#### а

ABC-categorization 153, 155 activity on arrow (AOA) 277–281, 285 activity on node (AON) 277, 278, 284–285, 291–293 actual delivery time 51, 169 actual takt time 38 advanced approach 81, 83, 87 aggregate planning 25, 43, 120, 166 aggregate production planning 120 asset management 42 available stock ( $I_{avail}$ ) 80, 83, 88, 95, 152 average tardiness 170, 181–183, 255 average throughput time, minimization of 171

## b

batch operation time 38 Bertrand, Wortmann and Wijngaard (BWW) 43 first level 45 fourth level 46 second level 45–46 third level 46 bill of materials (BOM) 33, 34, 59, 118, 130, 136 vs. bill-of-distribution 130–132 bucket brigade policy 219, 220 buffer policies 221 bullwhip effect 136, 143, 147–151

#### С

campaign production 187

capacity adjustment 255-256, 265-267 capacity allocation 163, 165-166, 196, 197, 200, 220-221, 240, 248, 252, 255, 262-263, 276, 286 capacity complexity 34-36 capacity planning 44, 45, 119, 120, 143, 166, 189, 242, 243, 287 causal models 61, 62 cell production 219 cherry picking 219 complexity 12, 15, 20, 21, 33-37, 146, 187, 188, 227, 274, 275, 286 confirmed line item performance 56 continuous demand 98, 108, 113, 115-116 continuous review 97-107, 157 controlled stock points 21, 24, 25, 50 correlation coefficient 69 cost-optimal cycle time 201 critical path 275, 277-285, 291-293 critical time 281, 283-285 cross training 219-220 customer order decoupling point (CODP) 17, 19, 20, 28, 31, 120

## d

dead stock 130, 136 decomposition example of 30–32 theorem 236 decouples 17 decoupling point control (DPC) 49, 150 advantages/disadvantages 146–150

Production Control in Practice: A Situation-Dependent Decisions Approach, First Edition. Henny Van Ooijen and Corné Dirne. © 2024 WILEY-VCH GmbH. Published 2024 by WILEY-VCH GmbH.

decoupling point control (DPC) (contd.) assumptions 75 demand pattern 59-60 forecasting methods 60-63 make-to-order situation 150-151 make-to-stock situation 151 on order policy 50 optimal batch size 72-75 performance measures 53-58 real-life situations 51 single period problem 83–84 stock levels 49 on stock policy 50 decoupling points horizontal decomposition 17 vertical decomposition 24 delivery time 8, 11, 20, 28-29, 45, 51-52, 84, 93, 97, 151, 167, 169, 239, 259-260 demand pattern 58-60, 63, 67, 104, 121, 152, 154, 155, 200 dependent demand 52, 59, 60, 146, 149 deterministic situations 52, 94, 169, 227, 249 discrete demand 83, 90, 97, 106, 109, 110.113-114 double exponential smoothing model 70 D-skill chaining 220 due date (DD) 259 determination rules 240-246 oriented priority rules 259

#### е

earliest finish times (EFTs) 280, 290 earliest occurrence times (EOTs) 280–282 earliest starting times (ESTs) 281, 282 echelon inventory position 137–140 echelon lead times downstream 140 echelon stock control system (ESC) 135, 137 concepts 142 line requirements planning 138–139 economical order quantity (EOQ) 72–74, 76, 78, 81, 82, 196 effective processing time 228, 229, 257, 269, 270 EMPRO 223, 224 exception messages 130, 149, 150 exponential smoothing 60, 63, 65, 70–71 external lead time 248 external service level 55

# f

First-Come-First-Served (FCFS) 232. 234, 235, 237, 240, 241, 249, 250, 252, 254, 257, 258, 262, 264.265 fixed amount 109.276 fixed-before-shared policy 221 flexibility, forms of 12 flexible batching 267-268 flow process production application 200-203 characteristics 187 control attention points 189-196 cycle time determination 190-196 capacity-oriented approach 193-194 detailed approach 192-193 one production line 196 variable demand 194–196 definition 187 description 187-189 industries 188 MTO 197-200 capacity allocation 200 sequencing and work order release 198-200 MTS capacity allocation 197 sequencing 196-197 work order release 197 flow shop sequencing problems 173 forecasting error 65-68 forecasting methods causal models 61 demand with trend 67-71 qualitative methods 61

for stationary demand 63–67 types 60 full-time equivalents (FTE) 41

g

goods flow control 12, 23

## h

high capacity complexity 34, 36 horizontal decomposition CODP 19 controlled stock point 21 decoupling point 17 definition 17 logistic sub-functions 16 material management 16 order release and sequencing decisions 16

## i

independent demand 52, 59, 60, 123 internal lead time 248 internal service levels 55 inventory control systems 96, 107, 190 inventory position 50, 80, 95–98, 109, 113, 118, 124, 136–140, 142, 149, 157 inventory turnover ratio 57

# j

job shop problems 184, 185 Johnson's rule 174, 250 Just-in-Case-methods 145 Just-in-Time vs. Just-in-Case 25–28

## l

latest finishing time (LFT) 281, 285 latest occurrence time (LOT) 281, 282 latest starting times (LSTs) 281, 282 lead time control 45 lead time reliability application 263–265 capacity allocation 262–263 sequencing 259–262 work order release 263

length of the routing 17 linear regression models 62, 68-70 line balancing 209 line requirements planning (LRP) 52, 53, 135, 138-143, 149 Little's law 171 logistic planning and control (LPC) 7, 41 operator capacity 42 production 43 logistics 3 concepts 7-10 planning and control 6-7 push vs. pull in 28–30 structure sunroof 31 transformation processes 4, 5 low-level codes (LLC) 118, 124, 150

#### m

makespan 170–178, 183, 185 manufacturing resources planning (MRP-II) 119-121 Markets-Output-Process-Control-Organisation-Information 8 mass assembly application 222-224 capacity allocation 220-221 sequencing 220 work order release 221-222 mass assembly/flow production 35, 36 mass assembly production general description 205-207 main control attention points 207-220 non-pure flow production 206 pure flow production 208-209 no availability of efficient technology 212-213 different processing times 209-210 different products 211-212 disturbances at the work centers 212 variable processing times 211 variety of routings 213-214 master production schedule (MPS) 52, 120, 138, 149, 150 material complexity 33, 35, 36, 187

material coordination 45 material management 16 material requirements planning (MRP-I) 52.117-119 material resource planning (MRP) 43, 45, 53, 55, 86, 117-140, 142, 149-151.153 MaxGap Policy 221 maximum level 96, 98, 109–110 Maxload Policy 221 MaxQueueGap Policy 221 MaxQueue Policy 221 minimum order quantity (MOQ) 79, 109, 125 minimum slack first rule 289 mixed model production 211, 221 mix-flexibility 166 moving average model 63, 64 multi-model production 211, 221 multiple operations 171, 173–178, 266 multiple order rule (nQ-rule) 125 multiple projects 276, 286, 289

### n

Newsvendor Problem 83, 85, 87–90 non-systematic error 66 no variable order-related costs 79–80

## 0

objective forecasting 60 operation due date (ODD) 166, 239, 244, 245, 255, 256, 259, 260, 266 operations, transformation steps 10 optimal approach 81, 82, 87, 88 optimal order quantity 72, 89 orders 11, 17 release 17

## р

parallel servers 232, 234 part period balancing (PPB) method 76 periodic review 99–100, 107–109, 157 period order quantity (POQ) 76, 149 planned delivery time 51, 169 priority control 46, 159, 163–165, 167 priority policy 221 priority rule, SPT 185 probability density function 106, 113, 115.231 processing time, defined 11 process-wise production systems 35, 187 production control complexity, uncertainty, and flexibility 12 concepts 11 definition 3 production on demand 50 production orders 16, 18, 23, 34, 37, 42, 43, 49, 52, 120-122, 125, 163, 166, 167, 189, 228, 230, 256, 263 production unit control (PCU) 12, 15, 23, 33, 46, 49, 159, 187, 205, 227, 273.275 production unit, organizational department 21 project-based production 273 activity on node networks 284-285 application 291–294 construction of a network 276-285 control attention points 275-285 critical path and project duration 279-281 description 273-274 non-recurring activity 279 production control decisions 286-291 capacity allocation 286-288 sequencing 286 work order release 290-291 work order scheduling 289-290 stochastic activity times 282-284 project shops 37, 159, 273-275, 286 project-wise production 37, 286 promised delivery time 8, 51 P2-service level 54, 55, 105 pure project shop 274 pure rotation cycle 196

## q

quantitative methods 60, 61 quantitative models 214 two stations with failures 216–218 two stations without failures 215–216 quantity discount 57, 78–79, 84, 157 queueing theory 227, 230–237

#### r

RANDOM rule 170, 249, 261 RDM 240, 241 relaxing assumptions 183-185 relocating operators 252, 254 remaining slack (RS) 247, 260, 261 remaining slack per operation (RSO) 260-262, 264 reorder level 96-109, 113-117, 124, 136, 142, 143, 149 reorder point systems 93–96, 101, 146 repetitive project shop 159, 273 requested line item performance 56 required reaction time 41, 45 required takt time 38 rescheduling assumption 132 routing, defined 10, 34

### S

safety stock 60, 101, 105, 106, 112, 128, 136, 137, 140, 145, 148-151, 156, 194, 197 scheduled receipts 122, 124, 126, 128, 130, 132, 149 sequencing orders with a delivery date 178-183 with different routings 184–185 without delivery date 171 service level 53-58, 104-106, 136, 139, 145, 146, 157 shortest processing time rule (SPT) 171, 179, 183, 185, 245-247, 249-251, 261, 262, 265 short-term capacity adjustment 265-267 Silver-Meal-algorithm 77-78 single item single echelon situation (SISE) 136 single linear regression model 62 single project 275, 276, 286, 290 small series production 36, 227

control attention points 229-248 decisions 248-263 description 227-229 internal vs. external due date 248 lead time reliability related aspects 239 - 248throughput time capacity allocation 252-256 related aspects 236–239 sequencing 249-252 work order release/work order detail planning 256-259 static production situations 159, 169-185 stationary demand 63-67, 104, 149 stochastic situation 51, 52, 164, 169, 171, 227 subjective forecasting 60 sunroof 30-32 systematic error 66, 68

### t

takt time 38, 207–211, 213, 220, 222 technical stock  $(I_{phys})$  95 throughput time production units 37–39 t-period probability function 113 transformation process 3–7, 9–11, 163 transition matrix 235, 263 Travelling Salesman problem 183

#### и

unbiased forecasting model 66 uncertainty 12, 21, 35–37, 60, 93, 100, 108, 117, 128, 130, 136, 149, 151, 157, 190, 228, 273, 274, 282–284, 286 uptime (UT) 217 utilization planning 45, 46, 189, 190

### V

VEGPRO 200, 202 VEPA 263–265 vertical decomposition controlled stock points 24 decoupling point 24

vertical decomposition (*contd.*) decoupling point control 22 definition 23 for operator capacity 42 order release decisions 23 production unit control 23 volume flexibility 165, 166, 188

### W

Wagner–Whitin algorithm 77, 78, 84, 86–87 weighted average throughput times 171–172 weighted moving average 63–65 work centers, defined 10 workflow 10 Work In Next Queue rule (WINQ) 249, 250 workload acceptance 44 workload control 46, 167, 171, 257, 268–270 work order acceptance 46, 166 work order detail planning 46, 163, 164, 166–168, 190, 230, 248, 256–259 work order release, production unit level 46

## X

XYZ-categorization 153-155

## Z

zoned craft policy 221