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Exam Revision Notes
Module - 2

Operations Management & Research-1

Unit-1
Intro & scope of operations management

Operations management can be understood as an area of management concerned with the government of systems, processes and functions that manufacture goods and render services to the end users to provide desired utilities to them while adhering to other objectives of the concern i.e., efficiency, effectiveness and productivity.
In simpler terms, the management of systems or processes that create goods and/or services.

Twin objectives of operations management :-
- Customer service objective - right specification, right cost and right time.
- Resource utilization objective - agreed levels of utilization of material, labor and machines

Importance & Scope of operations management
- Higher quality
- Greater flexibility
- Reduced wastage
- Better customer service
- Location of facilities - important decision is selection of location - high investment in acquiring building, arranging, installing plant & machinery.

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- Product design - in-depth analysis of customers requirement & proper shape to the idea to meet those. Involves designing & marketing, product development & introduction of product.
- Process design - planning & decision-making of entire workflow to transform raw material to finished goods. Involves choice of technology, process flow analysis, process selection...
- Plant layout - Its about grouping & arrangement of personnel, machine, equipment, storage space, other facilities used in production to produce desired output [quality & quantity wise].
- Material handling - holding & treatment of material within & outside the organization. Concerned with movement of material from one godown to another, from godown to machine & from process to another along with packaging and storing.
- Material management - deals with procurement, use and control of raw material to minimize cost. Establish good relations with suppliers to ensure ongoing supply of material.
- Quality control - systematic process of keeping intended quality of goods & services. Prevent defects & make corrective actions.
- Maintenance management - Machinery, tools & equipment play vital role in production. If not available at time (downtime, breakage), entire process suffers.

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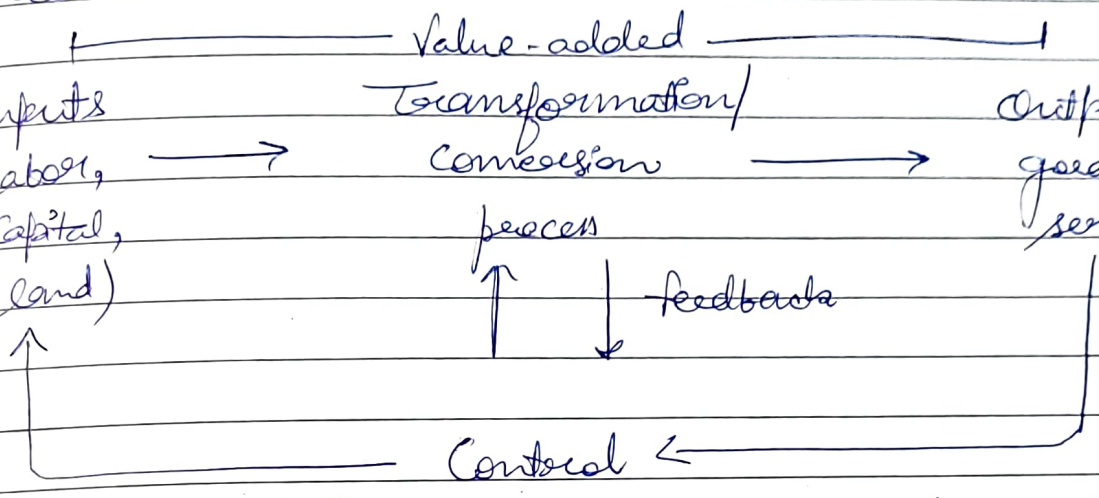
Concept of production :- It's a scientific process which involves transformation of inputs (RM) to desired product or service (output) by adding economic value



Value added is the difference between the cost of inputs and value or price of output.

Goods & Services

Characteristics	Goods	Services
→ Customer contact	Low	High
→ Uniformity of input	High	Low
→ Labor content	Low	High
→ Uniformity of output	High	low
→ Output	Tangible	Intangible
→ Measurement of productivity	Easy	Difficult
→ Opportunity to correct problems	High	Low
→ Inventory	Much	Little
→ Evaluation	Easier	Difficult
→ Patentable	Usually	Not usual

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Contemporary IT enabled manufacturing operations:
- Robotics - used for material handling, processing operations & assembly & inspection to automate these
- Nanotechnology - fast processing, smaller memory cards, greater flexibility, scalability
  Nanotechnology is manufacture & manipulation of nanoscopic material and technology
- 3D printing - produces objects in accordance to 3D model (digital one) & add material layer by layer to produce rapidly at low cost
- Internet of things (IOT) - devices connected to internet carry on intelligent conversion without intervention of humans. It offers new level of visibility, insights & control.
- Cloud computing - brings data together & shares data efficiently.

Demand forecasting Introduction
A statement about the future value of a variable of interest such as demand. to make informed decisions of both long and short range.
It's the process of using predictive analysis of historical data to estimate and predict customers future demand for a product or service.
Estimate total sales & revenue
optimize inventory by predicting sales

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features:-
- Accuracy to at time T
- Level of detail - for sales (individual) for entity (group)
- Stability
- Data pattern
- Rarely perfect because of randomness.

Elements:-
- Timely • Reliable • Meaningful • Written
- Accurate • Easy to use

Steps in forecasting:
- Determine purpose
- Establish time horizon
- Select forecast technique
- obtain, clean, analyze data
- Make forecast
- Monitor forecast

Qualitative techniques
- Judgmental forecast (subjective inputs)
  * Executive opinions (experts) * Delphi (expert panels)
  * Consumer survey * Salesforce polling
- Time series forecast
  * Trend (movement of data)
  * Seasonality (short term variations in data)
  * Cycle (wavelike variations)
  * Irregular variations (unusual circumstances)
  * Random variations (by chance)
- Associative models - several variables

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Quantitative techniques.

- Moving average :- averages a number of recent actual values, updates as new values become available.

$$f_n = \frac{f_{n-1} + f_{n-2} + f_{n-3} \cdots}{n}$$

Period	Demand
1	42
2	40
3	43
4	40
5	41

$$f_6 = \frac{41 + 40 + 43}{3}$$

$$f_6 = 41.33$$

- Weighted moving average :- more recent values in a series are given more weight in computing forecast

Period	Demand	weight
1	42	~~40~~
2	40	.10
3	43	.20
4	40	.30
5	41	.40

$f_6 = .10(40) + .20(43) + .30(40) + .40(41)$

$f_6 = 41.0$

- Exponential smoothing :- $f_t = f_{t-1} + \alpha(A_{t-1} - F_{t-1})$

Period	Demand	weight	f
1	60		
2	65		60
3	55	.20	62
4	58	.30	59.2
5	64	.50	58.72
6			60.83

6 periods.

$\alpha = .40$

$60 + .40(65 - 60) = 62$

$62 + .40(55 - 62) = 59.2$

$59.2 + .40(58 - 59.2) = 58.72$

$58.72 + .40(64 - 58.72) = 60.83$

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$\alpha = 0.10$

week	D	forecast	
1	820	820	
2	775	820	$820 + .10(775 - 820) = 815$
3	680	815	
4	655	801.5	$815 + .10(680 - 815) = 801.5$
5	750	787	$801.5 + .10(655 - 801.5) = 787$
6	802	783	$787 + .10(750 - 787) = 783.3$
7	798	785	$783 + .10(802 - 783) = 785$
8	689	786.3	$785 + .10(798 - 785) = 786.3$
9	775	776.6	$786.3 + .10(689 - 786.3) = 776.6$
10	?	776.4	$776.6 + .10(775 - 776.6) = 776.4$

Time series & Extrapolation

Time series (random variations) + (increasing trend) + (decreasing trend) + (seasonal variations)