capacity of the stages are given in the following table:

State	Time/Unit in minutes			Stage capacity (minutes)
	Product 1	Product 2	Product 3	
1	1	2	1	430
2	3	-	2	460
3	1	4	-	420
Profit/Unit	₹ 3	₹ 2	₹ 5	

**Required:**

**Develop** a linear programming model to determine how many products to be manufactured to maximize profit. 5

- (b) (i) TANEESA, a car rental Agency has collected the following parameters on the demand for five-seater vehicles over the past 50 days.

Daily demand	5	6	7	8	10
No. of days	4	10	16	14	6

The agency has only 7 cars currently.

[Given: Random numbers: 15, 48, 71, 56, 90]

**Required:**

- (1) **Using the Random** numbers stated supra, **develop** 5 days of demand for the car rental agency.
  - (2) **Calculate** the average number of cars rented per day for the 5 days.
  - (3) **Assess** how many rentals will be lost over the 5 days. 4+1+1=6
- (b) (ii) The Quantitative Parameters pertaining to a machine extracted from the records of a manufacturing unit of SONIX Ltd. are as given below:

Working days per month	25
Hours worked per day	8
Standard Minutes per unit of production:	
Operator Time (Minutes)	12
Machine Time (Minutes)	36
Total time per unit (Minutes)	48
Number of Operators	1
Number of Machines	1

(No. of Units to be rounded off to the nearest integer)

**Required:**

- (1) If the plant is operated at 80% efficiency and the operator is working at 100% efficiency, **calculate** the output (units) per month.
- (2) If the Machine productivity is reduced by 10% over existing level, **assess** the output (in units) per month. 2+2=4

5. (a) SONTECH Ltd., a Solar manufacturing company has observed the following number of breakdowns in the new Lantern over the past year:

No. of breakdowns	0	1	2	3
No. of months it occurred	3	6	2	1

It costs the company ₹ 2000 to rectify a lantern. For a cost of ₹ 600 per month, preventive maintenance can be carried out to limit the breakdown to one per month.

**Required:**

**Which** policy is suitable for the company? Support your answer with needful calculations and justification. 5

- (b) Prantik (P) Ltd., a publisher, is preparing to produce the second edition of a Project Management Text Book. The activities required and their estimated times are as follows:

Activity and Identification		Estimated duration in days		
		Optimistic	Most Likely	Pessimistic
A	1-2	1	1	7
B	1-3	1	4	7
C	1-4	2	2	8
D	2-5	1	1	1
E	3-5	2	5	14
F	4-6	2	5	8
G	5-6	3	6	15

**Required:**

- (i) **Draw** the project network and identify all the paths through it.
- (ii) **Assess** the expected duration and variance for each activity and also project length.
- (iii) **Identify** the critical path and **assess** the EST, EFT, LST, LFT and total float for each activity. 3+3+4=10

**Section-B**  
**(Strategic Management)**

Answer Question No. 6 which is compulsory and any two from Question Nos. 7, 8, & 9.

6. (a) **Choose the correct answer from the given four alternatives (You may write only the Roman numeral and Alphabet chosen for your answer)** 1×4=4
- (i) Which one of the following provides the standards for performance appraisal?
    - (A) Mission
    - (B) Vision
    - (C) Objectives
    - (D) Values
  - (ii) Which one of the following provides the broad 'data' from which to identify key drivers of change?
    - (A) BCG matrix
    - (B) PESTEL analysis
    - (C) SWOT analysis
    - (D) Critical Success Factors
  - (iii) Any metric that measures whether an organization is meeting certain objectives and goals that are set to help the organization succeed is called
    - (A) Key Result Areas
    - (B) Key Performance Areas
    - (C) Task Control
    - (D) Key Performance Indicators
  - (iv) A shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network is referred to as
    - (A) Artificial Intelligence
    - (B) Virtual Machine
    - (C) Machine Language
    - (D) Blockchain
6. (b) **State whether the following statements are 'True' or 'False'. (You may write only the roman numeral and whether 'True' or 'False' without copying the statements into the answer books):** 1×3=3
- (i) Organizational behaviour is about how people may be motivated to work together in more effective ways.
  - (ii) The term threats can also be seen as challenges.
  - (iii) The advantages of JIT system is that it enables a company to maintain buffer stock of Inventory.

- (c) **Fill in the blanks (You may write only the Roman numeral and the content filling the blanks):** 1×3=3
- (i) While under Red Ocean Strategy, focus is on current customers, in \_\_\_\_\_ Strategy, focus is on non-customers.
  - (ii) \_\_\_\_\_ exists when consumers have a preference for the products of established companies.
  - (iii) \_\_\_\_\_ is a collection of data that is huge in volume and is growing exponentially with time.
7. (a) (i) Define the term 'Strategy'.  
(ii) **Explain** the three types of strategy usually considered by a typical business firm. 1+6=7
- (b) With reference to Business Environment, **examine** in detail (i) Various layers and (ii) Characteristics. 4+4=8
8. (a) (i) After assuming an organization of your own choice, **apply** the concept of Portfolio Analysis on it. Now **derive** (1) Various objectives of Portfolio Analysis and (2) Advantages of Portfolio Analysis. 3+4=7
- (b) Visualise as if you are heading a Project-based firm. **Justify** the formation of 'Project-based structure' in your firm. **Evaluate** the advantages and limitation of Project-based structures. 2+4+2=8
9. (a) What do you understand by Business Process Re-engineering? What are the important reasons that lead an organization to undertake re-engineering? 2+3=5
- (b) (i) **Compare and contrast** the two terms: Digitization and Digitalization.  
(ii) **Examine** various application areas of Internet of Things (IoT). (any six) 4+6=10
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# SUGGESTED ANSWERS TO QUESTIONS

## SECTION – A

### 1(a)

- (i) (B) Transport
- (ii) (A) Short-Term
- (iii) (B) Process Layout
- (iv) (D) Job Evaluation
- (v) (C) Productivity
- (vi) (C) MS Project
- (vii) (D) Capital Spares
- (viii) (D) None of the Above

### 1(b)

- (i) False
- (ii) True
- (iii) False
- (iv) False

### 1(c)

- (i) Resources
- (ii) Network
- (iii) Breakdown

### 2(a)

1. Product Selection
2. Facility Location Selection
3. Demand Forecasting
4. Process Selection & Layout Decision
5. Capacity Planning
6. Aggregate Planning, Master production schedule
7. Materials Requirement Planning (MRP) / Manufacturing Resource Plan (MRP1) / Distribution Resource Planning (DRP) / Enterprise Resource Plan (ERP)
8. Inventory Management
9. Supplier Selection / Sourcing
10. Process Management
11. Quality Management
12. Maintenance
13. Warehousing / Transportation
14. Reverse Logistics

In Addition, an operations manager is also responsible for working capital management, skill – Management etc.

## 2 (b)

### (i)

Various properties of Aggregate Planning with examples:

1. Both output and sales should be expressed in a logical overall unit of measuring. For example, an automobile manufacturing company can say 1000 vehicles per year, without giving the number of each variety of vehicle. Similarly a paint industry can say 10000 litres of paint and does not mention the quantities of each variety of colour.
2. Acceptable forecast for some reasonable planning period, say one year.
3. A method of identification and fixing the relevant costs associated with the plant. Availability of alternatives for meeting the objective of the organisation. Ability to construct a model that will permit to take optimal or near optimal decisions for the sequence of planning periods in the planning horizon.
4. Facilities that are considered fixed to carry out the objective.

### (ii)

Trend values of Sales of CTV for years:

YEAR 2021	Rs. 21.30 Million
YEAR 2024	Rs. 21.60 Million
YEAR 2026	Rs. 21.80 Million

## 3 (a)

The Design Thinking stages :

No, these stages are not always sequential, and teams often run them in parallel, out of order and repeat them in an iterative fashion.

Examination of each stage of Design Thinking :

### **Stage 1:** Empathize — Research Your Users Needs

Here, you should gain an empathetic understanding of the problem you're trying to solve, typically through user research. Empathy is crucial to a human-centered design process such as design thinking because it allows you to set aside your own assumptions about the world and gain real insight into users and their needs.

### **Stage 2:** Define — State Your Users' Needs and Problems

It's time to accumulate the information gathered during the Empathize stage. You then analyze your observations and synthesize them to define the core problems you and your team have identified. These definitions are called problem statements. You can create personas to help keep your efforts human-centered before proceeding to ideation.

### **Stage 3:** Ideate — Challenge Assumptions and Create Ideas

Now, you're ready to generate ideas. The solid background of knowledge from the first two phases means you can start to "think outside the box", look for alternative ways to view the problem and identify innovative solutions to the problem statement you've created. Brainstorming is particularly useful here...

### **Stage 4:** Prototype — Start to Create Solutions

This is an experimental phase. The aim is to identify the best possible solution for each problem found. Your team should produce some inexpensive, scaled - down versions of the product (or specific features found within the product) to investigate the ideas you've generated. This could involve simply paper prototyping.

**Stage 5: Test — Try Your Solutions Out**

Evaluators rigorously test the prototypes. Although this is the final phase, design thinking is iterative: Teams often use the results to redefine one or more further problems. So, you can return to previous stages to make further iterations, alterations and refinements - to find or rule out alternative solutions.

**3 (b)**

(i) EDD (Early due date job first) rule:

Sequence:

Job	C	B	A	E	D
No. of days until due date	2	4	6	7	8

(ii) LS (Least Slack) or minimum Slack Rule :

Sequence:

Job	B	C	D	A	E
Slack	- 4	- 3	2	3	5

(iii) LPT (Longest Processing time) Rule:

Sequence :

Job	B	D	C	A	E
Processing time (days)	8	6	5	3	2

(iv) Critical Ratio Rule :

Sequence :

Job	C	B	D	A	E
Critical Ratio	0.4	0.5	1.33	2	3.5

**4 (a)**

Let  $\chi_1$  be the no. of units of product 1.

Let  $\chi_2$  be the no. of units of product 2.

Let  $\chi_3$  be the no. of units of product 3.

Objective function: Max  $Z = 3\chi_1 + 3\chi_2 + 5\chi_3$

Subject to constraints:

$$\chi_1 + 2\chi_2 + \chi_3 \leq 430$$

$$3\chi_1 + 2\chi_3 \leq 460$$

$$\chi_1 + 4\chi_2 \leq 420$$

And  $\chi_1, \chi_2, \chi_3 \geq 0$  (Non - negative Constraints)

**4 (b)**

**(i)**

1. Generation of 5 days of Demand for the Rental Agency :

Days	Demand
1	6
2	7
3	8
4	7
5	10

2. Average No. of Cars Rented per day for the 5 days:

6.8 Cars

3. Rental Lost Over 5 days = 4 Nos.

**(ii)**

(1) As Plant operates at 80% efficiency monthly output is = 200 units

(2) If the Machine productivity is reduced by 10% over existing level, the output per month = 184 units

**5(a)**

Break down cost per month = Rs 2160

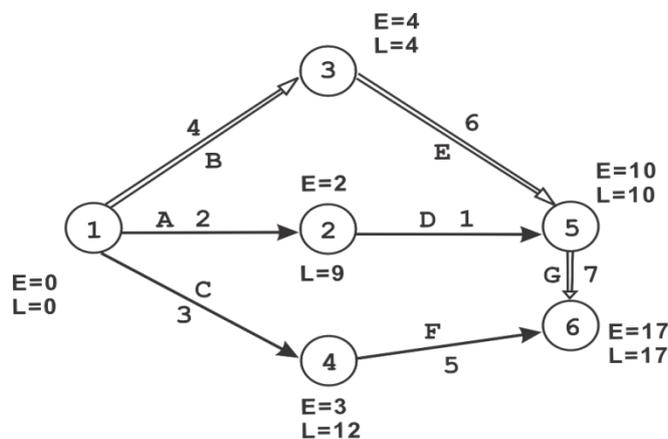
Preventive maintenance cost per month = Rs. 2600

Decision:

Since the Prevention maintenance cost per month is higher than the individual breakdown cost per month. The preventive policy is not suitable for the Company. So the Policy for rectification of individual breakdown is suitable for the Company.

**5 (b)**

(i) The Network is drawn as shown below :



Identification of Paths are:

(1) 1 – 3 – 5 – 6

(2) 1 – 2 – 5 – 6

(3) 1 – 4 – 6

(ii) & (iii)

Activity and Identification		$T_e =$	$V_t =$	EST	EFT	LST	LFT	Total Float
A	1 – 2	2	1	0	2	7	9	7
B	1 – 3	4	1	0	4	0	4	0
C	1 – 4	3	1	0	3	9	12	9
D	2 – 5	1	0	2	3	9	10	7
E	3 – 5	6	4	4	10	4	10	0
F	4 – 6	5	1	3	8	12	17	9
G	5 – 6	7	4	10	17	10	17	0

Project Length = 17 Days

Critical Path:

B – E – G (1 – 3 – 5 – 6)

## SECTION – B

### 6(a)

- (i) (C) Objectives
- (ii) (B) PESTEL Analysis
- (iii) (D) Key Performance Indicators (KPI)
- (iv) (D) Blockchain

### 6(b)

- (i) True
- (ii) True
- (iii) False

### 6(c)

- (i) Blue Ocean
- (ii) Brand Loyalty
- (iii) Big Data

## 7 (a)

(i) "Strategy" can be defined as "the direction and scope of an organisation over the long term, which achieves advantage for the organisation through the configuration of resources within a changing environment and to fulfill stakeholder expectations.

(ii) Three types of Strategy :

### • **Corporate Strategy :**

- Concerned with overall purpose and scope of an organization
- How value will be added to the different parts / business units and product lines of an organization ?
- Three main categories : stability, growth & retrenchment
- Decisions include : investments in diversification, vertical integration, acquisitions, new ventures, allocation of resources between different businesses of the firm and divestments.

### • **Business Strategy :**

- It is about - how to compete successfully in particular markets.
- It emphasizes improvement of the competitive position of organisation's products or services in the specified industry or market segment served by that business unit.
- Two main categories: competitive and cooperative strategies.

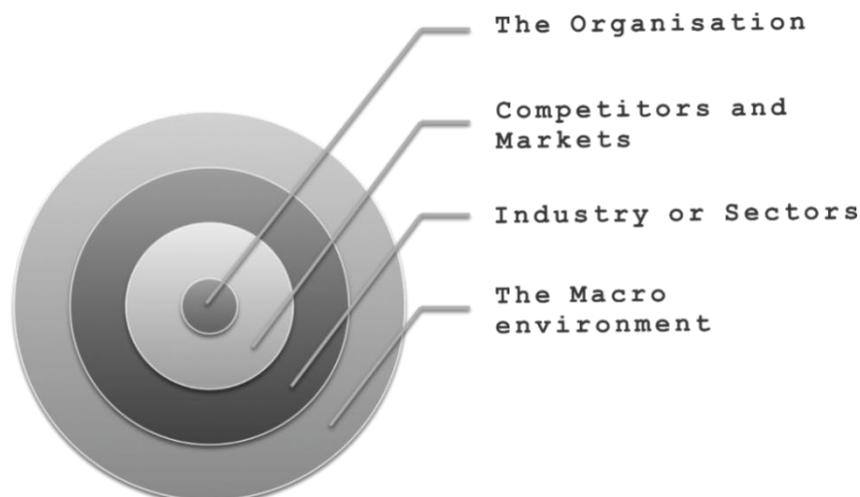
### • **Functional or Operational level Strategy :**

- How the component parts of an organisation deliver effectively the corporate and business level strategies in terms of resources, processes and people ?
- Concerned with developing and nurturing competence to provide a business unit with a competitive advantage.
- Directed towards maximizing resource productivity.

## 7 (b)

(i)

Layers of Business Environment:



- The Macro Environment is the outermost and the highest level layer.
  - This consists of environments factors that impact to a greater or lesser extent on almost all organisations.
  - Here the PESTEL framework can be used to identify how future trends in the political, economic, social, technological, environmental and legal environments might impinge on the organisations.
- Industry or Sector form the next layer.
  - This is made up of the organisations producing the same products or service.
  - Here the Porter's 5 Framework can be used.
- Competitors and markets are the most Immediate layer surrounding organisations.
  - Within most industries or sectors, there will be many different organisations with different characteristics and competing on different bases, some closer to a particular organisation, some more remote.
  - The concept of strategic groups can help identify close more remote competitors.

Similarly, in the marketplace, customers' expectations are not all the same.

**(ii) Characteristics of Business Environment :**

- Environment is complex :
  - as it comprises of a number of factors like: events, conditions, influences arising from different sources interacting with each other to create entirely new sets of influences.
  - It can be understood in segments rather as a total.
- Environment is dynamic :
  - It is dynamic due to no. of factors that continuously influences its character and shape.
- Environment is Multi-faceted :
  - It's changes can be perceived differently by different individuals.
  - The changes and developments may be considered to be an opportunity to one and a threat to others.
- Environment has a far reaching impact :
  - The Impact of environment on an organisation is huge.
  - It critically underpins the growth and profitability of an organisation.
  - Any changes in an environment affect the organisation in more ways than one.
  - The very survival and existence of an organisation is critically dependent on its environment.

## 8 (a)

Portfolio Analysis :

(i) Various objectives :

- To analyse the current mix of business and take investment decisions.
- To develop strategies for adding new business in the portfolio thereby inducing growth.
- To decide the business to be retained and the one to be excluded from the portfolio.

(ii) Advantages of Portfolio Analysis :

- It encourages top management to evaluate each of the corporation's business individually and to set objectives and allocate resources for each.
- It stimulates the use of externally oriented data to supplement management's judgement.
- It raises the issue of cash-flow availability for use in expansion and growth.
- Its graphic depiction facilitates communication
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## 8(b)

Justify the formation of "Project-based structure" in your firm :

The project-based structure is one where teams are created, undertake the work and are then dissolved. This can be particularly appropriate for your organization if it deliver large and expensive goods or services (civil, engg., information systems, films) or those delivering time-limited events (Conference, sporting events, or consulting engagements). The organisation structure is a constantly changing collection of project teams created, steered and glued together loosely by a small corporate group. Many organisations use such teams in a more adhoc way to complement the 'main' structure. For ex. Taskforces are set up to make progress on new elements of strategy or to provide momentum where the regular structure of the organisation is not effective.

Advantages of project-based structures:

- The project-based structure can be highly flexible, with projects being set up and dissolved as required.
- Accountability and control are good because project teams should have clear tasks to achieve within a define life.
- Projects can be effective at knowledge exchange as project team members will typically be drawn from different departments within the firm.
- Projects can also draw members internationally and, because project life spans are typically short, project teams may be more willing to work temporarily around the world.

Limitations of project-based structures:

- Without strong programme management providing overarching strategic control, organisations are prone to proliferate projects in an ill-coordinated fashion.
- The constant breaking up of project teams can also hinder the accumulation of knowledge over time or within specialisms.

## 9(a)

### **Business Process Re-engineering :**

Business Process Re-engineering may be considered to be radical redesign of the business processes often used by companies to cut costs and return to profitability. It is fundamental re-thinking and radical re-design of business processes to achieve dramatic improvements in critical contemporary measures of performances such as cost, quality, service and speed.

### **Three Important reasons :**

1. An organisation needs dramatic improvement to sustain itself and is already in deep trouble. High failure rates of products and repetitive customer complaints can be one of the reasons that can cause huge disruption in functioning of an organization.
2. The need for re-engineering can be felt by management keeping in mind the eminent problems that the organisation is expected to face in the future due to some dramatic changes in the environment both internal and external.
3. There can be situations when re-engineering can help organisations to be in better position than they are currently in.

## 9 (b)

### **(i) Digitization and Digitalization :**

Digitization :

All analogue data needs to be converted and generated by operating machinery and legacy systems, devices, physical documents, etc. into digital data and records. Taking steps to ensure that all data to be used in the process of business transformation are relevant, generated from first-hand sources and trustworthy is important.

Digitalization : The need to use digital technologies befitting the needs for changing business, operating and revenue models with the objective to generate more turnover and achieving maximisation of value creation as well as minimisation of value destruction needs to be implemented. For example, brick and mortar business models is added with and / or replaced by virtual marketplace for e-Commerce.

### **(ii) Application areas of Internet of Things (IoT):**

- Increasingly, organisations in a variety of industries are using IoT to operate more efficiently, better understand customers to deliver enhanced customer service, improve decision-making and increase the value of the business.
- **Access to low-cost, low-power sensor technology :**  
Affordable and reliable sensors are making IoT technology possible for more manufacturers.
- **Connectivity :**  
A host of network protocols for the internet has made it easy to connect sensors to the cloud and to other “things” for efficient data transfer.
- **Machine learning and analytics :**  
With advances in machine learning and analytics, along with access to varied and vast amounts of data stored in the cloud, businesses can gather insights faster and more easily. The emergence of these allied technologies continues to push the boundaries of IoT and the data produced by IoT also feeds these technologies.

- **Conversational artificial intelligence (AOI) :**

Advances in neural networks have brought natural-language processing (NLP) to IoT devices (such as digital personal assistants Alexa, Cortana, and Siri) and made them appealing, affordable and viable for home use.

- **Smart Lighting :**

This is another one of the Internet of Things examples that have gradually been coming into common usage. Bulbs and battens connected to Wifi can be turned on and off remotely. Schedule for usage can be set for these devices along with their brightnesses controlled and their power consumption monitored. Using other IoT devices, smart lighting devices can also be turned on and off by voice alone. The power consumption of these devices can also be easily monitored using IoT.

- **Smart Parking :**

It is hard to regulate the occupancy and parking coverage in large multi-story car parking facilities. Among the many Internet of Things examples is the use of IoT in such facilities for counting the number of cars that have driven into the facility and the number that have driven out. Specific devices can also give you the exact location where you have parked your car so you are not lost.

- **Medical Fridges :**

Medical fridges are a grand entry to the Internet of Things examples list and can be used for regulatory compliance and safety purposes. Vials of vaccines and medicines can often be spoiled if they are not kept at the correct temperatures. Medical refrigerators cannot be monitored throughout the day, especially in person. Having IoT sensors inside medical fridges can enable them to be monitored remotely, and their temperature changed as per requirement.

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