Operations & Management
ZHAW FS2015

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Inhaltsverzeichnis

Zusammenfassung

1 Preamble

1.1 Lecture: Operations and Processes

1.2 Goals: Operations and Processes - Part 1

- Know the operations management **goals and concepts** of different types of organizations
- Know the influence of **customer orientation** and company **strategy** on the operations
- Know the most important **influencing factors** on processes, products, layout, and supply chain
- Are able to **analyze and design processes** to meet the organization's goals

1.3 Goals: Operations and Processes - Part 2

- Understand the need and methods for optimization of whole **Supply Chains**
- Know the goals and concepts of capacity planning to manage demand variation
- Know the role of inventories and the practical tools used in **inventory management**
- Know about the philosophy of **Lean**Lean and **Quality Management** to improve operations

2 Formeln

2.1 Little's Law

Alles in der Blackbox, egal ob in Warteschlange oder Nacharbeit, wird als Work in Progress (WIP) gezählt

T	Troughput time	s/min/h
WIP	Work in Progress	piece/kg/CHF
t_c	cycle time	time per piece
R_0	Output rate	$\frac{piece}{time}$

$$t_c = \frac{T}{WIP}$$
$$R_0 = \frac{1}{t_c}$$
$$\text{T} = WIP \cdot cycletime$$
$$\text{T} = \frac{WIP}{outputrate}$$

2.2 EBQ

Economic batch quantity

EOQ/EBQ	Economical Batch Quality
Q	Batch Size
D	Demand per annum
C_h	Cost of holding one unit for one year
C_O	Cost of setting up a bach ready to be produced
R	Anulal replenishment rate

$$\sqrt{\frac{2 \cdot C_O \cdot D}{C_h \cdot (1 - \frac{D}{R})}}$$

2.3 EOQ

Holding Costs	Order Costs
Working capital costs Storage costs Obsolescence risk costs	Cost of placing an order PRice discount costs

EOQ/EBQ	Economical Batch Quality
Q	Ordering quantity
C_t	Total sourcing costs
C_O	ordering costs per order
D	Demand per Periodt_p
S	Safety Stock
C_h	Holding costs per unit (t_p)

$$C_h = \frac{C_h \cdot Q}{2 + C_h \cdot S}$$

$$C_O = \frac{C_O \cdot D}{Q}$$
$$C_t = C_h + C_O$$
$$EOQ = \frac{D \cdot C_t}{D \cdot Q} = 0$$
$$EOQ = \sqrt{\frac{2 \cdot C_O \cdot D}{C_h}}$$
$$\text{Order frequency} = \frac{D}{EOQ}$$
$$\text{Time between orders} = \frac{EOQ}{D}$$

2.4 Prozessberechnungen

Balancing Loss	Zeitverlust	Verschwendete Zeit durch ungleich verteilte Arbeiten in % zur gesammten Arbeitszeit
Process Time T_p	Prozesszeit (Overall)	längster Prozess · Prozessschritte
T_w	verschwendete Zeit	Summe aller Zeitdifferenzen zum längsten Prozessschritt

$$IdleTime = \text{longste step time - } step_1..n \text{ time)}$$
$$T_w = \sum(Time_{longestStep} - Time_{Step_1 \ldots n})$$
$$T_p = longestStep \cdot Steps$$
$$BalancingLoss = \frac{T_w}{T_p}$$

2.5 Six Sigma

C_p	Process Capability	Process capability is a technique to find out the measurable property of a process to a specification. Generally, the final solution of the process capability is specified either in the form of calculations or histograms
C_pk	Process Capability Index	Process capability index (cpk) is the measure of process capability. It shows how closely a process is able to produce the output to its overall specifications.
USL	Upper Specification Limit	
LSL	Lower Specification Limit	
UCL	Upper Control Limit	
LCL	Lower Control Limit	

$$C_p = \frac{USL - LSL}{6 \cdot std.Dev}$$
$$C_pk = min(\frac{USL - mean}{3 \cdot std.Dev}, \frac{mean - LSL}{3 \cdot std.Dev})$$
$$USL > UCL \;\&\; LSL < LCL = \text{production in bounds}$$

Sigma level	DPMO	fehlerhaft %	fehlerfrei %	Kurzfristiger Cpk	Langfristiger Cpk
1	691.462	69 %	31 %	0,33	,Äì0,17
2	308.538	31 %	69 %	0,67	0,17
3	66.807	6,7 %	93,3 %	1,00	0,5
4	**6.210**	**0,62 %**	**99,38 %**	**1,33**	**0,83**
5	233	0,023 %	99,977 %	1,67	1,17
6	3,4	0,00034 %	99,99966 %	2,00	1,5
7	0,019	0,0000019 %	99,9999981 %	2,33	1,83

3 W01 - Operations Management

3.1 Introduction to OPM

3.1.1 What is Operations (and Process) Management?

Operations and process management is the activites of managing the resources that produce products and services. Soll heissen: Leistung erstellen, Produktion & Logistik, Führen & lenken der Ressourcen

3.1.2 Why Is w.1OP Highly Relevant for the Banking, Finance, and Insurance Industries?

Industrialization as a Megatrend in Services

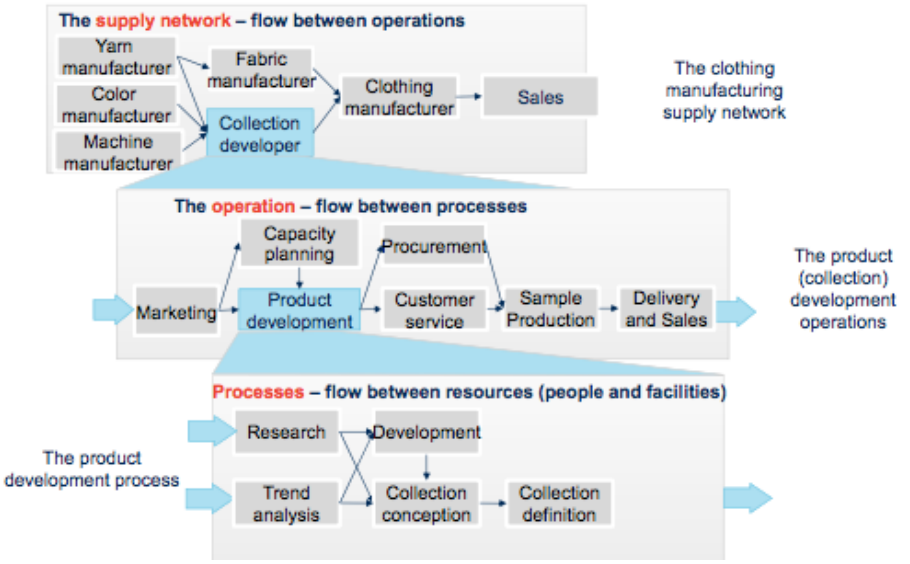
3.1.3 IKEA,Äôs Success Factors

3 Hauptprozesse in einem Unternehmen	
Leistungserstellung (Operation = Gewinn)	Günstig = tiefe Kosten Economics of scale = Hohes Volumen, konzentration der Fertigung (SCM)
Innovationsprozesse	Produktekonzept * Kunde baut zusammen * Kunde holt aus Lager * Produktionskonzept * Service design
Marketing, Verkauf/Kundenprozess	Verkaufskonzept Standort Erlebnis

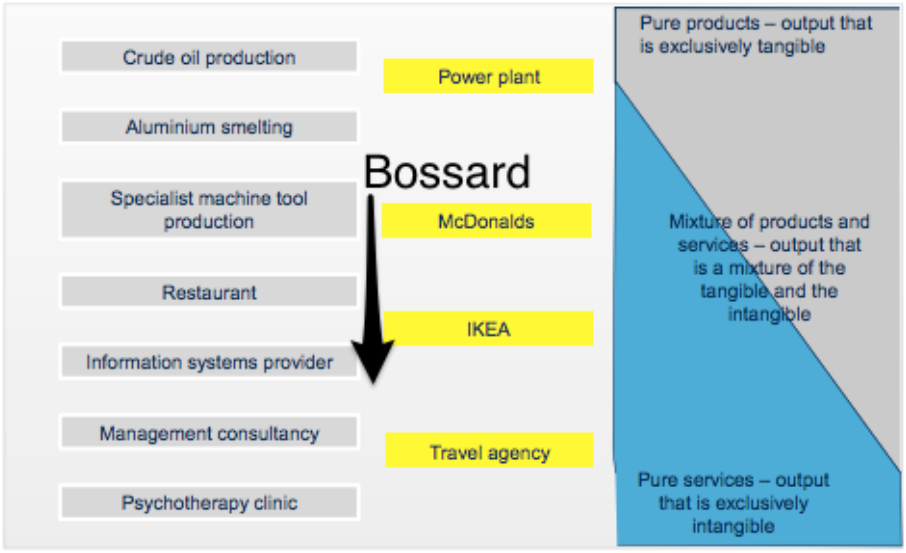
3.2 Core Activities

3.2.1 Where Does a Business Get Its Competitive Edge?

3.2.2 Operations Can be Analyzed at Three Levels

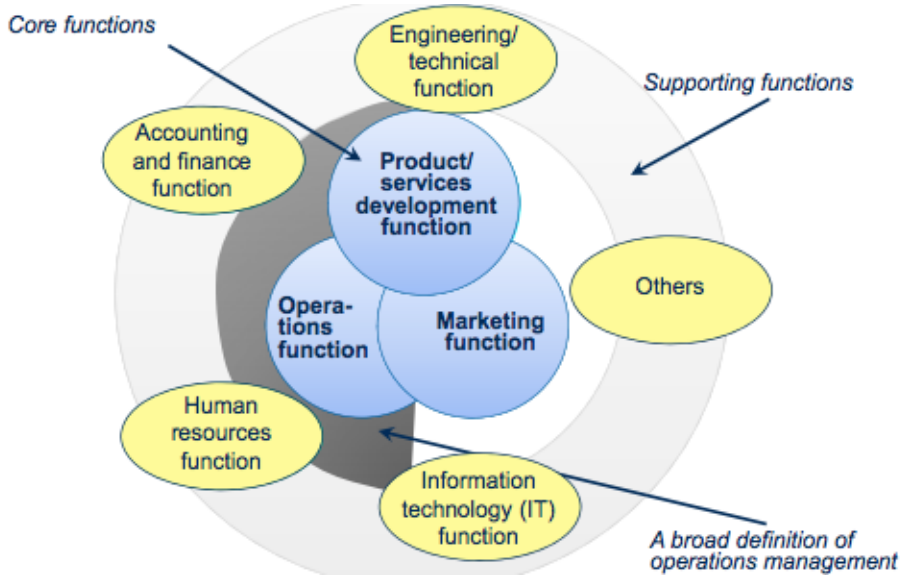


3.2.3 The Output of Most Types of Operation: A Mixture of Goods and Services



Bossard group bietet Verbindungstechnik als Dienstleistung. (Mixture Products and Service)

3.2.4 Core and Supporting Processes/Functions

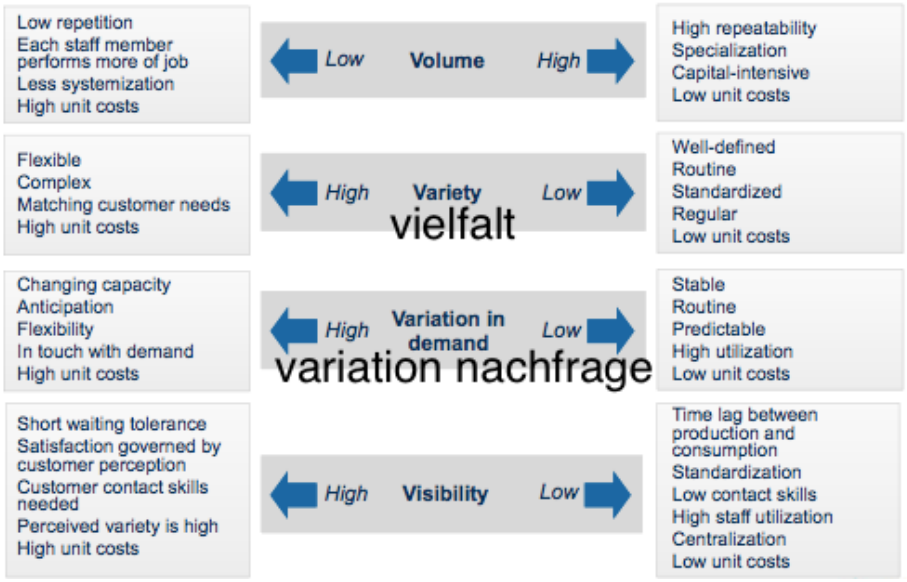


3.3 Characteristics of OPM

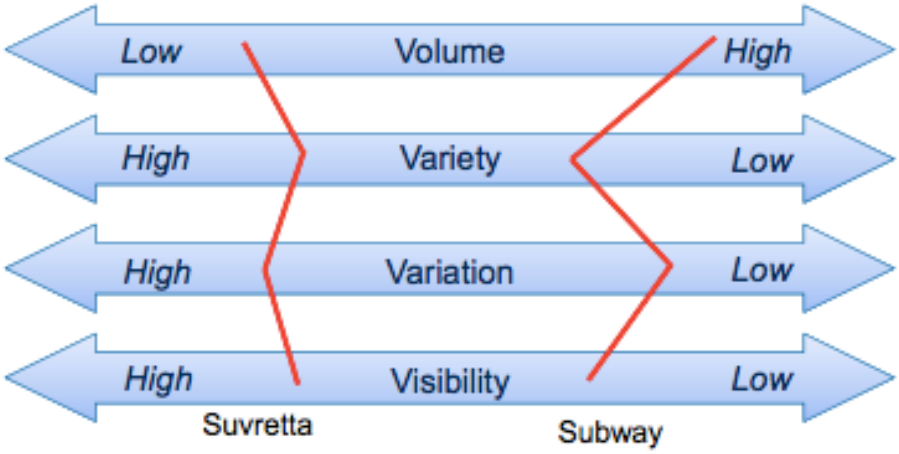
3.3.1 Differences Within Sectors Are often Greater than the Differences between Sectors

Aufgepasst beim Vergleich mit Branchenkennzahlen!

3.3.2 The Four V,Äôs: The Typology of Operations



3.3.3 Profiles of Different Types of Restaurants (4V)

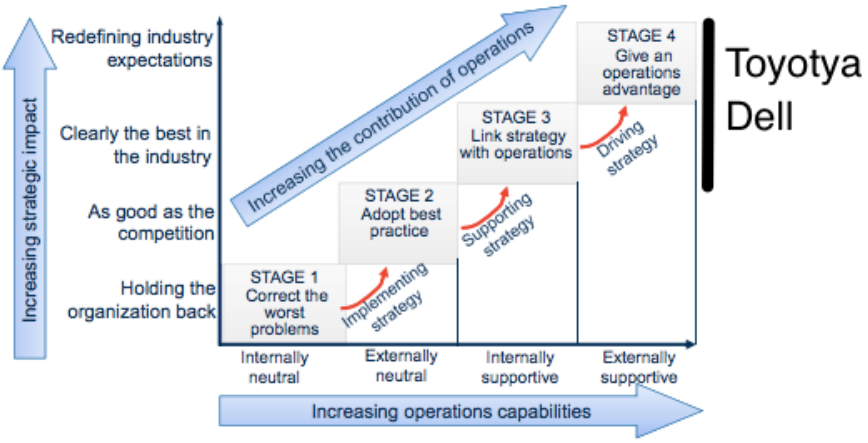


- It is important to understand how different operations are positioned in terms of the 4 V's.
- Is the positioning where it is supposed to be?
- Are the strategic implications clear?

4 W02 - OP Strategy & Performance

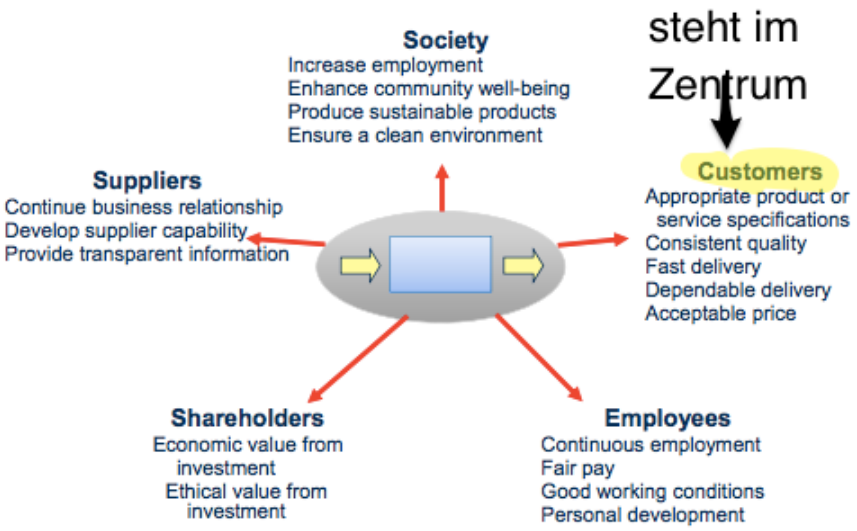
4.1 Role of Operations

4.1.1 The Strategic Role of Operations can be defined by its aspirations (Hayes and Wheelwright)



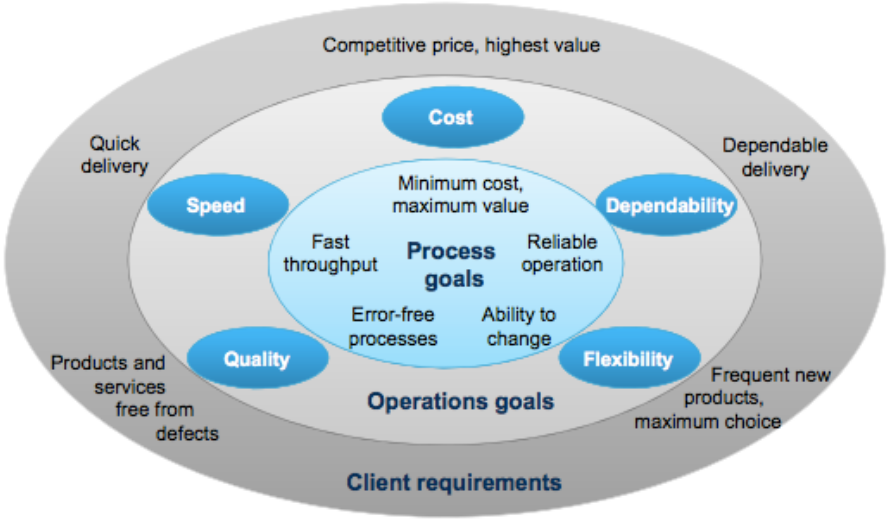
STAGE 2 Best Practise
so gut wie die anderen, nach heutigem standard. Kunde nimt einen als normalen Anbieter wahr
STAGE 3: Best in Class
Vorsprung wie kurze Lieferzeiten oder Preis. Kunde merkt das noch nicht.
STAGE 4
Nur 1 mal in der Branche. **Kunde** bemerkt Anbieter und **kommt selbständig**

4.1.2 Broad Strategic Objectives for an Operation Applied to Stakeholder Groups

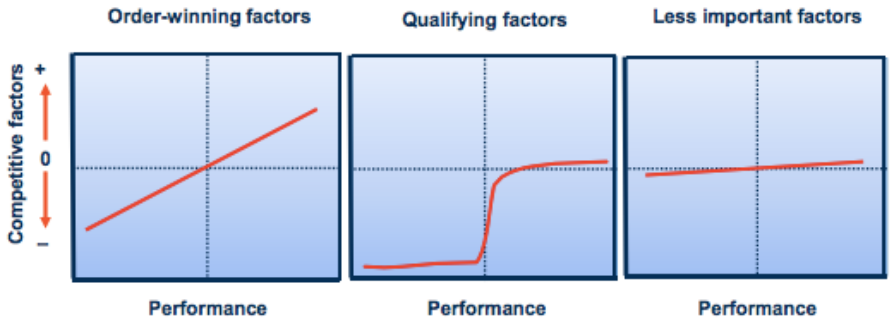


4.2 Operations Goals

4.2.1 The Five Performance Goals



4.2.2 Performance Goals and Competitive Factors



Order-winnning factors: bei kleinen Performanceveränderungen grosser "Gewinn"
Qualifying factors: wenn minimum nicht erreicht wird, Kunde/Auftrag verloren

4.2.3 The Five Competitive Objectives

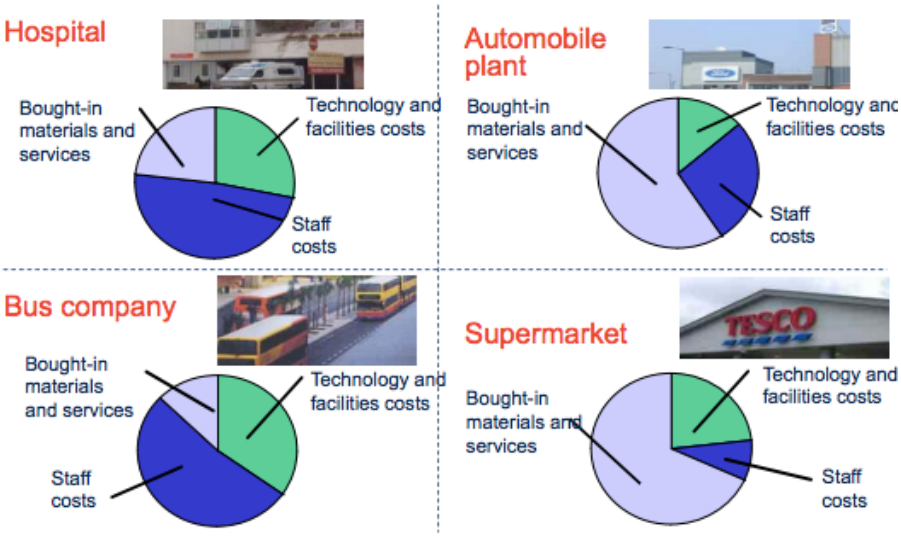
Quality	RIGHT	
Speed	FAST	
Dependability	ON TIME	= Competitivenesse
Flexibility	ABLE TO CHANGE	
Cost	PRODUCTIVE	

4.2.4 The Effects of the Product/Service Life Cycle on an Operation,Äôs Performance Objectives

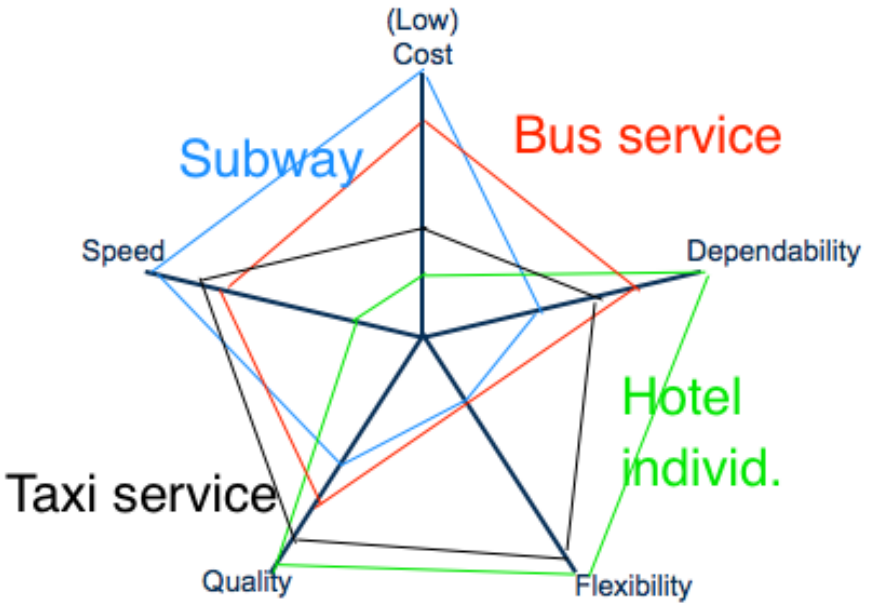
4.2.5 Quality Means Different Things in Different Operations

Hospital	Automobile plant
Bus company	Supermarket

4.2.6 Cost Means Different Things in Different Operations



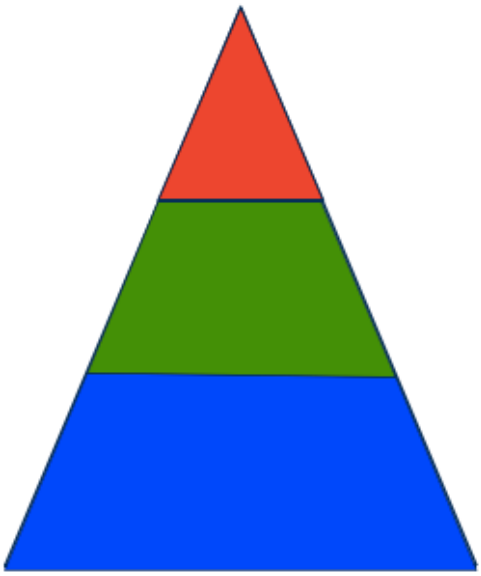
4.2.7 Polar Diagrams



4.3 Strategy and Trade-Offs

4.3.1 What is Strategy?

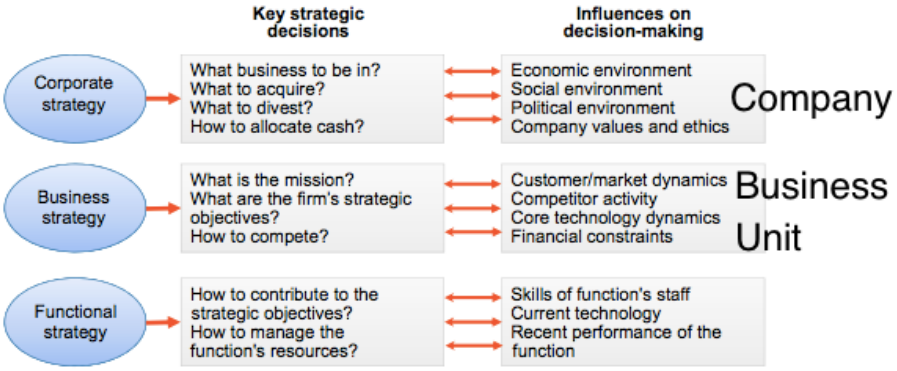
Das Kriegsche Modell:
Values are fix, and mid-term goals are reacting on values.



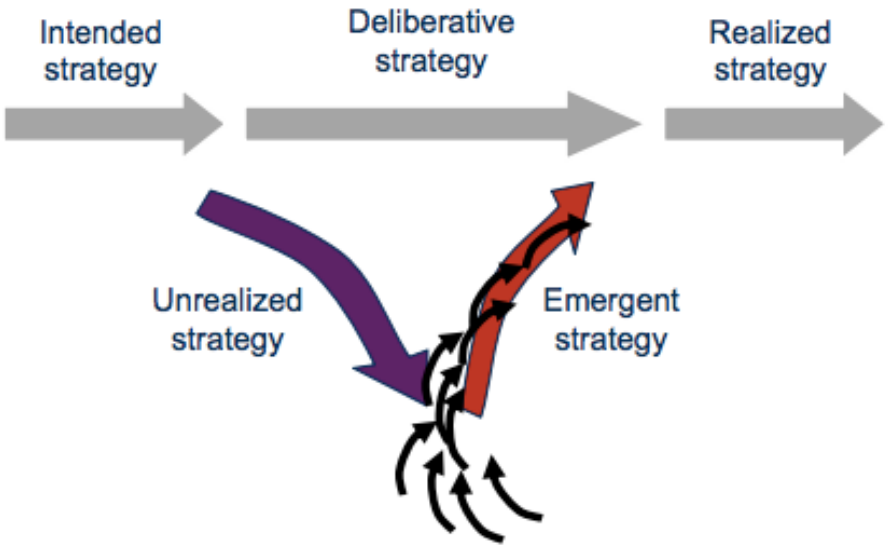
4.3.2 Operational Management Executes the Operations Strategy

	Operational management	Operations strategy
Time scale	Short-term e.g., capacity decisions Demand 1-12 months	Long-term e.g., capacity decisions Demand 1-10 years
Level of analysis	Micro-level of process	Macro-level of total operation
Level of aggregation	Detailed e.g., *"How much stock should we order of the X-Box One for the Christmas peak season?"*	Aggregated e.g., *"Should we move the production of the next generation console from China to Vietnam?"*
Level of abstraction	Concrete E.g., *"How do we improve our warehouse processes?"*	Philosophical E.g., *"Should we develop strategic alliances with suppliers?"*

4.3.3 The Strategic Hierarchy



4.3.4 Mintzberg's Concept of Emergent Strategy

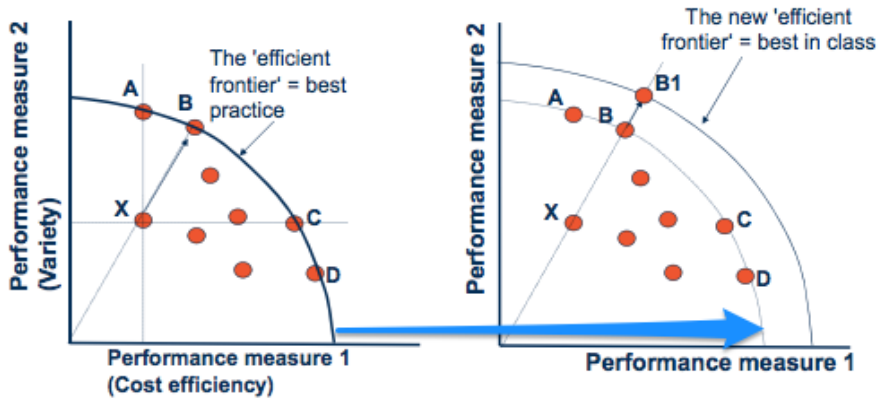


4.3.5 Good - Cheap - Fast

Pick two :)

4.3.6 Tradeoffs - The 'Efficient Frontier' View

ABCD haben "Best Practice" erreicht, aus Sicht X ist B der grösste Konkurrent. B1 zeigt das Best in Class ein nachhaltiger Vorteil ist.

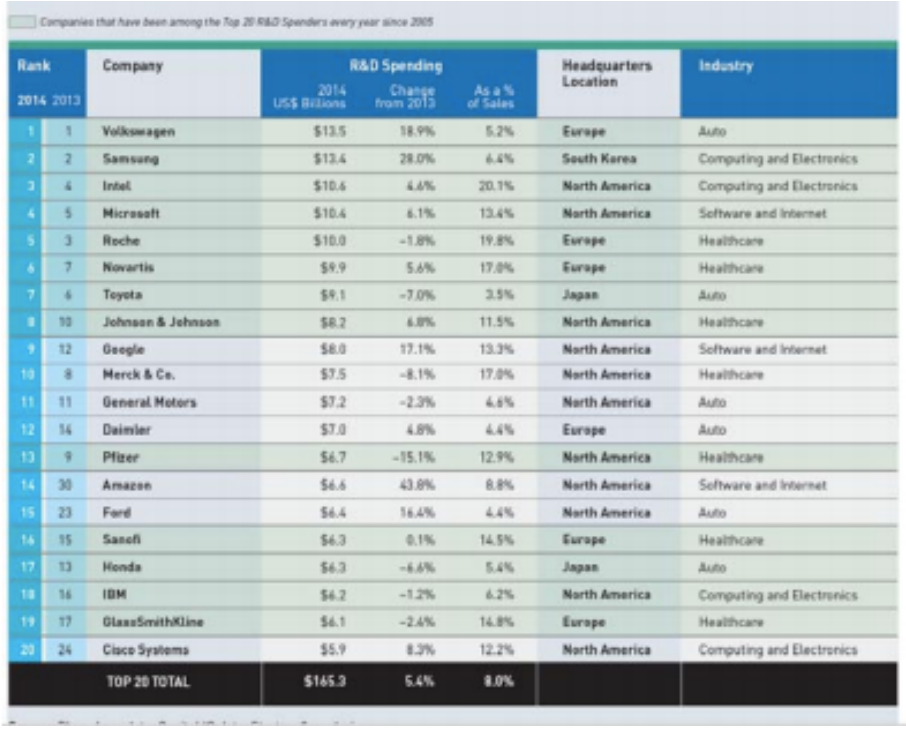

Performance measure 2
(Variety)
A
B
The 'efficient
frontier' = best
practice
X
C
D
Performance measure 1
(Cost efficiency)
Performance measure 2
The new 'efficient
frontier' = best in class
A
B
B1
X
C
D
Performance measure 1

5 W03 - Product & Service Design

5.1 Slides

5.1.1 The Innovation Top 20

Tendenz: F&E nach asien verlagern -> Forschung zum Markt.



Companies that have been among the Top 20 R&D Spenders every year since 2005

Rank 2014	Rank 2013	Company	R&D Spending 2014 US$ Billions	R&D Spending Change from 2013	R&D Spending As a % of Sales	Headquarters Location	Industry
1	1	Volkswagen	$13.5	18.9%	5.2%	Europe	Auto
2	2	Samsung	$13.4	28.0%	6.4%	South Korea	Computing and Electronics
3	4	Intel	$10.6	4.4%	20.1%	North America	Computing and Electronics
4	5	Microsoft	$10.4	6.1%	13.4%	North America	Software and Internet
5	3	Roche	$10.0	-1.8%	19.8%	Europe	Healthcare
6	7	Novartis	$9.9	5.6%	17.0%	Europe	Healthcare
7	6	Toyota	$9.1	-7.0%	3.5%	Japan	Auto
8	10	Johnson & Johnson	$8.2	6.8%	11.5%	North America	Healthcare
9	12	Google	$8.0	17.1%	13.3%	North America	Software and Internet
10	8	Merck & Co.	$7.5	-8.1%	17.0%	North America	Healthcare
11	11	General Motors	$7.2	-2.3%	4.6%	North America	Auto
12	14	Daimler	$7.0	4.8%	4.4%	Europe	Auto
13	9	Pfizer	$6.7	-15.1%	12.9%	North America	Healthcare
14	30	Amazon	$6.6	43.8%	8.8%	North America	Software and Internet
15	23	Ford	$6.4	16.4%	4.4%	North America	Auto
16	15	Sanofi	$6.3	0.1%	14.5%	Europe	Healthcare
17	13	Honda	$6.3	-6.6%	5.4%	Japan	Auto
18	16	IBM	$6.2	-1.2%	6.2%	North America	Computing and Electronics
19	17	GlaxoSmithKline	$6.1	-2.6%	14.8%	Europe	Healthcare
20	24	Cisco Systems	$5.9	8.3%	12.2%	North America	Computing and Electronics
		TOP 20 TOTAL	$165.3	5.4%	8.0%		

Die Autoindustrie ist gross, darum auch in den Top 20.

5.1.2 The ‚ÄúGlobal Innovation 1000‚Äù 2014 Study: Insights

Key take-aways

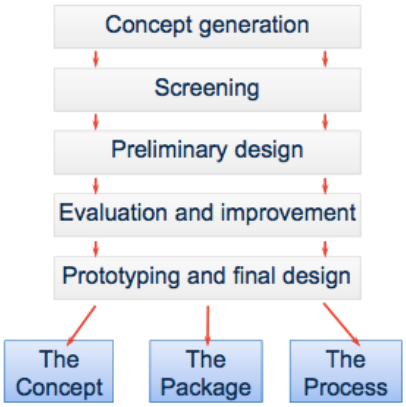
- The biggest 1000 companies (in R&D volume) spent USD 647 billion on R&D in 2014 (+/-1.4% compared to 2013)
- R&D intensity on a slight decline (+0.2%) compared to 2012 (normal 5-7%)
- Germany remains the biggest innovation location in Europe
- China has increased their spending by 45.9 (was 34.4 % in 13)
- Strong investments in IT: Google, Samsung, Microsoft
- Interesting newcomer: Amazon

Nur Time to Market entscheidet, hohe TTM -> weniger Innovation

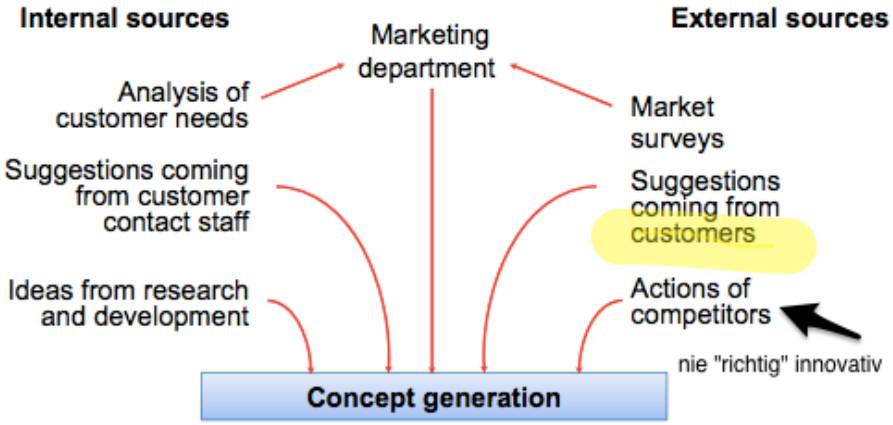
5.1.3 Product and Service Design Activity: An Individual Process

5.1.4 The Five Stages of Product / Service Design

Floprate 50-90%

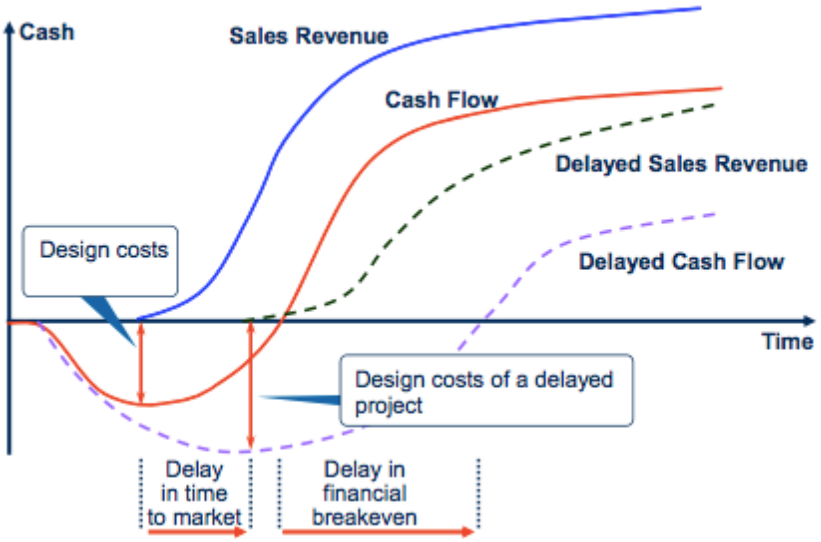


5.1.5 Product or Service Concept Generation



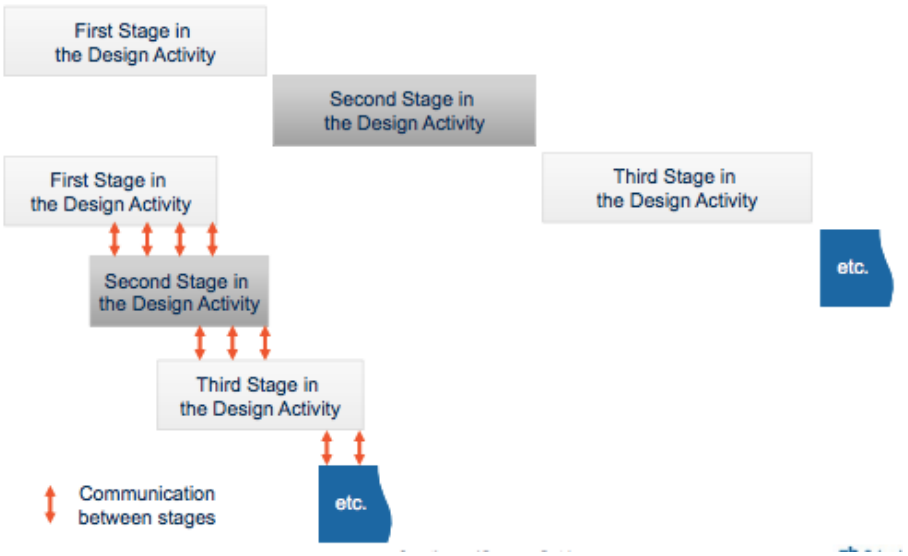
5.1.6 Time to Market - Time Is Money

Delay in time to market of new products and services reduces and delays revenues and increases the costs of development.



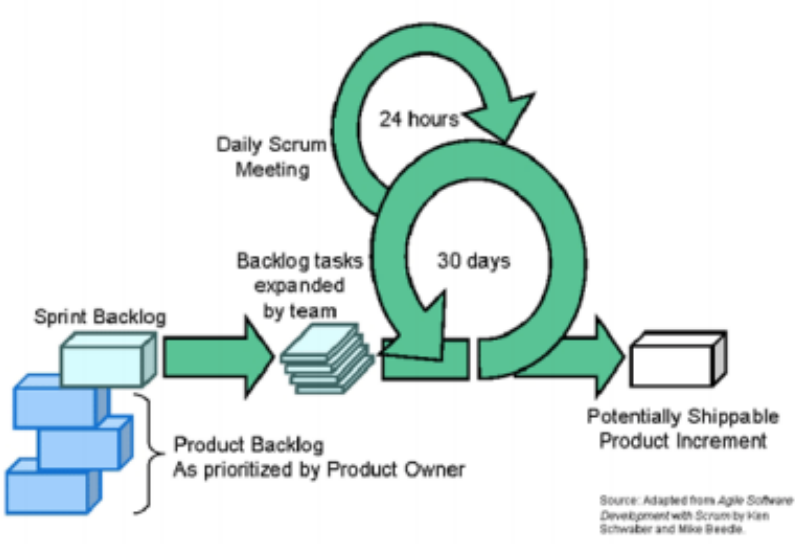
Simultanos engineering & Product Management

5.1.7 Simultaneous Arrangement of the Stages in Design Activity

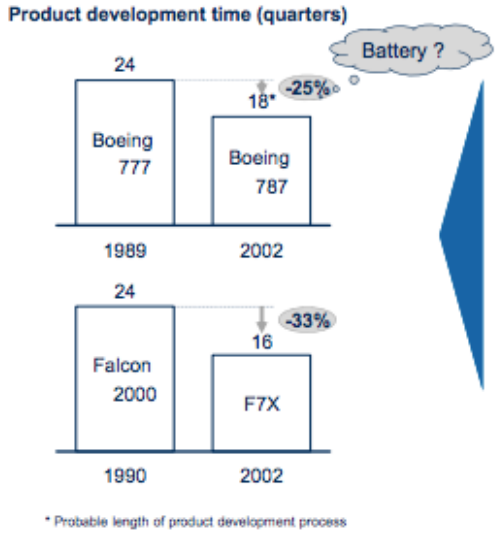


Parallel, this is fast but needs more flexibility!

5.1.8 Agile Development: Scrum



5.1.9 Reduction of Development Time in Aeronautics



Key levers

- Concurrent engineering
- Use of common project life-cycle management system for all partners
- Enforcing the outsourcing of manufacturing content
- Enforcing the outsourcing of the responsibility for innovation, detailed drawings, and tooling
- Speeding-up of transportation using planes

6 W04 - Process Design

6.1 Process Design

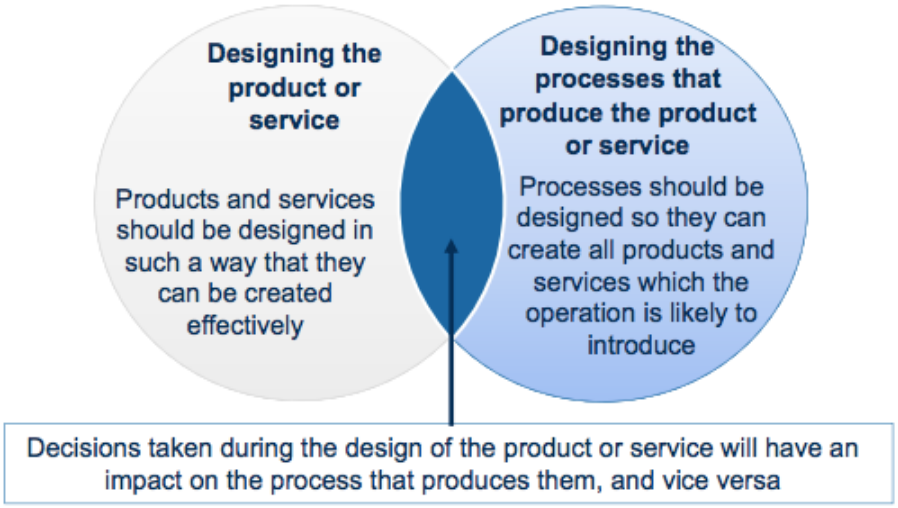
6.1.1 Definition: (Process)Design

- To design is to conceive the looks, arrangement, and workings **before** something is constructed
- Design is therefore a **conceptual activity** that has to deliver a solution that works in practice
- In some languages ”design” has a stronger connotation with the looks of an object (artistic aspects)

6.1.2 Designer‚Äôs Aims

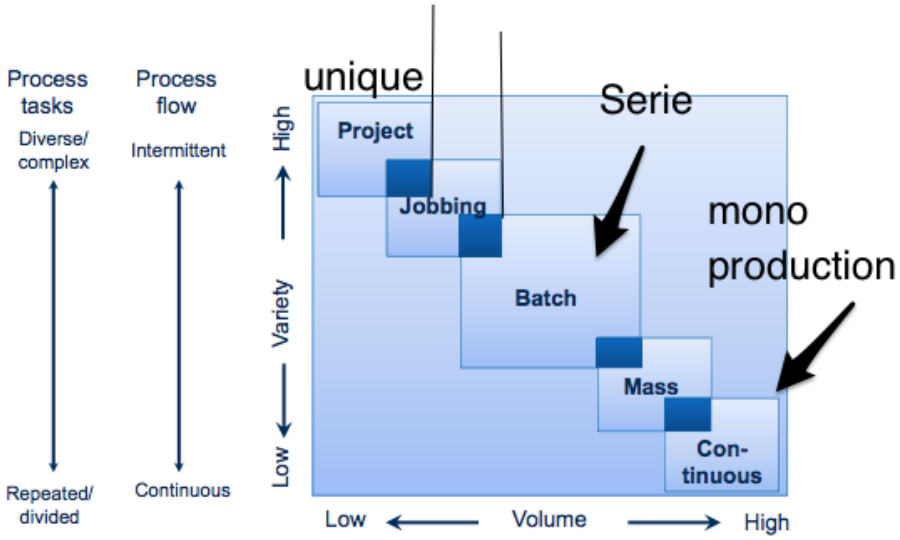
Product designers will seek to create things that...	Operation managers tend to focus on the design of the tranformation process- which..
are aesthetically pleasing satisfy needs meet expcetations perform well are reliable are easy to manufacture and deliver	is flexible and efficient supports the stategic goals of companies is without errors is motivating for employees is robust and easy to control

6.1.3 Relationship between Product and Process Design



6.2 Process Types

6.2.1 Manufacturing Process Types



6.2.2 Project Processes

- One-off, complex, large-scale 'products' with a high work content
- Defined start and finish: time, quality, and cost objectives
- Specially made, every one 'customized' (engineered to order)
- Complex planning, as many different skills have to be coordinated
- Fixed position layout: material is assigned to the object
- Examples: **Construction site**, shipyard, plant construction

6.2.3 Jobbing Processes

- Very small quantities: 'one-offs', or only a few required
- Specially made: every one 'customized' (make to order)
- High variety and low repetition
- Skill requirements are usually very broad
- Skilled jobbers or team complete whole product
- Fixed position or functional layout
- Examples: **Machine industry**, press cylinder, tailor-made suits

6.2.4 Batch Processes

- Higher volumes and lower variety than for jobbing
- Standard products, repeating demand (but can be made to order)
- Specialized, narrower skills
- Set-ups (changeovers) at each stage of production
- Functional or cell layout
- Example: Machine tool manufacturing, food production, clothing, **canteen kitchen**

50x Los am Tag produzieren / Bäcker Batch(Teig) zu Brot verarbeiten

6.2.5 Mass Processes

- Higher volumes than batch
- Standard, repeat products (make to stock) or with customer-specific assembly (mass customization)
- Low and/or narrow skills; high degree of work split
- No change-overs, or almost instantaneous ones
- Cell or product layout
- Example: Automotive production, mass electronics, **beer bottling**

Tages-/Wochenarbeit, Automatisiert, Fluss steht im Zentrum, wenn ein Anlageteil steht so steht die ganze Produktion.

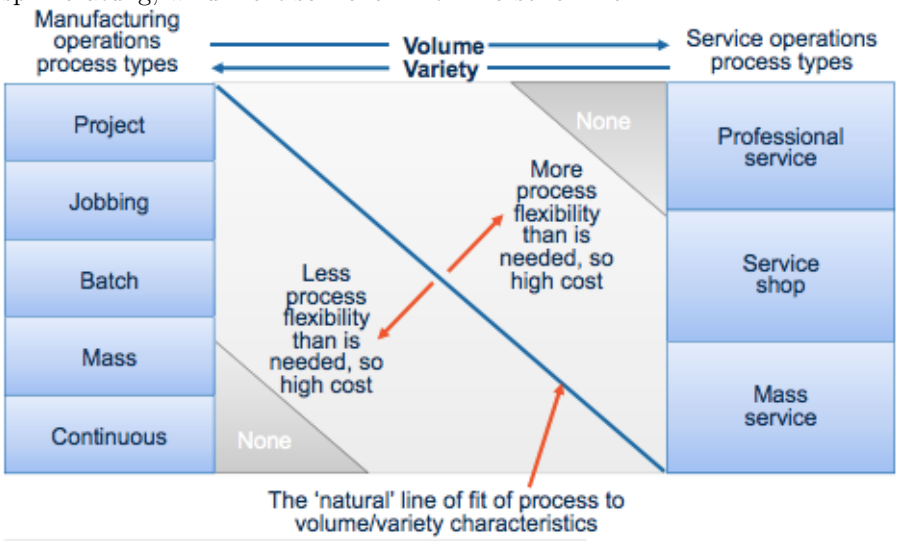
6.2.6 Continuous Processes

- Extremely high volumes and low variety: often single product in endless flow
- Standard, repeat products (make to stock)
- Highly capital-intensive and automated
- Few change-overs required
- Difficult and expensive to start and stop the process, therefore few changeovers
- Example: **petrochemical refineries**, steel-making industry, internet server

6.2.7 Process Types: Services

6.2.8 Costs of Operations

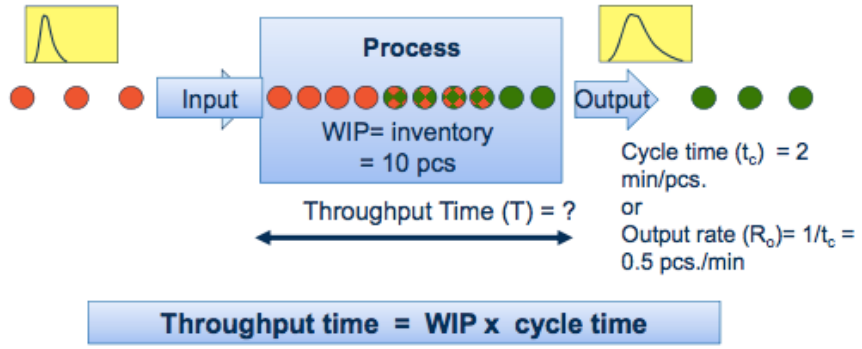
Bsp: Beratung, wird nicht schneller mit n-Personen mehr.



Deviations from the 'natural' diagonal line on the product–process matrix affects cost

6.3 Methods and Tools

6.3.1 Little's Law - Example



6.3.2 Little's Law

Alles in der Blackbox, egal ob in Warteschlange oder Nacharbeit, wird als Work in Progress (WIP) gezählt

T	Troughput time	s/min/h
WIP	Work in Progress	piece/kg/CHF
t_c	cycle time	time per piece
R_0	Output rate	$\frac{piece}{time}$

$$R_0 = \frac{1}{t_c}$$

$$\text{T} = WIP \cdot cycletime$$

$$\text{T} = \frac{WIP}{outputrate}$$

6.3.3 Example: Snowboarding

120 Snowboarders ar waiting, everey 8 seconds 4 where transported.

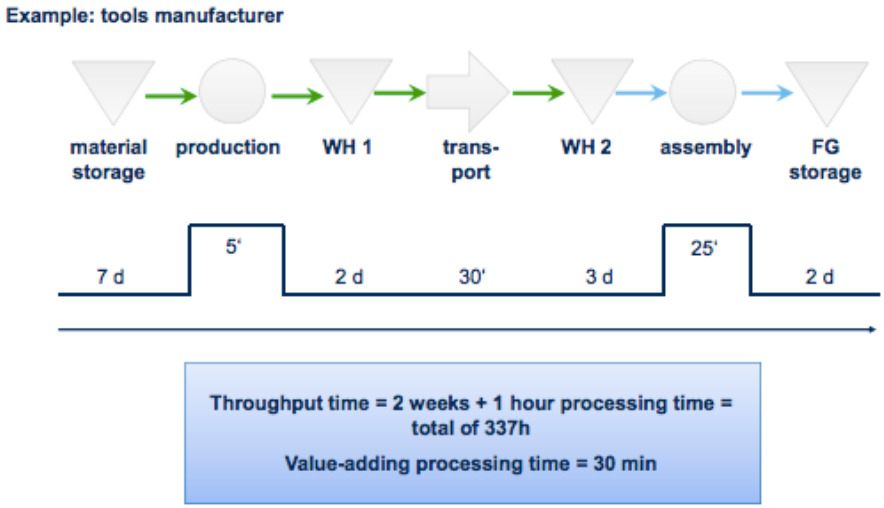
$$WIP = 120SB$$

$$t_c = \frac{8[sec]}{4[SB]} = 2[sec/SB]$$

$$T = 120[SB] \cdot 2[t_c] = 240[sec] = 4[min]$$

6.3.4 Throughput time and Processing Time Are not the Same!

Nur Bearbeitungszeit ist wertschöpfend, Transportzeit kann auch wertsch|öpfend sein.



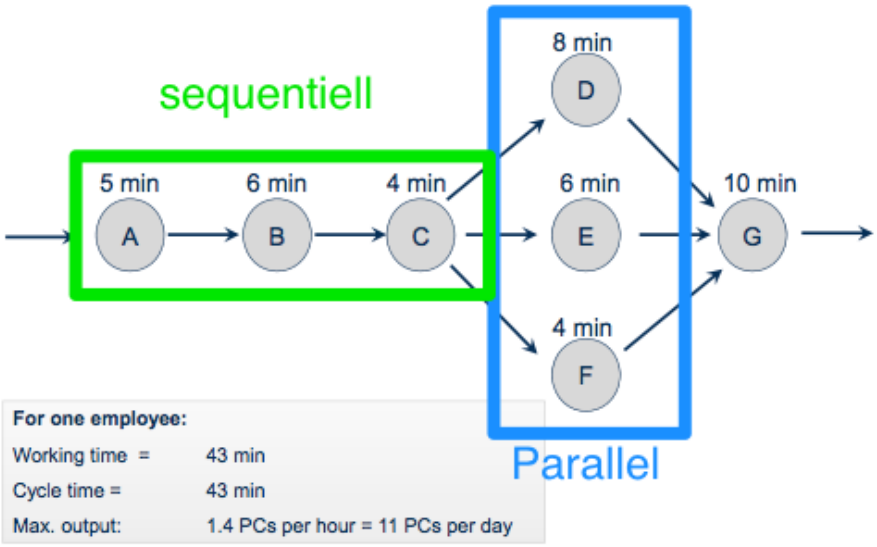
6.3.5 Little's Law Exercise: Automotive Supply Chain

- An automotive OEM produces a new car every 2 minutes. The throughput time (from arrival of raw materials until the car is ready for distribution) is 2 weeks. Please calculate the capital tied up in the OEMs supply chain
- Average value of the car during the 2 weeks of production: CHF 20,000
- Manufacturer's working time: 3 x 8-hour shifts on 5 days a week

$$GebundenesKapitalminimieren \Longrightarrow schnellerarbeiten$$
$$t_c = 2min = \tfrac{1}{30}h$$
$$T = 2w \cdot 5d \cdot 3shifts = 240h$$
$$Bestand = 7200Cars \cdot 20'000 = 144'000'000$$
$$20'000 \cdot \tfrac{2 \cdot 5 \cdot 24 \cdot 60}{2} = 144'000'000$$

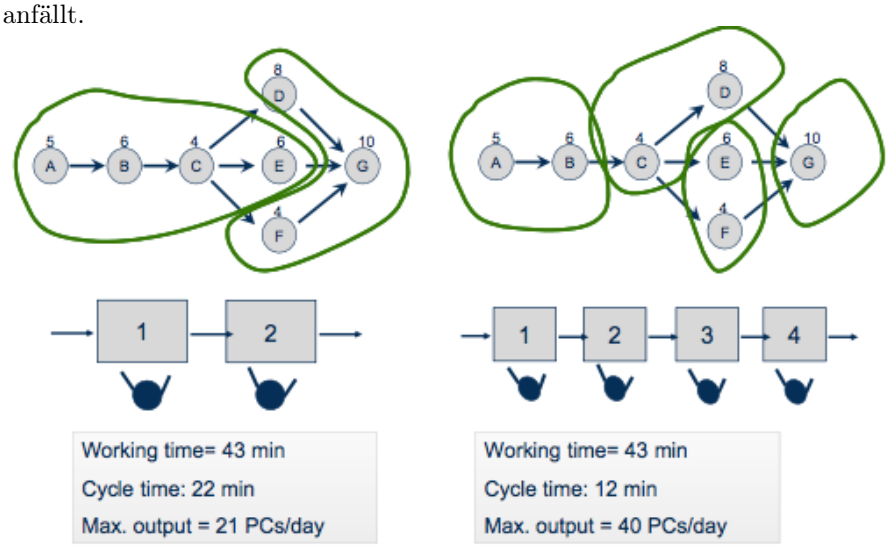
6.3.6 Division of Labor - Example

Code	Activity	Predecessor	Time (min)
A	Pretest 1	-	5
B	Pretest 2	A	6
C	De-assembly	B	4
D	Repair 1	C	8
E	Repair 2	C	6
F	Repair 3	C	4
G	Assembly	D, E, F	10



6.3.7 Division of Labor

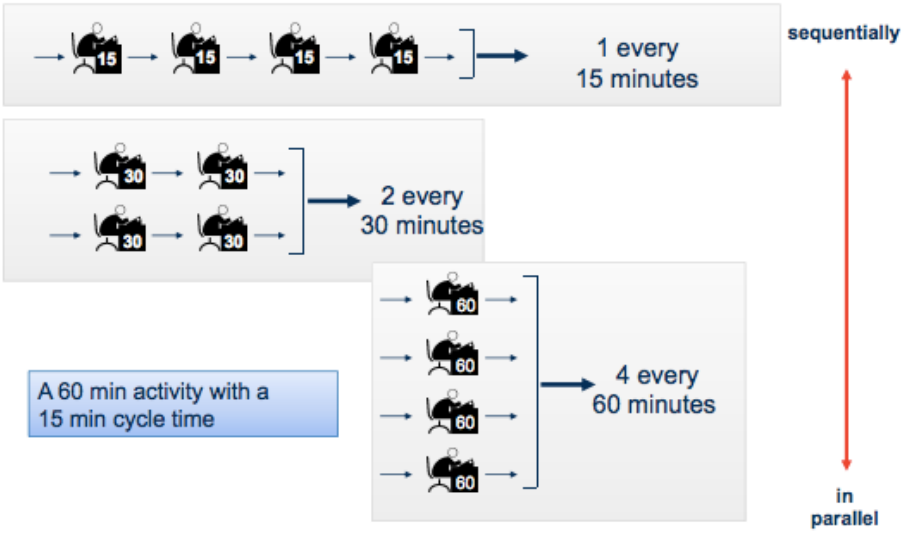
Längster Schritt diktiert denn Takt. Balancing Loss weil wartezeit pro Zyklus anfällt.



6.3.8 In Series (Sequentially) or in Parallel?

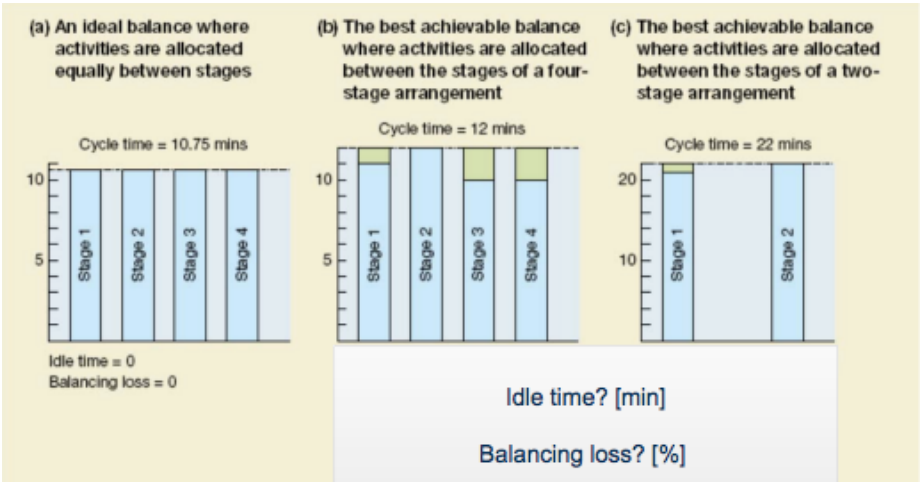
serie	parallel
kosteneffizient Erfahrungskurve (20-30%) Weniger Platz (Infrastruktur ·1) Produktequalität	robust (Ausfall) flexibel(Volumen) Variantenvielfalt Servicequalität
Channeled flow, easier to manage Simple material handling Lower capital requirements More efficient operation (higher propotion of direct productive work) Space-saving	Higher mix flexibility Higher volumen flexiblity Higher robustness Less monotony[1] Greater autononmy[1]

[1] Employee motivation



6.3.9 Balancing Processes to Avoid Loss of Efficiency

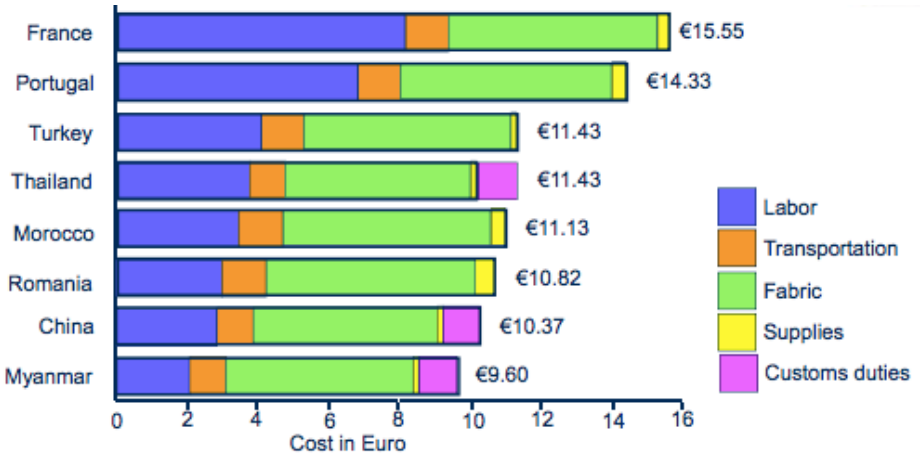
Verlustzeit aufgrund Arbeitsteilung, je mehr sequentiell desto höher Balance Loss (Achtung Lernkurve).


(a) An ideal balance where activities are allocated equally between stages
Cycle time = 10.75 mins
10
5
Stage 1
Stage 2
Stage 3
Stage 4
Idle time = 0
Balancing loss = 0
(b) The best achievable balance where activities are allocated between the stages of a four-stage arrangement
Cycle time = 12 mins
10
5
Stage 1
Stage 2
Stage 3
Stage 4
(c) The best achievable balance where activities are allocated between the stages of a two-stage arrangement
Cycle time = 22 mins
20
10
Stage 1
Stage 2
Idle time? [min]
Balancing loss? [%]

7 W05 - Location, Layout & Flow

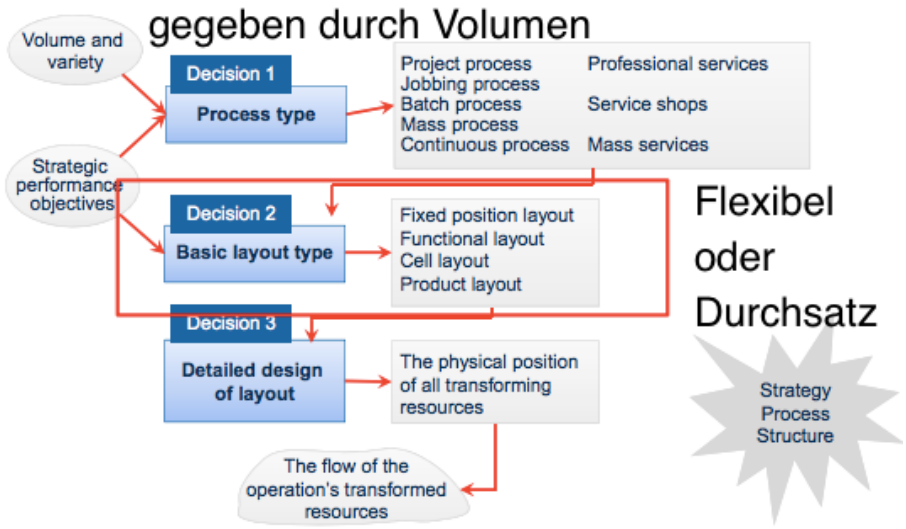
7.1 Location of Operations

7.1.1 Example: Cost Breakdown of Shirt Produced in Various Countries and Sold in France

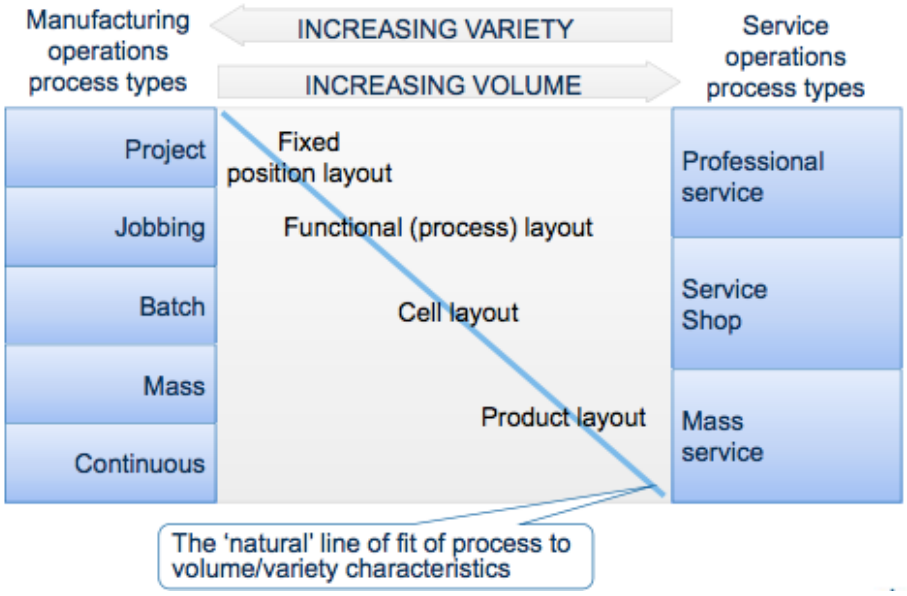


7.2 Basic Layout Design

7.2.1 Process Design: Design Procedure



7.2.2 The Nature of the Basic Layout Types



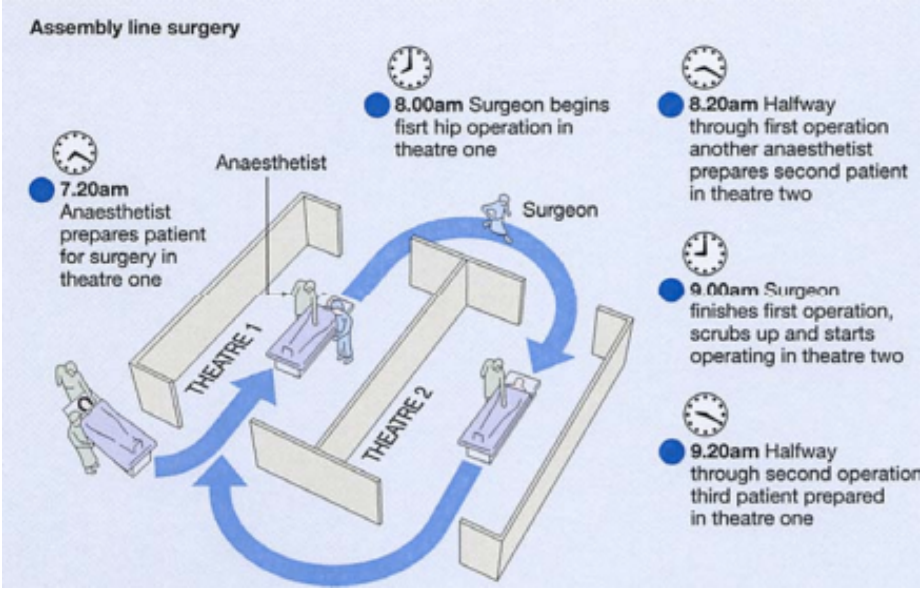
7.2.3 Example of a Fixed Position Layout: Hotel Construction Site

Festplatz, Werft, Flugzeugbau

- kann nicht bewegt werden
- Kostenintensiv

- Robust
- Fixpreis -> immer mit konkretem Plan

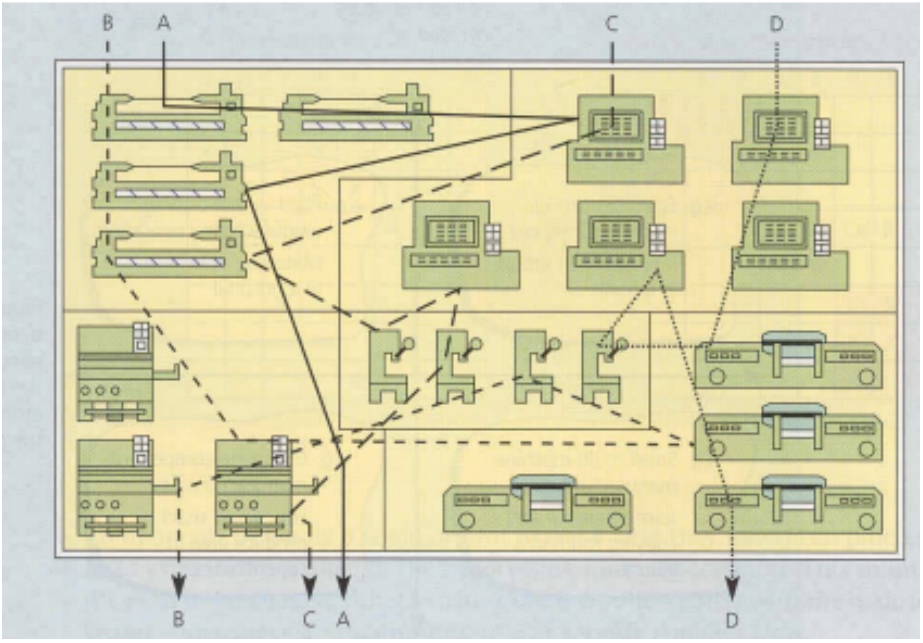
7.2.4 Example of Fixed Position Layout: Hospital OR



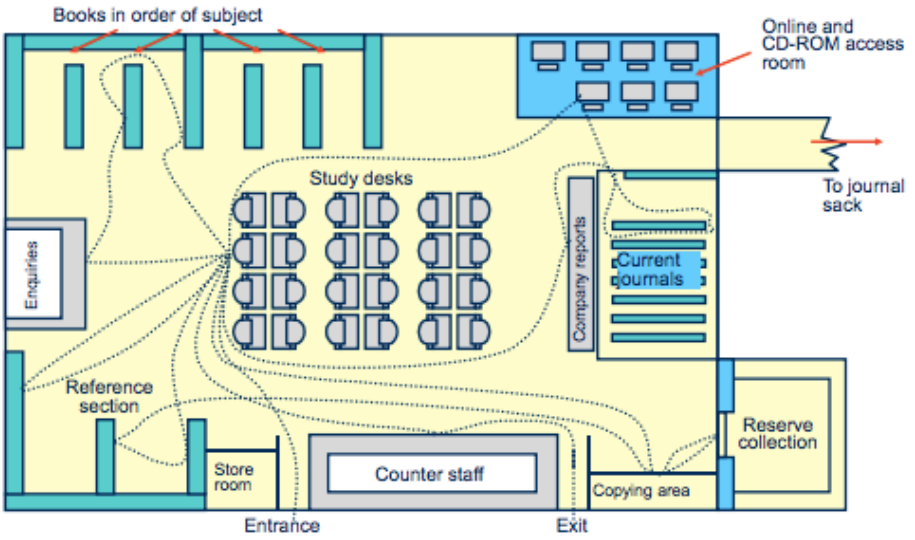
7.2.5 Example of Functional Layout: Glassblowing Workshop

7.2.6 Example of Functional Layout: Machine Construction

Fähigkeiten werden zusammengezogen. Jegliches Produkt kann hergestellt werden. Engpass nicht Sichtbar. Lange Durchlaufszeiten.



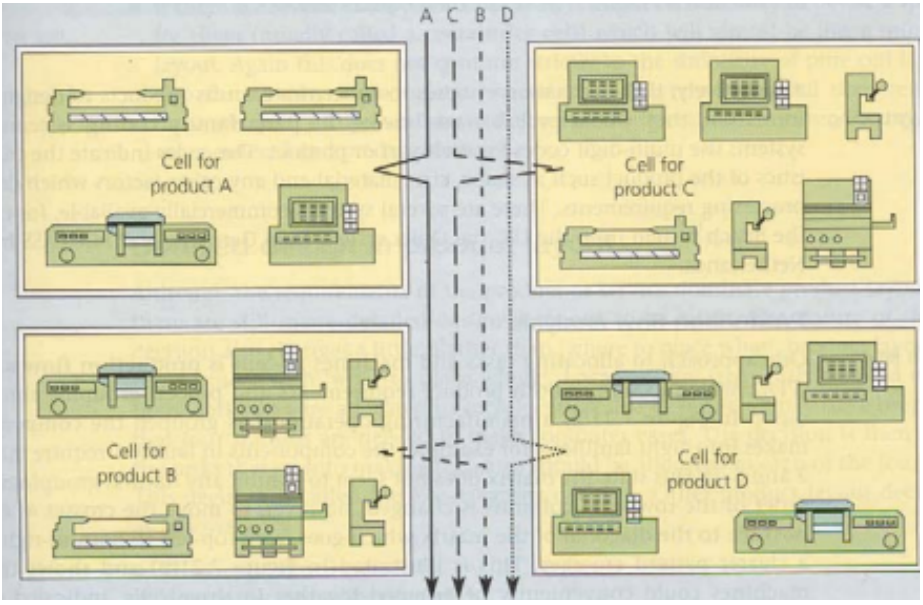
7.2.7 Example of Functional Layout : Library Floor Plan



7.2.8 Example of Functional Layout (Process): Kitchen

7.2.9 Example of Cell Layout: Machine Construction

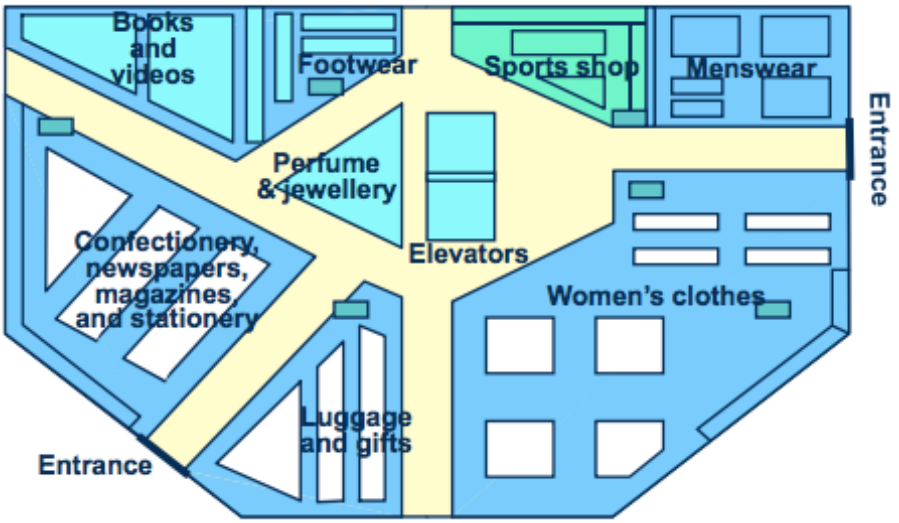
Flexiblität nimmt ab. 5. Zelle als Werkstatt (Prototypen & Lehrlinge). Volumen muss hoch sein. Sonst entsteht viel Leerlauf.



7.2.10 Example of Cell Layout: Pharmaceutical Production

7.2.11 Example of Cell Layout: Department Store Floor Plan

Service kann gezielt bezogen werden. Achtung, mit zentraler Kasse kein Cell Layout mehr.

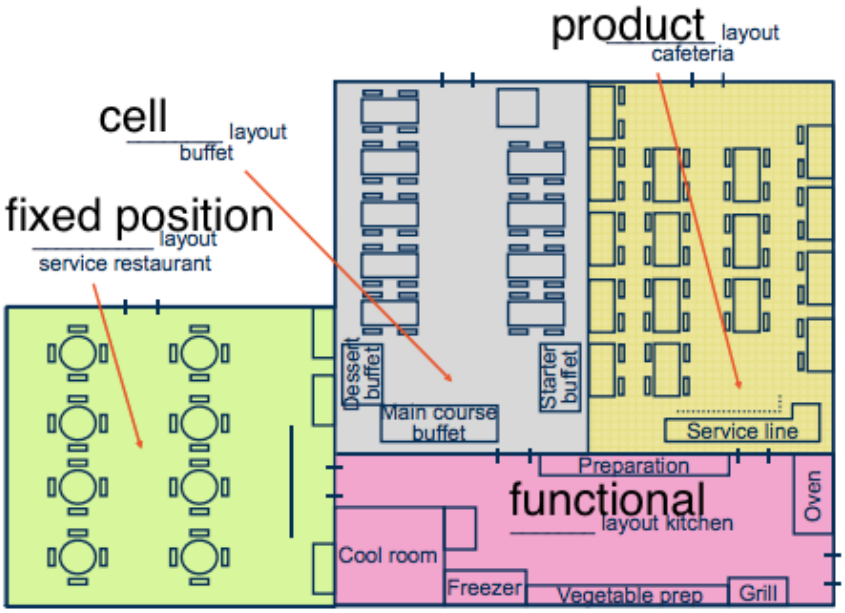


7.2.12 Example of Product Layout: Paper Production

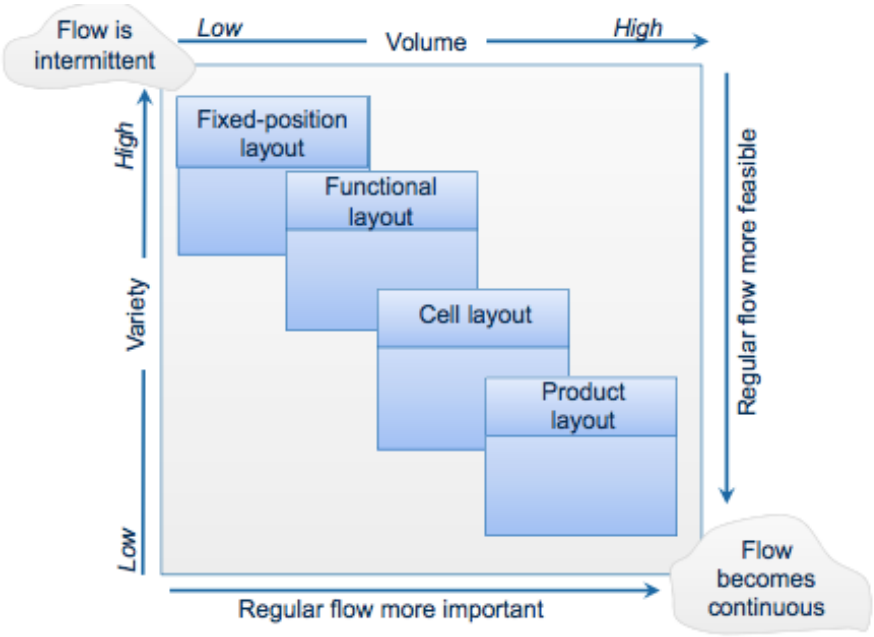
7.2.13 Example of Product Layout: Airport

7.2.14 Example of Product Layout: Army Induction Center

7.2.15 Restaurant Using All Four Basic Layout Types



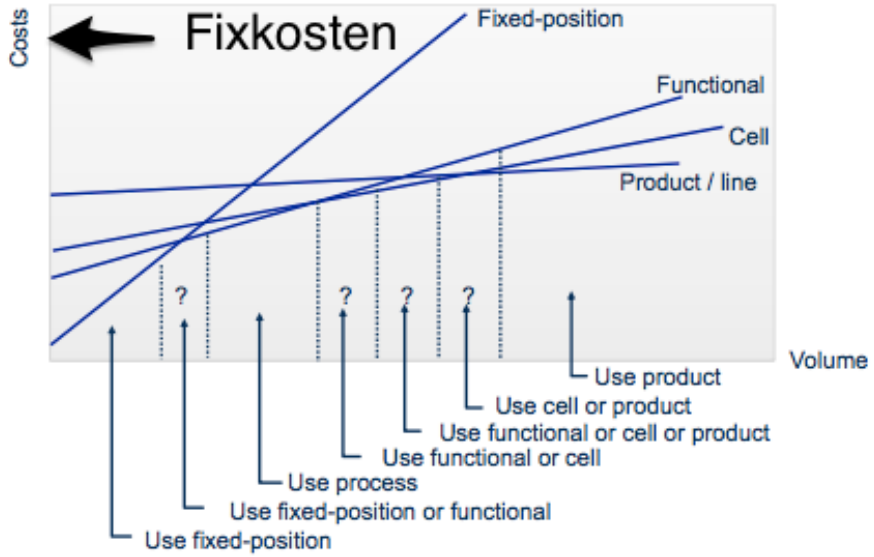
7.2.16 Revision: Basic Layout Types



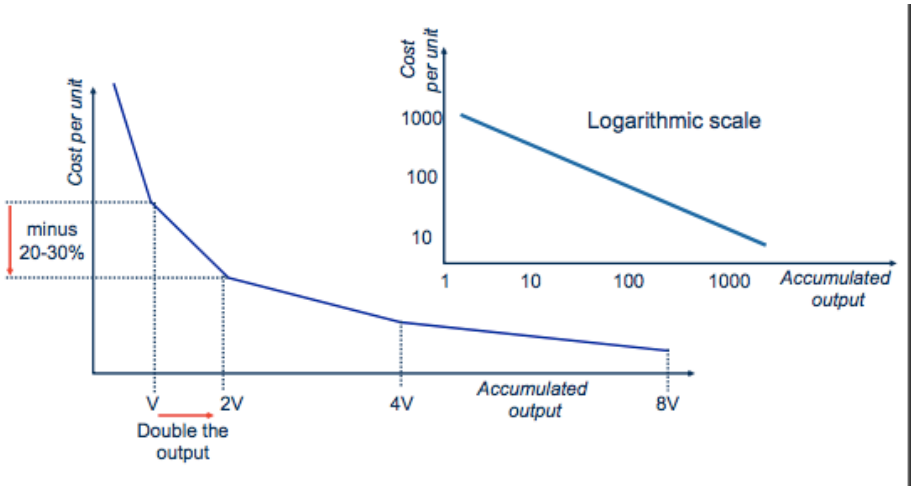
7.2.17 Advantages and Disadvantages

	Fixed position layout	Functional (process) layout	Cell layout	Product layout
Advantages	Very high product and mix flexibility Product/customer not moved High variety of tasks for staff	High product and mix flexibility Disruptions have little effect on other processes Easy to supervise	May be a good compromise Fast throughput Working in groups has a positive effect on motivatio	Low unit costs in cases of high volume Opportunities for specialization of equipment
Disadvantages	Very high unit costs Allocating space and activities may be difficult	Low utilization May have very high WIP Complex flow	Rearranging the existing layout can be costly May need more space	Reduces mix flexibility May be affected by disruptions Work can be very repetitive

7.2.18 The Different Fixed and Variable Cost Characteristics Determine the Choice of Layout Type



7.2.19 The Right Layout Type Is One Lever in Leveraging the Learning Curve



7.2.20 Examples of Learning Curve Slopes

Example	Improving Parameter	Cumulative Parameter	Learning-Curve Slope (%)
1. Model-T Ford production	Price	Units produced	86
2. Aircraft assembly	Direct labor-hours per unit	Units produced	80
3. Equipment maintenance at GE	Average time to replace a group of parts	Number of replacements	76
4. Steel production	Production worker labor-hours per unit produced	Units produced	79
5. Integrated circuits	Average price per unit	Units produced	72[a]
6. Handheld calculator	Average factory selling price	Units produced	74
7. Disk memory drives	Average price per bit	Number of bits	76
8. Heart transplants	1-year death rates	Transplants completed	79
9. Cesarean section baby deliveries	Average operation time	Number of surgeries	93

[a]Constant dollars.

Sources: W. Y. Fok, L. Y. S. Chan, and T. K. H. Chung, "The Effect of Learning Curves on the Outcome of a Caesarean Section," *BJOG* (November 2006): 1259–1263; James A. Cunningham, "Using the Learning Curve as a Management Tool," *IEEE Spectrum* (June 1980): 45. © 1980 IEEE; and Davis B. Smith and Jan L. Larsson, "The Impact of Learning on Cost: The Case of Heart Transplantation," *Hospital and Health Services Administration* (Spring 1989): 85–97.

7.3 Workplace Design

7.3.1 The objectives of job design

7.3.2 Is Your Mouse Making You Ill?

7.3.3 Definition Ergonomics

7.3.4 Ergonomics: Legal Requirements

7.3.5 Ergonomics ‚Äì How an Individual Interfaces with the Physical Aspects of His or Her Workplace

7.3.6 Job Design ‚Äì Your Job as Manager Is to Define the Right Ergonomics for Your Team

- Eliminate health riskis
- Reduce health risks
- Provide protection

7.3.7 Group Exercises at the Conveyor Belt to Improve Health and Fight Burnout

7.3.8 Usability Engineering (Software Ergonomics)

7.3.9 Usability is key for a positive user experience

7.3.10 Basic Principles of Usability Engineering

7.3.11 What Is my function in an app?

7.3.12 Basic Principles of Usability Engineering

7.3.13 Usability Engineering (Software Ergonomics)

8 W06 - Supply Management & Distribution

8.1 Supplier Network Configuration

8.1.1 Case Study: Dell

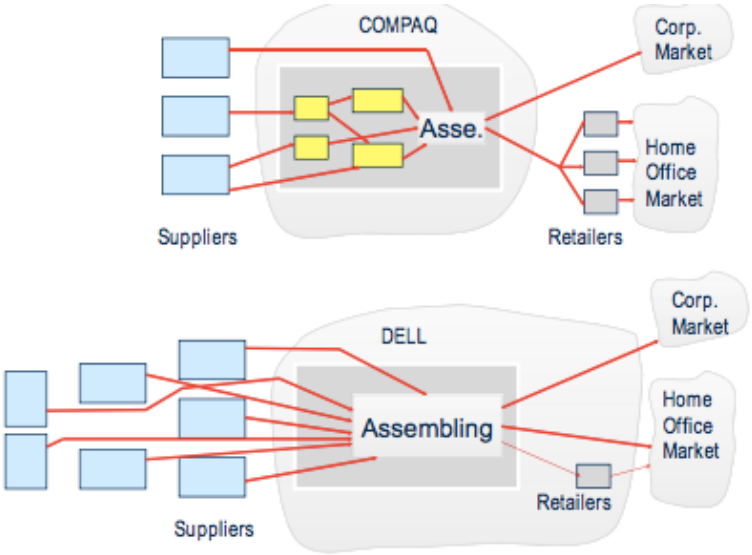
8.1.2 Market Shares until 2000

8.1.3 Market Shares until 2006

8.1.4 Market Shares today

8.1.5 Comparing Operating Margins

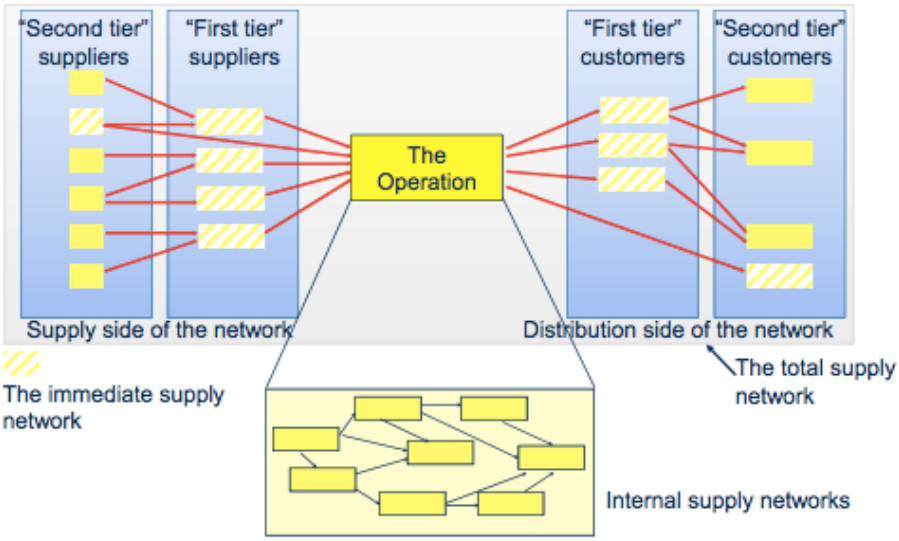
8.1.6 Dell's Supply Network



8.1.7 Dell's Innovative Financing Model: Another Factor in Its Success

8.1.8 PC Design Evolution

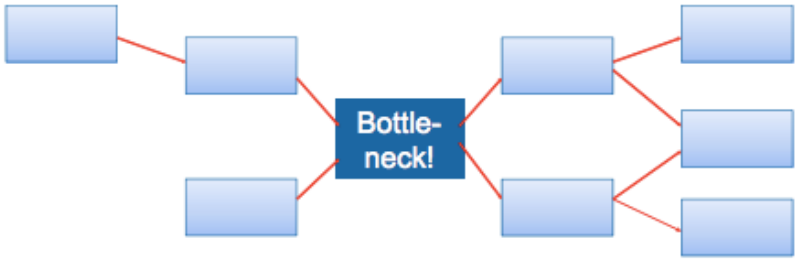
8.1.9 Structure of Supply Networks



8.1.10 OperationsPerformance: A Whole Supply Chain Issue

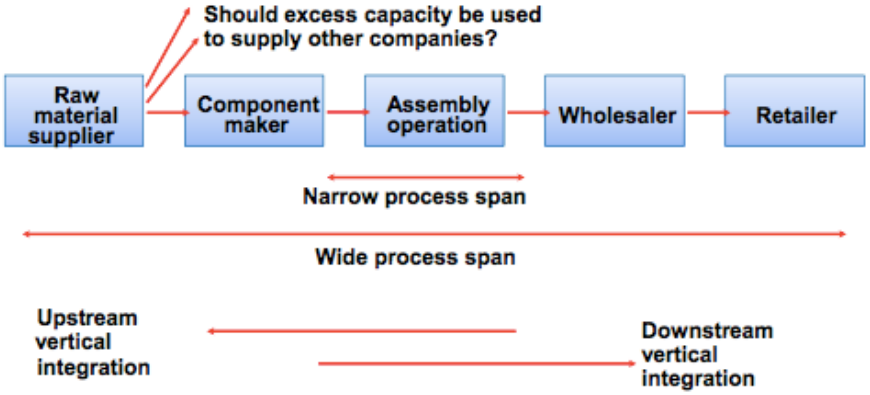
Benefits of looking at the whole supply chain include:

- It puts the operation into its competitive context
- It helps to identify the keay players
- It shifts emphasis to the long term item It sensitizes the operation to macro-changes



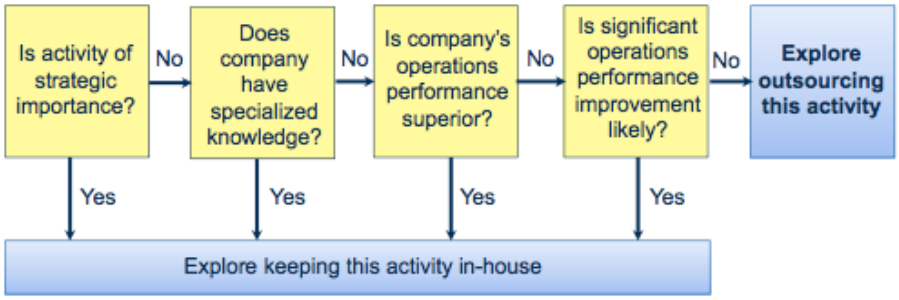
8.1.11 Supply Network Design: Extension of Process Span

Example for horizontal integration: google into car production (not in the own supply chain).

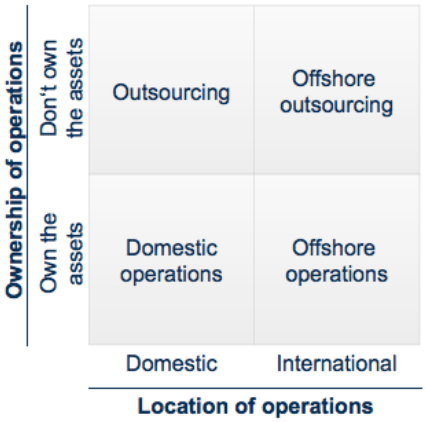


8.1.12 The Decision Logic of Outsourcing

Know How strategisch -> kein Outsourcing Outsourcing nur aus Kostengründen ist nicht Lohnenswert.

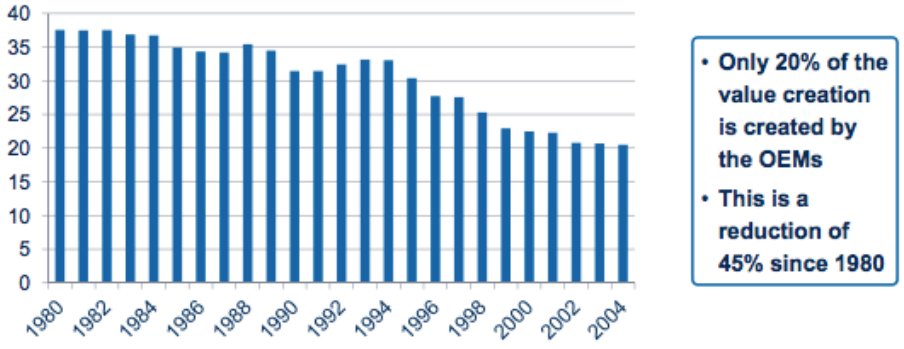


8.1.13 Relationship between Offshoring and Outsourcing



8.1.14 Trends in Outsourcing Example: Automotive Industry

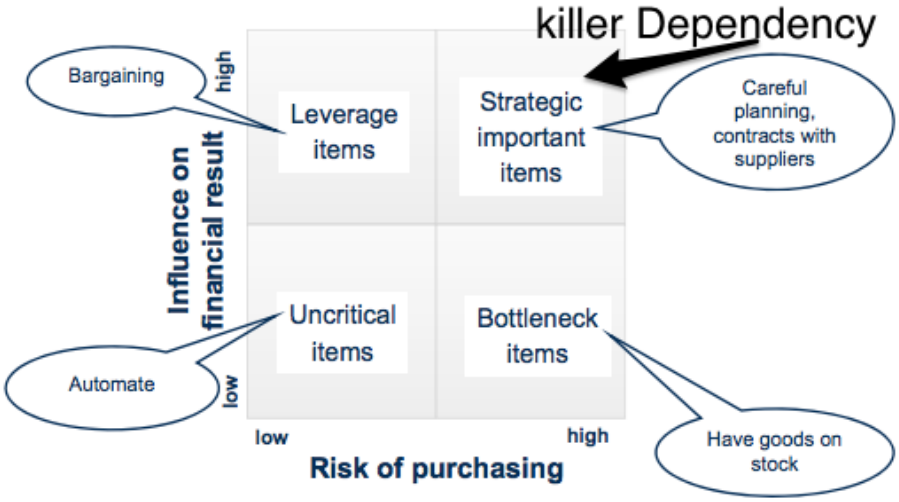
Percentage of in-house value creation of German automotive OEMs - Wertschöpfung = Kosten + Marge?



8.2 Supplier Management

8.2.1 The complexity of forces an systematic approach ‚Äì Example Metro Germany

8.2.2 A material classificaiton is the basis for a segmented approach towards suppliers



8.2.3 How to segment your supplier ‚Äì Example scorecard

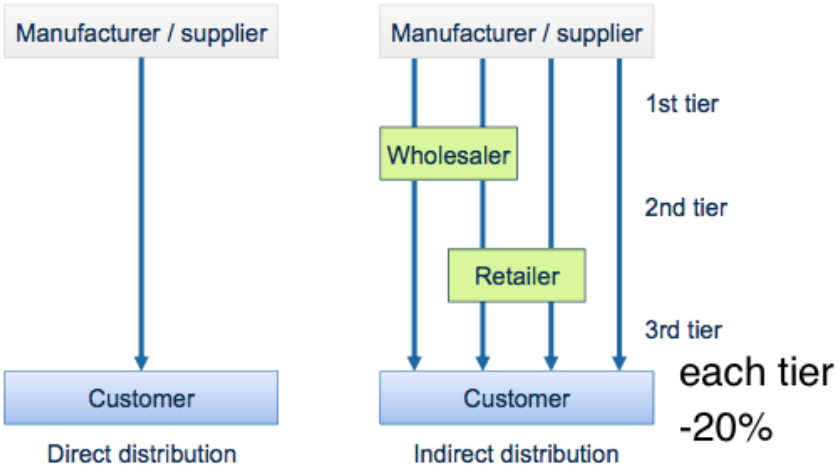
8.2.4 Supplier Management: Measure and score their performance-regularly

8.2.5 An ambitious route of managing suppliers: Develop them further ‚Äì example Toyota

8.3 Distribution

8.3.1 Distribution: From the Manufacturer to the Stores

8.3.2 Distribution and Channels

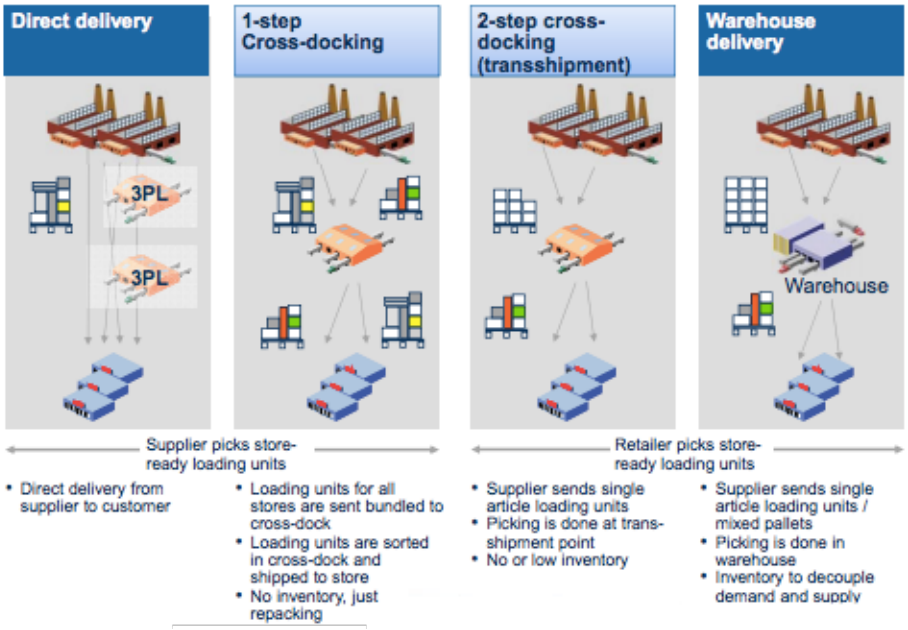


8.3.3 Transportation of Materials: Key Figures for Switzerland

8.3.4 Distribution: Example of Swiss Retailer

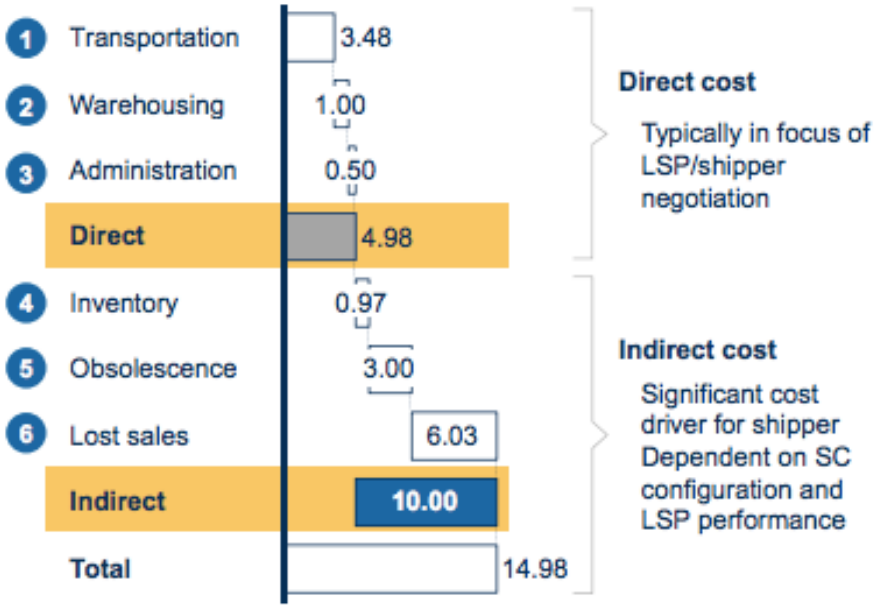
8.3.5 Cross-Docking: Modern Distribution System

Nichts mehr einlagern, nur kurz zwischenlagern, fixer & schneller. Verteilzentren werden aufgelöst.



8.3.6 Indirect distribution costs are often overlooked

3) zu viel an Lager
6) zu wenig an Lager



9 Presentations

9.1 Coop at Home

9.2 admin

10 W08 - Supply Chain Management

10.1 Introduction to SCM

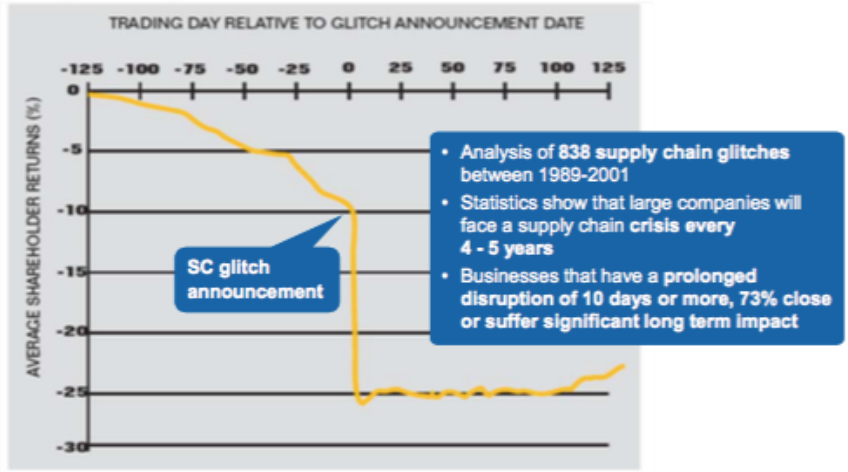
10.1.1 The Revolution in 1983

10.1.2 Swatch 1992: 100,Äô000,Äô000 Uhr

10.1.3 Understanding the Impact of Supply Chain Disruptions

10.1.4 Supply Chain Glitches Can Affect a Company,Äôs Performance

Auswirkung auf Aktienkurs be Lieferproblemen, x-Achse = 1 Jahr.



10.1.5 Comparison: The Effect of a Supply Chain Glitch (-20% to -25% Stock Price Reduction)

Statement	Stock Price Reaction
Operations Events	
Increase in R&D spending	1.4%
Closing factories	-0.7%
Successful TQM	0.6%
Successful green initiatives	1.9%
Marketing Events	
Contracting of celebrities	0.2%
Introduction of new product	0.3%
IT	
IT problems	-1.8%

10.1.6 Case Study: McDonalds Meat Scandal in China

10.1.7 Case Study: Toyota

10.1.8 Was Everything just a Misunderstanding?

10.1.9 Which Industries Are most Likely to Be Influenced by Supply Chain Glitches?

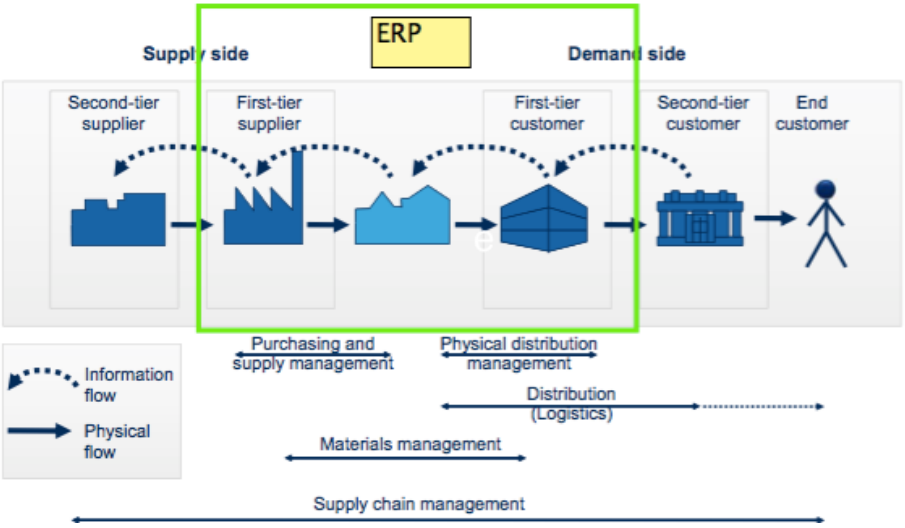
10.1.10 Supply Chain Management: From Sheep to Shawl

10.1.11 This is not Supply Chain Management ‚Äì Optimizing yourself on cost of other players in the chain

! Just in Time ist gefährlich! spezialisierte Produkte die schnell ausgeliefert werden müssen, brauchen hohe Lagerkosten. Auf keinen Fall zum externen Warenlager werden.

10.1.12 Logistics = Supply Chain Management ?

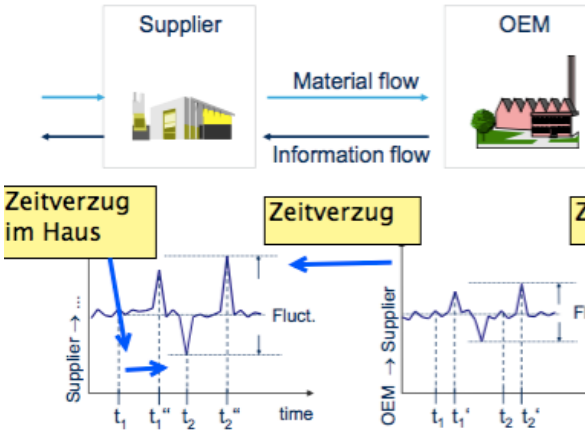
10.1.13 Key Terminology of Supply Chain Management



10.2 Bullwhip Effect

10.2.1 The Bullwhip Effect: Increasing Variability Upstream

1. Für den Bullwhip Effect braucht es ”störung” in der Beschaffung (mehr Einkauf als geplant)
2. Für Bullwhip Effect braucht es einen Zeitverzug zwischen Suppliers. Um zu



vermeiden -> alle in der Lieferkette müssen informiert sein.

10.2.2 The Bullwhip Effect Can also Happen within a Company

10.2.3 Even Whole Economies Can Become Volatile: Machine Tools at the Tip of the Bullwhip

10.2.4 The Bullwhip Effect during the Financial Crisis in 2009

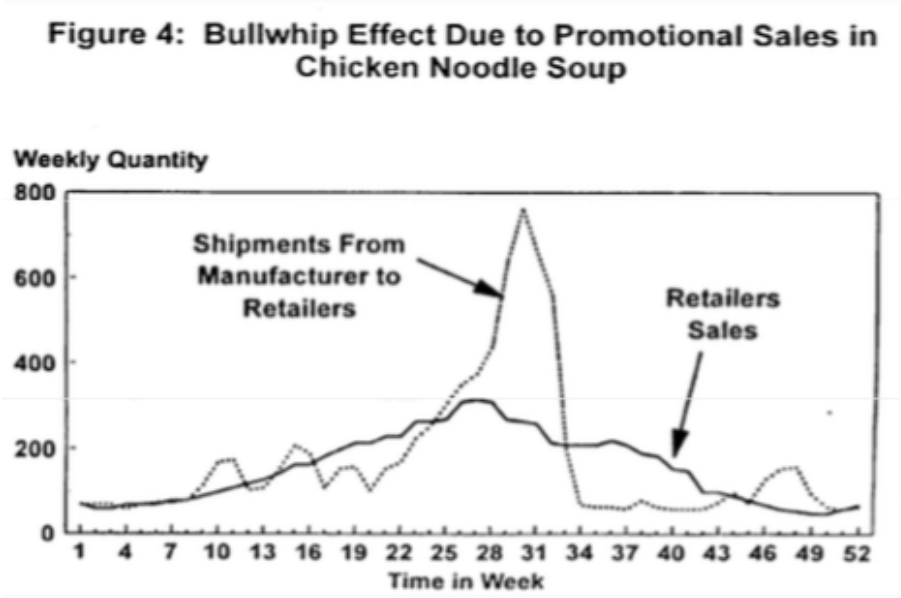
10.2.5 Impact of Bullwhip

1. High inventory
2. Out-of-stocks (OOS) backlog cost
3. Low operational efficiency
   - underutilization
   - overtime
   - expediting
4. Unnecessary capacity investment
5. Swings in working capital

10.2.6 What causes the Bullwhip Effect? 6 Main Reasons

1. Over-reaction to backlogs
2. Neglecting to order based on inventory position
3. Ordering in batches
4. Price variations (eq. Promotions)
5. Lack of communication & coordination - shortage gaming
6. Delay times for information and delivery of materials
7.

10.2.7 Reducing the Price (Promotions) Creates Spikes



10.2.8 "Chinese Whispers": Information Distortion along the Supply Chain

If one start to panic, all will start to panic. -> Domino

10.2.9 How to Fight the Bullwhip Effect?

1. ERP-Systeme
2. SCM-Systeme
3. konstante Preise
4. automatisierter Datenaustausch
5. E-Commerce
6. Vendor Managed Inventory
7. automatisierte Bestellsysteme

10.2.10 Automatic Replenishment Systems Can Mitigate the Effects of Overreaction

10.2.11 Eliminate Promotions with "Every Day Low Prices" (EDLP)

10.2.12 Handelsradar (Mai 2011) ‚Äì Datenaustausch zwischen Industrie und Handel

10.2.13 Handelsradar Supply Side: Warum tauschen Sie nicht mehr Daten aus?

10.2.14 Shorten Supply Chain: Let the Vendor Manage the Inventory

10.3 Designing the Supply Chain

10.3.1 Goals of Supply Chain Management

- Right quality: Every link is responsible for its own quality and that of its suppliers
- High speed: The faster the throughput time, the more flexible and cheaper the whole chain becomes
- Reliability: Being on time, in full deliveries on all supply chain tiers
- Flexibility: Supply chain agility is a prerequisite for reacting effectively to glitches and changes
- Cost: Reducing the overall transaction and transport costs of the whole chain

10.3.2 How to design and optimize a Supply Network?

10.3.3 Choose the Right Supply Chain for each Product: Segmentation Logic by M. Fisher

10.3.4 Different Products Require Different Supply Chain Strategies

11 W09 - Capacity Management

11.1 Introduction

11.1.1 What Capacity Does this Operation Have?

11.1.2 What is Capacity?

- Capacity is in the static, physical sense the fixed volume of a container, or the space in a building, or the seats in a plane, theater, etc.
- The definition of the capacity of an operation is the maximum level of value-added activity over a period of time that the process can achieve under normal operating conditions

11.1.3 Capacity Constraints

- The parts of the operation that are operating at their capacity ‚Äòceiling‚Äô are capacity constraints for the whole operation.
- These constraints are often referred to as ‚Äòbottlenecks‚Äô. Depending on the nature of demand, different parts of an operation may be pushed to their capacity ceiling and act as a bottleneck.

11.1.4 Capacity Metaphor

11.1.5 Medium- and Short-Term Capacity Planning

Medium-term capacity planning involves an assessment of demand forecasts over a period of 2 to 18 months, during which time planned output can be varied, for example, by changing the number of hours the equipment is used
Short-term capacity planning adjusts the resources with a time horizon of days or hours, e.g. the services in a garden restaurant

11.1.6 Basic Questions in Capacity Planning

- Demand quantity
- Dependencies of the demand
- Demand seasonality
- Limits of supply
- Storing capabilities of offered product
- Available capabilities

12 W10 - Inventory Management

12.1 Introduction

12.1.1 Water Consumption During the 2006 World Cup Championship

12.1.2 Visual Interpretation of Inventories

12.1.3 What other reasons are there for holding inventories?

12.1.4 Case Study: Leaving Everything Behind,Ä¶

12.1.5 The Strategic Role of the Inventory: The Five Operations Performance Objectives

Bsp: Zementfabrik, lange Anlaufzeit.
Ersatzteile, Kundennachfrage
cost -> Aktionen / Rabatte

- Supporting **quality** objectives
- Supporting **speed** objectives
- Supporting **dependability** objectives
- Supporting **flexibility** objectives
- Supporting **cost** objectives

12.1.6 Types of Inventory

- Buffer (NORDAL)
- Cycle
- De-coupling (Serielle Produktion (0.6*0.9))
- Anticipation (Gleichmässige Produktion, Absatz in kurzer frist, ex: Osterhasen)
- Pipeline (Lager während Transport)

12.1.7 Disadvantages of Holding Inventory

- May become **obsolete** as alternatives become available
- Can be **damaged** or deteriorate
- Could be **totally lost**,or be very expensive to retrieve
- Might be **hazardous** to store
- May need excessive **storage space** compared to its value
- If **duplicated** at different locations, it may be reordered at one location while excess inventory exists at others
- Involves high **administrative** and **insurance** costs

12.1.8 Typical Inventory Profiles

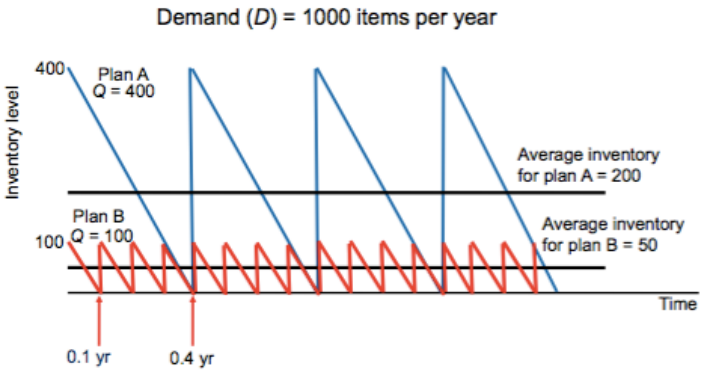
12.1.9 The 3 Main Questions of Inventory Management

- **How much** should I order? (Q)
- **When** should I order? ($\frac{Q}{D}$)
- How should I **control the system**?

12.2 Reordering Approach

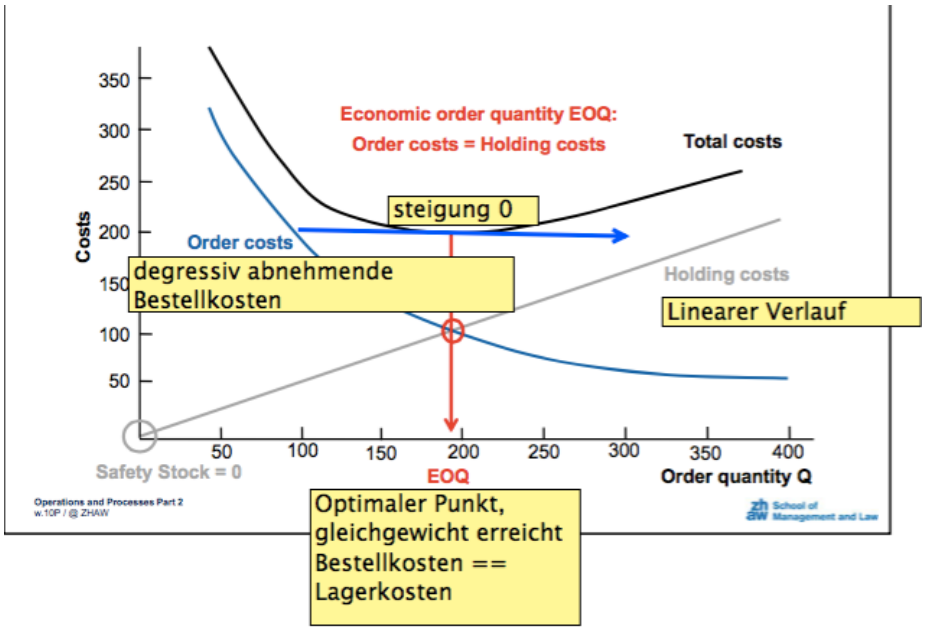
12.2.1 Reducing the Reorder Quantity Reduces Stock While Increasing the Reorder Frequency

A	B
+Mengenrabatt	+Lagerfläche
+Admin	+tiefe Bestandeskosten
-Lagerfläche	-viel Admin
-hohe Bestandeskosten	-kaum Rabatte



12.2.2 Trade-Offs in Considering Optimal Quantity

12.2.3 EOQ: Economic Order Quantity (based on simplified assumptions)



12.2.4 How to Calculate the Economic Order Quantity

Holding Costs	Order Costs
Working capital costs Storage costs & Price discount costs Obsolescence risk costs	Cost of placing an order

EOQ	Minimal total costs
Q	Ordering quantity
C_t	Total sourcing costs
C_O	ordering costs per order
D	Demand per Periodt_p
S	Safety Stock
C_h	Holding costs per unit (t_p)

$$C_h = \frac{C_h \cdot Q}{2 + C_h \cdot S}$$

$$C_O = \frac{C_O \cdot D}{Q}$$

$$C_t = C_h + C_O$$

$$EOQ = \frac{D \cdot C_t}{D \cdot Q} = 0$$

$$EOQ = \sqrt{\frac{2 \cdot C_O \cdot D}{C_h}}$$

$$\text{Order frequency} = \frac{D}{EOQ}$$

$$\text{Time between orders} = \frac{EOQ}{D}$$

12.2.5 Exercise ‚Äì determining the EOQ for our motors

12.2.6 The Total Costs Are Relatively Unaffected by Q

12.2.7 Reorder Point Method

12.2.8 Safety Stock Required to Cover Excessive Demand and/or Delivery Insecurity

12.2.9 How to Calculate the Safety Stock? Example: A Bar

12.2.10 Safety Stock and Remaining Risk: Demand and Delivery Lead Time are Statistic Distributions Frequency

12.2.11 Inventory Costs vs. Availability

12.3 Inventory Control

12.3.1 Pareto Curve for Stocked Items (ABC Analysis)

12.3.2 Inventory Classifications and Measures

12.3.3 Example: Pareto Distribution for a Pharmaceutical Co. A long tail of SKUs representing only a small part of the overall volume

13 W11 - Planning & Control Activities

13.1 Planning and Control

13.1.1 Planning or Control?

13.1.2 Definitions

13.1.3 Example: Air France Flight Plan: What Do You Have to Plan?

13.1.4 Example: SWISS: European Airbus Fleet Flight Plan for one Day

13.1.5 Significance of Planning and Control Time horizon Hours/days Days/weeks/months Months/years

13.1.6 Dependent and Independent Demand

13.1.7 The Order Penetration Point (OPP)

13.1.8 Goals to Optimize with the OPP

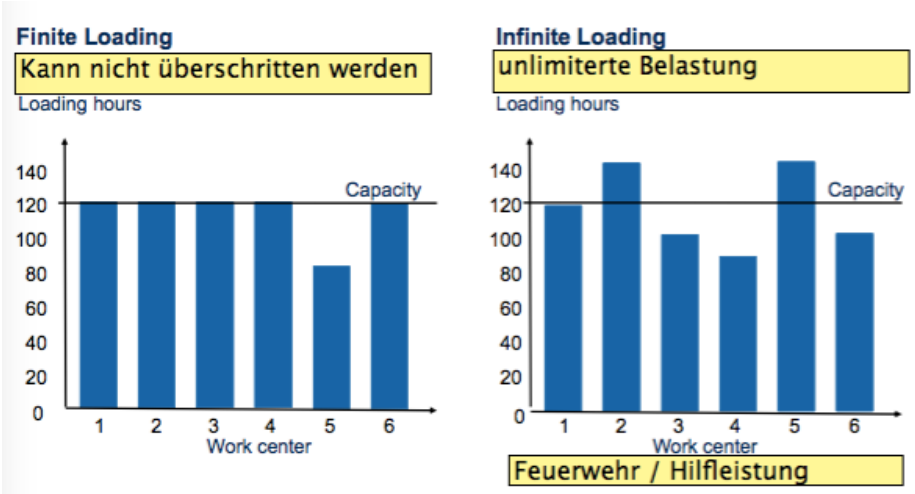
13.2 The 4 Main Activities of P&C

13.2.1 The Activities of Planning and Control

13.2.2 Scheduling Using a Gantt Diagram

13.2.3 Factors Affecting Operating Time

13.2.4 Finite and Infinite Loading of Work Centers



13.2.5 Local Decision Rules, e.g., Sequencing

4 jobs for 1 work center may be planned according to the following possibilities:
$4 \cdot 3 \cdot 2 \cdot 1 = 24 possibilities$

n jobs for 1 work center yields $n!$ possibilites of sequencing
n jobs for m work centres yields n^m possibilities of sequencing.

14 W12 - Lean Synchronization

14.1 History of Lean

14.1.1 Lean Management and Just in Time (JIT)

For Slack et al., the following terms are synonymous

- continuous flow manufacture
- high value-added manufacture
- stockless production
- low-inventory production
- fast-throughput manufacturing
- lean manufacturing
- Toyota production system
- short cycle-time manufacturing

14.1.2 Toyota Simultaneously Increases Quality and Productivity

14.1.3 Introductory Movie on Lean

14.1.4 JIT Definitions

14.1.5 Lean Optimizes 3 Aspects Simultaneously

14.1.6 Successful lean projects are based on 3 preconditions

14.2 3 Value Destroyers

14.2.1 The 3 Value Destroyers: Waste, Variability, and Inflexibility

14.2.2 The 7+1 Types of Waste (= muda)

1. overproduction
2. waiting time
3. transport
4. over-process/poor process
5. inventory
6. motion
7. defective gooods
8. *people's unused potential*

14.2.3 There Is a Gray Area Between Waste and Value-Added Activity

14.2.4 Variability: 5 Typical Reasons

- Enviroment
- People
- Process/Tools
- Material
- Information

14.2.5 Inflexibility: We Are Used to Waste

14.3 The Lean Toolbox

14.3.1 How to Become Lean ,Äì Example of a Toolset

1. Analyze processes
2. Reduce inventories
3. Optimize process technology
4. Standardize
5. Change over quickly (SMED)
6. Implement flow/ level scheduling (Heijunka)

14.3.2 There Are 3 Types of Processes

1. What the process really is
2. What we think the process is
3. What the process should be

14.3.3 Airbus A340-300 Maintenance Services

14.3.4 Spaghetti Diagrams

14.3.5 Reducing Waste

14.3.6 Spaghetti Diagram in a Hospital: Preparing the Surgical Carts for the OR

14.3.7 The Problem with Inventory

14.3.8 Process Technology (Small-Scale Technology)

14.3.9 Example of Standardized Work

14.3.10 Definition of Standardized Work

Standardized work is the currently best way to safely complete an activity with the proper outcome and the highest quality

14.3.11 How Pit Stop Teams Manage Their Fast Tire Changes?

14.3.12 Reducing Set-Up Reduces Inventory: SMED ‚Äì Single Minute Exchange of Die

D=demand
C_O = ordering (set-up) cost = £400 / order
C_h = holding cost = £900 / item / yr = £900
Eonomic order quantity (EOQ):
$\sqrt{\frac{2 \cdot D \cdot C_O}{C_h}} = \sqrt{\frac{2 \cdot 5000 \cdot 400}{900}} = 67$
Reducing the order (set-up) cost from £400 to £100:
$\sqrt{\frac{2 \cdot 5000 \cdot 100}{900}} = 33.33$
SMED
Single minute exchange of die ist eine Messgrösse wie lange man zur Umrüstung einer Maschine braucht vom letzten produzieren Teil bis zum ersten neuen

14.3.13 Levelled Scheduling (Heijunka) Balances the Mix of Products Produced every Day

Der Mix und das Volumen zwischen versch. Stationen soll gleich behalten werden. Das führt zu kleinere Menge die verschoben werden müssen, kleinere Lager nötig, Fehler werden schneller aufgedeckt, einfachere Planung

14.3.14 Levelled Scheduling (Heijunka) Balances the Mix of Products Produced every Day (Continued)

14.3.15 Delivering Smaller quantities More Frequently Can Reduce Inventory Levels

14.3.16 Basics of Material Flow: Credo of Lean Production

Eliminate the **U**nnecessary -> **S**implify the necessary -> **A**utomate Simplified processes = **"USA"**

14.3.17 How to Become Lean ‚Äì Example of a Toolset

1. Analyze processes
2. Reduce inventories
3. Optimize process technology
4. Standardize
5. Change over quickly (SMED)
6. Implement flow/ level scheduling (Heijunka)

14.3.18 Read More on Lean Banking on Moodle,Ä¶

14.3.19 The 3 Step Approach to Lean Banking

1. Identify **customer needs**

2. Understand **root causes** for poor performance

3. Create **behavioral change**

14.3.20 Poor Performance ‚Äì Examples of Wastes in a Mortgage Process (Muda)

14.3.21 How to Achieve the Transformation? Use your Operations Knowledge ‚Äì Example Capacity

14.3.22 Lean Banking Can Transform Every Part of a Bank

15 W13 - Quality Management

15.0.23 Repetition: The 7+1 Types of Waste (= muda)

15.0.24 Revision: How to Become Lean ‚Äì Example of Toolset

14.3.17

15.1 Quality and Errors

15.1.1 What is Quality in Production?

15.1.2 What is Quality in Service?

15.1.3 Revision: Quality means different things in different operations

15.1.4 Perceived Quality is Governed by the Gap Between Customers,Äô Expectations and Their Perceptions of the Product or Service

15.1.5 High Quality Puts Costs down and Revenue up

15.1.6 A ‚ÄòGap‚Äô Model of Quality

15.1.7 The Perception ‚Äì Expectation Gap

15.1.8 Conformance to Specification

15.1.9 Quality Characteristics of Goods and Services

15.1.10 Quality Problem ‚Äì Whose Fault Was It?

15.1.11 Why Examine and Change Processes? Among Other Things, to Increase Quality and Reduce Errors

”The majority of (medical) errors do not result from individual recklessness or the actions of a particular group - this is not a ”bad apple“ problem. More commonly, errors are caused by faulty systems, processes, and conditions that lead people to make mistakes or fail to prevent them”

15.1.12 What is the Magnitude of Errors?

Typical range of cost of poor quality (COPQ as % of Sales):

Manufacturing	20-30%
Services	30-40%
Software	40-65%

15.1.13 TQM Can be Viewed as a Natural Extension of Earlier Approaches to Quality Management

15.1.14 Total Quality Management: What Does TQM Include?

1. Includes all parts of the organization 2. Includes all staff of the organization 3. Includes consideration of all costs 4. Includes every opportunity to get things right 5. Includes all the systems that affect quality 6. And it never stops!

15.1.15 The Internal Customer,ÄìSupplier Concept Involves Understanding the Relationship Between Processes

15.1.16 The Traditional Cost-of-Quality Model

15.1.17 The Traditional Cost-of-Quality Model with Adjustments to Reflect Criticism of TQM

15.1.18 How to Prevent Errors Cheaply: Poka-Yoke

-> Idiotensicher

15.1.19 Poka-Yoke or Bullet-Proof Assembly for Kite Surfers

15.1.20 Poka-Yoke is a Japanese Term Meaning "Fail-Safing" or "Mistake-Proofing"

15.1.21 Increasing the Effort Spent on Preventing Errors from Occurring in the First Place Leads to a more than Equivalent Reduction in other Cost Categories

15.1.22 The Cost of Rectifying Errors increases the Longer the Errors Remain Uncorrected in the Development and Launch Process

15.1.23 TQM in Services

15.1.24 How to Assure Quality in Services? TQM at UPS

15.1.25 How to Measure and Prove Quality? Examples of Certification and International Codes

15.1.26 EFQM ,ÄòBusiness excellence,Äô Model

15.1.27 EFQM Characteristics

Self assessment (it,Äôs possible to adapt weighting system of the 9 categories) Excellent results can only be achieved if the interests of all involved parties are taken into account Methods: benchmarking, Kaizen, PDCA Cycle, etc. "Committed to Excellence": 3 successful implemented improvement concepts and audit through validator (2-year shelf life) "Recognized to Excellence": Extensive self assessment and audit; "Stars Award" depending on points achieved Competition in Switzerland: ESPRIX ,Äì Swiss Excellence Award

15.2 Quality Assurance

15.2.1 Quality Management in Daily Life: Wasabi-nuts

15.2.2 Costs of Poor Performance / Quality

- **Defects** any instance when a proces fails to satisfy ist customer
- **Prevention costs** are associate with preventing defects before they happen
- **Appraisal costs** are incurred when the firm assesses the performance level of the processes

- **Internal failure costs**, result from defects that are discovered during production of a service or products
- **External failure costs**, arise when a defect is discovered after the customer receives the service or product
-

15.2.3 Important Analytical QA Methods: QA Instruments in Practice

15.2.4 SPC - Natural vs. assignable causes of variation

15.2.5 Natural Variations vs. Assignable Variations

15.2.6 Histogram: Standard Deviation = Measure for Deviation

15.3 Six Sigma

15.3.1 Six Sigma: Basic Information

15.3.2 Process Variation and Its Effect on Process Defects per Million Opportunities (DPMO)

15.3.3 Low Process Variation Allows Changes in Process Performance to be Readily Detected

15.3.4 Six Sigma is Based on 3 Main Elements

16 Berechnung OEE / OPE (Alle Wege)

16.1 OEE: Unterscheidung Sequentiell und Parallel

17 OPE

Zusammenhang OPE Zykluszeit & Balancing Loss (Balancing Loss ist auf Basis ist Zykluszeit und nicht Kapazitäten) 2.4 Berechnung Balancing loss

18 Heijunka -> Unterscheidung Heijunka viele Maschinen und nur eine Maschine

http://de.wikipedia.org/wiki/Heijunka Bei Heijunka geht es um die weitgehende Harmonisierung des Produktionsflusses durch einen mengenmässigen Ausgleich. Es handelt sich um eine Weiterführung des Heikinka, der nivellierten Produktion, bei welcher der bereits feste Produktionszyklus öfter als einmal am Tag wiederholt wird. Ohne Nivellieren kann kein Synchrones Produktionssystem geschaffen werden.

Warteschlangen und damit **Liege- und Transportzeite**n sollen beim Heijunka weitgehend **vermieden** werden. Eine Fliessproduktion (Continuous-Flow-Manufacturing) mit kurzen Transportwegen ist dazu Voraussetzung. Das Konzept ist vor allem angesichts komplexer, mehrstufiger Produktion von hoher Bedeutung. Die jeweiligen Engpässe wirken hier limitierend für das ganze System (Ausgleichsgesetz der Planung) und erzeugen damit zugleich bei allen anderen Teilen Verschwendung (siehe auch: Muda).

19 Supply Chain Management: Wahl der Transportwege (auch Quantitativ angewendet -> siehe Übung Smartphone)

20 Qualitativ verstehen: Produkt & Prozessentwicklung

21 EOQ & EBQ: Gleichungen auflösen

12.2.4 EOQ Economic order quantity (EOQ) is the level of inventory that minimizes the total inventory holding costs and ordering costs.
Economic batch quantity (EBQ), also called öptimal batch quantityör economic production quantity, is a measure used to determine the quantity of units that can be produced at minimum average costs in a given batch or production run.

22 Statistische Prozesskontrolle: Mit Messgrössen (ETC) vertraut machen die für die ermittlung der Kennzahlen wichtig sind

23 Layoutformen wann ist welche geeignet

7.2.15 All layouts in one example

24 Kapazitätsstrategie

wie wird diese geplant. Wann und zu welchem Zeitpunkt wird Kapazität aufgebaut (in Erwartung damgekauft wird, oder erst bei regelmässigen Rückständen)

25 5 Leistungsziele -> Bedeutung und abhängigkeit

4.2.1 5 Performance Goals

26 Operationsstrategie -> Bedeutung und wozu dient es

4.3.1

27 Lernkontrollfragen

27.1 4V

Where is a low visibility (with regard to the 4V concept) typically given and advantageous?

- **for selling standardized and massmanufactured products and services through e-commerce channels**
- in customer-specific operations
- for hiding confidential production know-how in area of intrusion and fire protection systems
- where a fully customized production results in a time lag between placing and delivering an order

27.2 Operations Management

Operations Management distinguishes between three levels:

- The supply network level which is concerned with the flow of goods and information between operations
- The operations level which represents activities in a department or in a subsidiary
- The process level which represents the flow between resources such as equipment or personnel

Which of the following statements does NOT reflect this classification?

- **A process optimization initiative of workflows of a production line refers to the operations level**
- a mistake in the clearing and settlement process of a credit card payment affects the entire supply network
- An operations strategy considers all three levels
- Resource planning is executed at the "process level"
- Service operations share information or information products along the supply chain

27.3 Produktivität

According to a US study discussed in the lecture, which factor has the highest impact on productivity?

- Suppliers
- Employees

- **Management**
- Kunden
- Kapital

27.4 Qualifizierende Faktoren

Qualifying factors incorporate the following characteristic

- they improve proportionally as the performance increases
- are not relevant for the performance
- determine measuring values on a performance scale
- is a measure for an increasing performance advantage
- **the qualifying performance level must be achieved. Overperformance will not be rewarded**

27.5 Operations Entwicklungsstufen

How may neutral development stages in area of operations be differentiated from supportive development stages?

- neutral development stages ensure a competitive advantage
- by adopting "best practice", operations become supportive
- **supportive development stages require a leading position in area of operations Richtig**
- a neutral development stage ensures a competitive advantage
- There is no differentiation

27.6 Operations Strategie

Which of the following performance objectives is **not** considered part of an operations strategy?

- The reliability of a service operation.
- The delivery time for a highly individualized sports car.
- The service quality of an aviation school in Lugano.
- The cost efficiency of an operation compared to the competition.
- **The effectiveness of an internet presence for a customer segment.**

27.7 Time to Market

The chances of successfully launching new products or services increases with faster time-to-market. Which factor might prevent such faster time-to-market?

- **The management team and sales advisors introduce innovative design ideas shortly before the launch of the product or the service.**
- Depending on the particular product or service development process, the team is organized and a project manager with the overall responsibility is assigned.
- Uncertainties and different concepts of products or services are clarified during the early conceptual phase of the product or service development process.
- Various phases of the product or service development process occur simultaneously. Falsch
- Supporting tools, such as CAD or prototypes, are used during the product or service development process.

27.8 Push & Pull

In the material replenishment process, we differentiate between push and pull systems. Regarding these push and pull systems, which of the following statements is correct?

- If the supplier reorders in a planned and periodical manner, the process always corresponds to a pull system.
- A change towards a pull system causes out-of-stock situation at customer's plant.
- An empty inventory at the supplier's plant only occurs in the push system.
- Very high inventory levels at the customer's plant typically occurs in a pull system.
- **If the customer initiates the reorder of materials, the process corresponds to a pull system.**

27.9 Push & Pull

In the containership game several groups have changed from a push system to a pull system. What is generally **no** effect of a transition from a push system to a pull system?

- Waste (Muda) decreases. Falsch
- The production of ships is completed just-in-time.
- The customer dictates the cycle time.
- **The stock level increases.**
- The volatile customer demand is better met.

27.10 Little's Law

You are responsible for the business development of the Starbucks chain in Switzerland. During the opening day of a new coffee shop, you observe that 200 customers enter the shop during the first two hours. During the third and fourth hour another 200 customers enter the shop. A further analysis reveals that 45 customers are present on average during the third hour. What is the average length of a stay of a customer? Assume that the output and input in such a black box need to be balanced.

- The average length of a stay cannot be calculated with the data provided above.
- 27 min
- 13.5 min
- 0.27 h
- 45 min

27.11 Cycle Time

A cinema has 200 visitors. During a 20 minutes break, 50 visitors remain seated, 50 visitors leave the cinema because of the bad movie and 100 visitors purchase a snack. The cinema provides 10 snack sales counters. On average a snack sale lasts 90 seconds. What is the cycle time if either 5 or 10 snack sales counters are open?

- in both cases 0.2 min.
- **5 counters: 0.3 min. 10 counters: 0.15 min.**
- 5 counters: 0.2 min. 1 O counters: 0.1 min.
- in both cases 0.15 min.
- 5 counters: 0.3 min. 10 counters: 0.6 min.

27.12 Upstream Integration

Why do companies choose to integrate upstreams?

- Because organizations can therefore offer a broader product offering.
- Because organizations can therefore easier integrate downstreams.
- Because organizations can better control marketing activities.
- **Because organizations strive for controlling strategic important resources (e.g. commodities).**
- ecause organizations become independent of raw material prices.

27.13 Bullwhip

Felix, the CEO of Chocolate Inc. makes up thoughts on the Bullwhip effect regarding his chocolate bars "Vanilla-Cocoa-Dream". He instructed his team to develop ideas to reduce the probability of the emergence of the Bullwhip effect in the supply chain. The following ideas and justifications were presented to him. What combination of an idea and its justification **is not correct and has no influence for preventing** the Bullwhip effect?

- **. / Introducing the promotion "+ 30% content for the same price" - to reduce the variance of the final demand.**
- Direct import of the cocoa beans from the farmers in Costa Rica - the exclusion of any intermediary is necessary because these firms have different ERP systems which are not campatible to exchange information.
- Installation of an automatic ordering system - IT systems react less irrational to low stocks and therefore prevent unusually high orders.
- Daily orders of sugar from the suppliers - regular orders result in lower variance regarding the order quantity rather than larger batches.
- Implementing an agile and fast supply chain for the vanilla beans - slow supply chains reinforce the bullwhip effect.

27.14 Bullwhip

Which of the five statements is wrong with regard to the bullwhip effect?

- The bullwhip effect can be reduced by keeping (re-) selling prices at a constant level. Falsch
- One reason for the occurrence of the bullwhip stems from overreactions related to order backlogs.
- **The bullwhip effect can be observed while demand is rising. The Bullwhip effect in practice cannot be observed while demand is falling.**
- A further reason for the occurrence of the bullwhip effect is the lack of communication within the supply chain.
- The occurrence of the bullwhip effect is not limited to complete supply chains. The bullwhip effect can also be observed inside individual companies.

27.15 Bullwhip

Every summer, the cheese industry faces the same challenge in producing fresh cheese: Customers ask for an above-average amount of fresh cheese. This seasonal fluctuation causes shortages of milk, and consequently leads to bullwhip effects in the supply chain. Which of the following strategies would you not recommend during summer?

- During summer months, cheese producers should change their logistics systems from mono-article palettes to palettes with mixed articles. This reduces the delivery frequency for each article.
- **Retailers should establish shortages of fresh cheese by only putting fewer articles in the shelves. This signals customers that the products are scarce.**
- etailers could establish vendor-managed inventory contracts with the cheese producers. By doing so, the producers would know the inventory level and could forecast more precisely which articles need to be replenished.
- During summer months, it is not advisable to promote fresh cheese. Promotions would increase the demand for fresh cheese additionally.
- Retailers should establish an electronic data interchange with the cheese producers. Consequently, the companies in the supply chain know which products have the highest demand. Moreover, this enables prioritizing the production according to the current sales.

27.16 Bullwhip

You were charged to reduce the bullwhip-effect in the supply chain. Which of the following statements regarding the bullwhip-effect is **wrong**?

- **Sales of our core products (such as Cheeseburgers, Coke, Diet Coke) are not affected by the bullwhip effect since these products have a very long life cycles.**
- Infrequent orders of large batches can result in a bullwhip effect.
- One of the main reasons for the bullwhip effect is that we have provided only partial and incomplete sales figures to our suppliers.
- By means of a vendor managed inventory the bullwhip effect can be reduced.
- The application of supply chain management software reduces the bullwhip effect.

27.17 Supply Network

Which of the following statements regarding supply network design is correct?

- The price fixing at the commodity exchange significantly affects international supply chains because high commodity prices lead to increased transportation costs.
- Second-tier suppliers are external suppliers and require a cooperation with a logistics service provider.
- Risk management in supply chain design is confined to first-tier customers and suppliers.

- **Organizations should outsource activities which are of no strategic value and which are produced internally at significantly higher costs than market prices.**
- A vertical integration upstream in the supply chain provides close access to customers and will lead to a better controlled supply chain accordingly.

27.18 Supply Chain Management

Which of the following statements does **not** apply in Supply Chain Management?

- Suppy Chain Management is concerned about the material and informations flow
- **An organization that covers various steps in the supply chain from upstream to downstream is horizontally integrated**
- Vertical integration means the additional integration of upstream and/or downstream value chains
- Horizontal integration means the integration of additional parallel value creation steps
- Downstream (related to vertical Integration) symbolizes the flow of materials between the manufacturer and the customer

27.19 Supply Chain Management

The Fast-Food Restaurant Chain ”Tim&Friends” is listed on the NASDAQ Stockexchange. "Tim&Friends"has more than 500 outlets and is present in many global markets. Last year "Tim&Friends"could not sell their Premium-Burger „King Triple Cheese"due to a severe capacity constraint in the purchasing department. As a result you were mandated by the "Tim&Friends"management team to establish an internal Supply Chain Management (SCM) department. One of the directors of the "Tim&Friendsïs not convinced that SCM is important. Based on your knowledge regarding the study of Kevin B. Hendricks (see the figure below) you undertake to convince the questionable director about the importance of SCM. Which of the following answers is not correct according to Hendricks's study?

- Announcements regarding supply chain problems typically have a strong impact on the share price of a listed company. item **The share price typically declines before a supply chain problem is officially announced. One explanation is that negative effects of the glitch are previously published on the social media sites of the company.**
- The day the announcement of a supply chain problem is made, the share price falls dramatically.
- The share price falls rapidly. The stock market acts rationaly because such effects might have severe financial impacts on the organization. A rapid recovery of the share price is not to be expected.

- SCM, amongst other benefits, undertakes to reduce the probability of such supply chain problems.

27.20 Supply Chain Management

A fashion retailer decides to integrate its suppliers by means of EDI. What influences the payback period of the EDI implementation project most significantly?

- The introduction of the most current technology (Best-of-Breed).
- The conclusion or signing of a service contract with the IT service company.
- An e-commerce solution, which facilitates communication with customers.
- **The adoption rate of the EDI-solution by the suppliers.**
- The elimination of paper purchasing costs.

27.21 Supply Chain Management

What is the main reason for enterprises to continuously spend time and money to further develop their suppliers (Lieferantenentwicklung) ?

- Enterprises test their own Project Management skills.
- Enterprises seek access to industrial and trade secrets of their suppliers in order to resell those to other suppliers.
- Enterprises seek to develop their own consulting competence in order to develop new business activities.
- **Despite initital investments, enterprises expect a positive financial impact in the mid to long term.**
- Enterprises can quickly reduce their cost.

27.22 Supply Chain Management

You are the operations and supply chain manager of a big pharmaceutical company. Your boss tells you, that he wants to eliminate all the inventories in the entire company. Which would be the best answer to your boss?

- Correct. Inventories cost money and have to be avoided under any circumstances.
- Not correct. There are hardly and companies which are able to produce everything just-in-time.
- Correct. Other companies have optimized their inventories and have outsourced them to other companies.
- Not correct. Inventories cause costs, which cannot be optimized.
- **Not correct. Having inventories cannot be avoided in certain production processes.**

27.23 Supply Chain Management / ERP

A toy producer wants to introduce an ERP-system. Which of the following five statements is **wrong**?

- Especially for larger companies an ERP-system facilitates the planning and controlling of processes throughout the company.
- The purpose of an ERP-system is to integrate all departments and their functions in one IT-system. A further aim is to prevent redundant storage of data.
- An ERP-system is an enterprise-wide business solution which consists of different software modules (for example production and inventory control, purchasing, sales and distribution, human resources etc.).
- An important success factor in the development and market penetration of ERP-systems has been the rapid development of powerful computer and network systems.
- **ERP systems are responsible for integrating different players in the supply chain.**

27.24 OEE

A pharmaceutical company evaluates two different layouts for the production of the frequently sold drug Öblivion". Both layout types have the same capacity and require the same initial investment. Layout A enables the simultaneous production of 'Oblivion' with four independent machines running in parallel mode. Layout B also uses four machines. These produce 'Oblivion' in sequential mode one after the other. It is assumed that the machines used in the layout A and in the layout B have a typical of between 70% and 90%. What is the respective of layout A and of layout B if in one given month if all the machines have an average of 70%?

- **Layout A 70% and Layout B 24%**
  Parallel: $\frac{70\%+70\%+70\%+70\%}{4} = 70\%$
  Sequentiell: $70\% \cdot 70\% \cdot 70\% \cdot 70\% = 24\%$
- Both Layouts have the same OEE of 70%
- Both Layouts have the same of 210%
- Layout A 23.3% and Layout B 34.4%

27.25 OEE

You work in retail banking and make a time study. The bank has an 8-hour work day. You are observing a team member in the retirement plans section. On average, he takes 51.2 minutes to service a customer. You rate this at 80 out of 100.

Which of the following statements is true?

- Basic time is 8 hours.

- The observed team member is 33% slower than the average
- **The observed team member is 25% slower than the average.**
- The basic time equals 51.2 minutes.
- The basic time equals 68 minutes.

$8h \cdot 80\% = 6.4h => 51.2min \cdot \frac{8h}{6.4h} = 64min => \frac{64min}{51.2min} = 1,25 => 25\% langsamer$

27.26 OEE

You are starting your new job as assistant manager to the chief operating officer of a manufacturing company. Production works in shifts of 8-hours each. All employees can take two 15-minute breaks and one 30-minute meal break per shift. During the breaks the production is stopped. The average downtime of the welding machine is 47 minutes per shift. Its specifications say that it should ideally be run at 60 parts per minute. You analyze that on average 19,271 pieces are produced per shift, out of which 423 do not pass quality control.

Calculate the OEE.

- The Overall Equipment Effectiveness is between 60 and 65%.
- The Overall Equipment Effectiveness is between 50 and 55%.
- None of the answers is correct.
- **The Overall Equipment Effectiveness is between 70 and 75%**
  $8h = 480min$ Abzug: 60 min Pause, 47 min Schweissen, 7 min Qualitätsverlust $\frac{423Teile}{60TeileproMinute}$ $OEE = \frac{377min}{480min} = 76\%$
- Based on the information mentioned in the exersice, the OEE cannot be calculated.

27.27 OEE

Which constituent does not belong in the calculation of the OEE?

- unplanned work interruptions
- slow running machines
- **scheduled servicing**
- irregular interruptions and stoppages
- insufficient quality of production

27.28 EOQ

You have product A and B in your warehouse. At the moment, you reorder 4000 units of A and 2000 of B. Calculate the EOQ with the following information and decide which statement is correct.

- Both products have a yearly demand of 40'000 pieces.
- Product A has inventory holding costs of 0.5 EUR/year and unit.
- Product B has inventory holding costs of 3 $\frac{EUR}{year}$/ and unit.
- The ordering costs per order are 400 EUR for product A, and 600 EUR for product B.
- Product A and B are delivered in boxes of 500 units/box
- **The reordering quantities of product A and B should be doubled**
  $EOQA = \sqrt{\frac{2*40'000*400}{0.5}} = 8000$
  $EOQB = \sqrt{\frac{2*40'000*600}{3}} = 4000$
- The reordering quantity of product B should be halved
- The reordering quantity of product A should be doubled.
- The reordering quantities of product A and B should be interchanged
- The reordering quantities of product A and B are optimal

27.29 EOQ

The operator of a kiosk regularly orders lottery tickets from the countries lottery organization. His customers buy on a regular basis. He sells only one type of lottery tickets. Last year he has sold 5200 lottery tickets. One year ago he bought the kiosk including the sales premises and the operating inventory from his predecessor. He has financed the purchase with a loan. The loan is repayable at any time and carries an interest rate of 3

The lottery organization invoices the operator with an administrative fee of CHF 42.50 for each new order for lottery tickets. This fee covers all expenses for order administration and does not depend on the order size. The effective purchase price per lottery ticket is CHF 8.00. The sales price per lottery ticket is CHF 20.00. Any lottery winnings are paid by the countries lottery organization directly to the winners.

How many orders per year should the operator of the kiosk place?

- 2 orders per year
- **4 orders per year**
  $EOQ = \sqrt{\frac{2 \cdot 5200 \cdot 42.50}{0.03 \cdot 8}} = 1357.08$
  $\frac{5200}{1357.08} = 3.83 -> 4$ Mal bestellen
- 1 order every two years
- 1 order per year
- 8 orders per year

27.30 Lean Management

The Tim&Friends management team has decided to introduce Lean Management (”Lean Supply Chain Management”) in addition to SCM. However the management team members are confused about all these terms and methods. Which of the following proposals is not recommendable?

- Optimize the change between fish and vegetables at the fryers is optimized with SMED (single minute exchange of die).
- Preparation of a value stream map to visualize the entire flow of goods from the suppliers up to the end customers (guests in the restaurant).
- The suppliers deliveries are optimized by applying Heijunka in order to reduce inventories.
- The movements of the employees in the in a service process for an aircraft (e.g. at SR Technics) are visualized in a spaghetti diagram to determine waste (Muda).
- **You make use of the „Enterprise Resource Planning"concept and you eliminate several unnecessary process. steps before you automate cooking processes.**

27.31 Lean Synchronisation

Which action would you recommend a company for its improvement program with the working title "lean synchronization"?

- Optimization of the procurement processes for property, plant, and equipments.
- Changing inventory management to ensure readiness for delivery.
- **Demand-oriented deliveries between manufacturing steps.**
- Gapless logging of downtime.
- Improvement of data synchronization of the ERP system

27.32 Heijunka

Müller Inc. produces tissue toilet paper. The CEO decides to implement a strategic program to increase profitability based on the lean management philosophy. He implements a concept according to the Heijunka principle (continuous flow of goods in small batches) to deliver the products from the production site to school buildings and community centers.

Which implication do you expect?

- Planning in the production department becomes more challenging.
- The production department is able to adapt to changing customer needs less flexibly.
- You would not expect any of the mentioned implications.

- **The production department is able to adopt more flexibly to volatile demands.**
- Planning in the procurement department becomes more challenging.

27.33 Six Sigma

You are responsible for the production of spicy Wasabi-nuts. Recently you receive customer complaints claiming that the nuts are too spicy. Your manager does not want to take a risk and he requires you analyze the situation. A quality control identifies the following results and values: Cp = 1.44 and Cpk= 1.35. What do you report back to your manager?

- You tell him that the situation is not normal and that such quality variation is unusual.
- The case is obvious The AQL (Acceptable Quality Level) method implies that we do not have a quality problem.
- Obviously a Cp-value of 1.33 is exceeded and the quality is therefore not acceptable. The products must be removed from the market.
- **The Cp and the Cpk value are within the typical quality standard for food items of this type (3-Sigma). The process is capable and controlled. There is no cause for concern.**
- The Cp-value is bigger than the Cpk-value. This means that the quality of the nuts is strongly fluctuating. Management must immediately take corrective action.

27.34 Six Sigma

Why is it critial to reduce the variation for increasing process capability and process control?

- You have to measure more frequently.
- Process control is more important than process capability.
- You can adjust the measured values manually.
- Process capability is a prerequisite for process improvements in general.
- **Because your customers demand lower variations.**

Stichwortverzeichnis