

The Good, the Bad and the Mediocre: Creating Insightful Stories on Process Improvement

Supplementary file

Model equations

perceived delivery dependability=

$$\text{SMOOTH}(\text{throughput time competitors}/\text{throughput time}, \text{ST market}, \text{INI perceived delivery dependability})$$

~ Dmnl

~ |

perceived quality level=

$$\text{SMOOTH}(\text{quality level}/(\text{quality level competitors}), \text{ST market}, \text{INI perceived quality level})$$

~ Dmnl

~ |

perceived price level=

$$\text{SMOOTH}(\text{price}/(\text{price level competitors}), \text{ST market}, \text{INI price level})$$

~ Dmnl

~ |

management's program commitment=

$$\text{SMOOTH}((\text{E perceived financial effort on commitment} + \text{E improvement results on commitment})/2, \text{ST management's commitment})$$

~ Dmnl

~ |

Perceived financial effort for process improvement=

$$\text{XIDZ}(\text{expenses for process improvement}, (\text{revenues} - \text{expenses}), \text{expenses for process improvement}/1\text{e-}012)$$

~ Dmnl

~ |

E perceived financial effort on commitment=

$$\text{T E perceived financial effort on commitment}(\text{Perceived financial effort for process improvement})$$

~ Dmnl

~ |

T E perceived financial effort on commitment(

$$[(-1,0)-(-1,1)], (-1,0), (0,0), (0,1), (0,1,1), (0,2,0.75), (0,3,0.5), (0,4,0.25), (0,5,0.125), (0,6,0.075), (0,7,0.0375), (0,8,0.01875), (0,9,0))$$

~

~ |

expenses for process improvement=

$$\text{budget for improvements}/\text{days per year}$$

~ €Day

~ |

ST management's commitment=

$$360$$

~ Day
~ |

INI price level=

1
~ Dmnl
~ |

budget for improvements= GAME (
normal budget for improvements)

~ €
~ |

accumulated profits= INTEG (

revenues-expenses-expenses for process improvement-expenses for process improvement,
INI finanzielle mittel)
~ €
~ ~ :SUPPLEMENTARY
|

INI fraction of accumulated profits for process improvements=

0.1
~ Dmnl
~ |

normal budget for improvements= INITIAL(

INI finanzielle mittel*INI fraction of accumulated profits for process improvements)
~ €
~ |

expected results processes' quality=

workers' effort in process improvement*LN(2)*INI likelihood of defects introduction\
"expected half-life time"
~ Dmnl/Day
~ |

expected results quality control=

workers' effort in process improvement*LN(2)*INI quality control/"expected half-life time"
~ Dmnl/Day
~ |

expected results processing time=

workers' effort in process improvement*LN(2)*INI processing time/"expected half-life time"
~ Dmnl
~ |

T E improvement results on commitment(

[(0,0)-(2,1.5)],(0,0.25),(0.5,0.5),(1,1),(1.5,1.25),(2,1.5))
~ Dmnl
~ |

average salaries=

2500
~ €(Worker*Month)
~ |

perceived improvement results=

(perceived results workers' productivity+perceived results machinery down time+perceived results
processing time\
+perceived results suppliers' quality+perceived results processes' quality+perceived results
quality control\
) / 6

~ Dmnl
~ |

"max. likelihood of defects introduction"=
0.4

~ Dmnl
~ |

expected results machinery down time=

workers' effort in process improvement*LN(2)*INI machinery down time/"expected half-life time"
~ Dmnl/Day
~ |

"min. processing time"=

1
~ Day
~ |

expected results workers' productivity=

workers' effort in process improvement*LN(2)*INI worker productivity/"expected half-life time"
~ Dmnl/Day
~ |

"expected half-life time"=

200
~ Day
~ |

perceived results workers' productivity=

gains in worker productivity/expected results workers' productivity
~ Dmnl
~ |

expected results suppliers' quality=

workers' effort in process improvement*LN(2)*INI fraction of defects from suppliers/
"expected half-life time"
~ Dmnl/Day
~ |

perceived results machinery down time=

improvements in machinery down time/expected results machinery down time
~ Dmnl
~ |

perceived results processing time=

improvements in processing time/expected results processing time
~ Dmnl
~ |

perceived results quality control=

improvements in quality control/expected results quality control
~ Dmnl
~ |

E improvement results on commitment=

T E improvement results on commitment(perceived improvement results)
~ Dmnl
~ |

perceived results processes' quality=

improvements in likelihood of defects introduction/expected results processes' quality
~ Dmnl

~ |
 perceived results suppliers' quality=
 improvements in suppliers' quality/expected results suppliers' quality
 ~ Dmnl
 ~ |

captial unit costs=
 (KAPITALKOSTEN+perceived inventory turnover*INTERNER ZINSSATZ*material costs)/net
 production rate
 ~ €Unit
 ~ |

unit costs=
 (unit labor costs+material costs+captial unit costs)
 ~ €Unit
 ~ |

unit labor costs=
 average salaries/days per month*work force/net production rate
 ~ €Unit
 ~ |

focus machinery down time= GAME (
 INI effort for machinery down time/SUM INI improvement effort)
 ~ Dmnl
 ~ |

focus quality control= GAME (
 INI effort quality control/SUM INI improvement effort)
 ~ Dmnl
 ~ |

gains in worker productivity=
 ("max. worker productivity"-worker productivity)*LN(2)*workers' effort in process improvement\
 *effort worker productivity
 /"half-life time worker productivity"
 ~ Unit/(Worker*Day*Day)
 ~ |

improvements in processing time=
 (processing time-"min. processing time")*LN(2)/"half-life time processing time"*workers' effort in
 process improvement
 *effort processing time
 ~ Day/Day
 ~ |

improvements in likelihood of defects introduction=
 (likelihood of defects introduction-"min. likelihood of defects introduction")*LN(2)\
 /"half-life time likelihood of defects introduction"
 *effort for likelihood of defects introduction*workers' effort in process improvement
 ~ Dmnl/Day
 ~ |

improvements in suppliers' quality=
 (fraction of defects from suppliers-"min. fraction of defects from suppliers"
)/"half-life time fraction of defects from suppliers"*LN(2)*workers' effort in process improvement
 *effort fraction of defects from suppliers
 ~ Dmnl/Day
 ~ |

improvements in machinery down time=

$\text{LN}(2) * (\text{machinery down time} - \text{min. machinery down time}) / \text{"half-life time machinery down time"}$
 *effort for machinery down time
 *workers' effort in process improvement
 ~ Dmnl/Day
 ~ |

improvements in quality control=
 $(\text{"max. quality control"} - \text{quality control}) * \text{LN}(2) * \text{workers' effort in process improvement}$
 *effort quality control
 /"half-life time quality control"
 ~ Dmnl/Day
 ~ |

effort for machinery down time=
 focus machinery down time * SUM INI improvement effort
 ~ Dmnl
 ~ |

effort quality control=
 focus quality control * SUM INI improvement effort
 ~ Dmnl
 ~ |

focus processing time= GAME (
 INI effort processing time / SUM INI improvement effort)
 ~ Dmnl
 ~ |

focus worker productivity= GAME (
 INI effort worker productivity / SUM INI improvement effort)
 ~ Dmnl
 ~ |

focus likelihood of defects introduction= GAME (
 INI effort for likelihood of defects introduction / SUM INI improvement effort)
 ~ Dmnl
 ~ |

effort for likelihood of defects introduction=
 focus likelihood of defects introduction * SUM INI improvement effort
 ~ Dmnl
 ~ |

focus on fraction of defects from suppliers= GAME (
 INI effort fraction of defects from suppliers / SUM INI improvement effort)
 ~ Dmnl
 ~ |

effort worker productivity=
 focus worker productivity * SUM INI improvement effort
 ~ Dmnl
 ~ |

effort processing time=
 focus processing time * SUM INI improvement effort
 ~ Dmnl
 ~ |

effort fraction of defects from suppliers=
 focus on fraction of defects from suppliers * SUM INI improvement effort
 ~ Dmnl
 ~ |

likelihood of defects introduction= INTEG (
 deteriorations in likelihood of defects introduction-improvements in likelihood of defects introduction\
 ,
 INI likelihood of defects introduction)

~ Dmnl
 ~ |

"max. processing time"=

3
 ~ Day
 ~ |

quality control= INTEG (

-deteriorations in quality control+improvements in quality control,
 INI quality control)

~ Dmnl
 ~ |

deteriorations in suppliers' quality=

("max. fraction of defects from suppliers"-fraction of defects from suppliers
)*LN(2)/ET fraction of defects from suppliers

~ Dmnl/Day
 ~ |

"max. machinery down time"=

0.2
 ~ Dmnl
 ~ |

SUM INI improvement effort= INITIAL(

INI effort worker productivity+INI effort for likelihood of defects introduction+INI effort processing
 time\

+INI effort fraction of defects from suppliers+INI effort for machinery down time+INI effort
 quality control\

)
 ~ Dmnl
 ~ |

fraction of defects from suppliers= INTEG (

deteriorations in suppliers' quality-improvements in suppliers' quality,
 INI fraction of defects from suppliers)

~ Dmnl
 ~ |

machinery down time= INTEG (

-improvements in machinery down time+deteriorations in machinery down time,
 INI machinery down time)

~ Dmnl
 ~ |

worker productivity= INTEG (

-loses in worker productivity+gains in worker productivity,
 INI worker productivity)

~ Unit/(Worker*Day)
 ~ |

INI effort for likelihood of defects introduction= INITIAL(

(LN(2)/ET likelihood of defects introduction)*("max. likelihood of defects introduction"\
 -INI likelihood of defects introduction)/(workers' effort in process improvement

(LN(2)/"half-life time likelihood of defects introduction")(INI likelihood of defects introduction\
 -"min. likelihood of defects introduction"

)))
~ Dmnl
~ |

INI effort processing time= INITIAL(
(LN(2)/ET processing time)*("max. processing time"-INI processing time)/(workers' effort in process
improvement\

LN(2)/"half-life time processing time")(INI processing time-"min. processing time"
)))
~ Dmnl
~ |

INI effort fraction of defects from suppliers= INITIAL(
(LN(2)/ET fraction of defects from suppliers)*("max. fraction of defects from suppliers"\
-INI fraction of defects from suppliers
)/(workers' effort in process improvement*LN(2)/"half-life time fraction of defects from suppliers"\
)*INI fraction of defects from suppliers
-"min. fraction of defects from suppliers"
)))

~ Dmnl
~ |

INI effort for machinery down time= INITIAL(
(LN(2)/ET machinery down time)*("max. machinery down time"-INI machinery down time
)/(workers' effort in process improvement*LN(2)/"half-life time machinery down time"\
)*INI machinery down time
-"min. machinery down time"
)))

~ Dmnl
~ |

INI effort quality control= INITIAL(
(INI quality control-MINIMALER ANTEIL FEHLERENTDECKUNG)*LN(2)/ET quality
control/((("max. quality control"\
-INI quality control)*LN(2)*workers' effort in process improvement
/"half-life time quality control"))

~ Dmnl
~ |

deteriorations in likelihood of defects introduction=
("max. likelihood of defects introduction"-likelihood of defects introduction)*LN(2)\
/ET likelihood of defects introduction

~ Dmnl/Day
~ |

deteriorations in machinery down time=
("max. machinery down time"-machinery down time)*LN(2)/ET machinery down time

~ Dmnl/Day
~ |

"max. fraction of defects from suppliers"=

0.4
~ Dmnl
~ |

GAME INTERVAL=

GAME(30)
~ Day
~ ~ :SUPPLEMENTARY
|

program commitment workers= INTEG (

(change in workers' commitment+E management on workers' commitment),
INI workers' commitment)
~ Dmnl
~ |

"min. worker productivity"=
8
~ Unit/(Day*Worker)
~ |

MINIMALER ANTEIL FEHLERENTDECKUNG=
0.8
~ Dmnl
~ |

processing time= INTEG (
deteriorations in processing time-improvements in processing time,
INI processing time)
~ Day
~ |

deteriorations in quality control=
(quality control-MINIMALER ANTEIL FEHLERENTDECKUNG)*LN(2)/ET quality control
~ Dmnl/Day
~ |

loses in worker productivity=
(worker productivity-"min. worker productivity")*LN(2)/ET worker productivity
~ Unit/(Worker*Day*Day)
~ |

ET machinery down time=
1080
~ Day
~ |

INI effort worker productivity= INITIAL(
(INI worker productivity-"min. worker productivity")*LN(2)/ET worker productivity/((
"max. worker productivity"
-INI worker productivity)*LN(2)*workers' effort in process improvement
/"half-life time worker productivity"))
~ Dmnl
~ |

deteriorations in processing time=
("max. processing time"-processing time)*LN(2)/ET processing time
~ Day/Day
~ |

INI workers' commitment= INITIAL(
0.786821)
~ Dmnl
~ |

machinery capacity=
10000*(1-machinery down time)
~ Unit/Day
~ |

T E market share on margin(
[(0,0)-(2,2)],(2,2),(1.3,2),(1.2,1.75),(1.1,1.5),(1.05,1.1),(1,1),(0.95,0.9),(0.9,0.5\
) ,(0.8,0.25),(0.7,0),(0,0))

~ Dmnl
~ |

E market share on margin=

T E market share on margin(market share/desired market share)

~ Dmnl
~ |

price=

SMOOTH(unit costs*(1+desired margin*E market share on margin), AT price)

~ €Unit
~ |

desired market share=

INI traditional market share

~ Dmnl
~ |

decline in memories in lay offs=

perceived job security/ST forgetting lay offs

~ Dmnl/(Day*Day)
~ |

willingness to hire=

GAME(1)

~ Dmnl
~ |

INI experience level=

"averag. experiences new recruits"*hiring+ on the job experiences/(1/DT forgetting time experiences\
+1/work force*(laying off+fluctuation+on the job experiences/"max. averag. experience level"\
)

~ Hour
~ |

fraction of workers' productivity for training=

(1-training effort-fraction of training effort)

~ Dmnl
~ |

INI workers' productivity=

10
~ Unit/(Worker*Day)
~ |

INI perceived quality level=

1
~ Dmnl
~ |

INI perceived delivery dependability=

1
~ Dmnl
~ |

fraction of training effort=

"max. fraction working day for improvements"*program commitment workers

~ Dmnl
~ |

INI training level=

"averag. training new recruits"*hiring+intensity of training*work force/(1/DT forgetting time training\
)

+1/work force*(fluctuation+laying off)+intensity of training/"max. averag. training level"
)
 ~ Hour
 ~ |

workers' effort in process improvement=
 "averag. improvement capabilities worker"*program commitment workers
 ~ Dmnl
 ~ |

gains in experience through hiring=
 "averag. experiences new recruits"*hiring
 ~ Hour/Day
 ~ |

ST workers' productivity=
 30
 ~ Day
 ~ |

DT forgetting time experiences=
 1800
 ~ Day
 ~ |

work day=
 8
 ~ Hour/(Day*Worker)
 ~ |

ordering=
 customer order rate
 ~ Unit/Day
 ~ |

E commitment on gains in commitment=
 T E commitment on gains in commitment(program commitment workers)
 ~ Dmnl
 ~ |

expenses=
 unit costs*net production rate
 ~ €Day
 ~ |

desired management support per worker=
 1
 ~ Hour/Worker/Day
 ~ |

desired management support=
 work force*desired management support per worker*program commitment workers
 ~ Hour/Day
 ~ |

T effekt arbeitsplatzsicherheit auf commitment(
 [(0,-1)-(0.1,0)],(0,0),(0.0075,-0.35),(0.02,-0.6),(0.035,-0.825),(0.06,-0.95),(0.07,\
 -0.975),(0.09,-1),(0.1,-1))
 ~ Dmnl
 ~ |

T E commitment on gains in commitment(

[(0,0)-(1,1)],(0,0),(0.25,0.5),(0.3,0.58),(0.35,0.65),(0.42,0.72),(0.5,0.75),(0.58,0.72)\
(0.64,0.67),(0.69,0.6),(0.75,0.5),(1,0))
~ Dmnl
~ |

T E price on market share(
[(0.75,0)-(1.25,1.6)],(0.75,1.6),(0.8,1.4),(0.85,1.25),(0.9,1.15),(0.95,1.05),(1,1),\
(1.05,0.95),(1.1,0.85),(1.15,0.75),(1.2,0.6),(1.25,0.4))
~ Dmnl
~ |

gross production rate=
min(production capacity,WIP/processing time)
~ Unit/Day
~ |

fluctuation=
work force/DT membership
~ Worker/Day
~ |

market share=
E quality on market share*E price on market share*E delivery dependability on market share\
*traditional market share
~ Dmnl
~ |

training effort=
intensity of training*work day
~ Dmnl
~ |

throughput time=
backlog/net production rate
~ Day
~ |

throughput time competitors= INITIAL(
throughput time*INI perceived delivery dependability)
~ Day
~ |

"average. lay offs"=
laying off/work force
~ Dmnl/Day
~ |

DT membership=
7200
~ Day
~ |

"averag. improvement capabilities worker"=
E experiences on improvement capabilities*"averag. training level"/"max. averag. training level"
+E training on improvement capabilities
*"averag. experiences"/"max. averag. experience level"
~ Dmnl
~ |

"averag. experiences"=
workers' experiences/work force
~ Hour/Worker

~ |

"averag. experiences new recruits"=
0.1
~ Hour/Worker
~ |

"averag. training level"=
workers' training level/work force
~ Hour/Worker
~ |

"averag. training new recruits"=
0.1
~ Hour/Worker
~ |

E delivery dependability on market share=
T E delivery dependability on market share(perceived delivery dependability)
~ Dmnl
~ |

E management support=
T E management support(desired management support/management support)
~ Dmnl
~ |

E quality on market share=
T E quality on market share(perceived quality level)
~ Dmnl
~ |

E perceived job security on commitment=
T effekt arbeitsplatzsicherheit auf commitment(perceived job security)
~ Dmnl
~ |

perceived fluctuation=
SMOOTH(fluctuation, ST fluctuation)
~ Worker/Day
~ |

E experiences on gain in experiences=
MAX(1-"averag. experiences"/"max. averag. experience level",0)
~ Dmnl
~ |

E price on market share=
T E price on market share(perceived price level)
~ Dmnl
~ |

E training on gain in training=
MAX(1-"averag. training level"/"max. averag. training level",0)
~ Dmnl
~ |

E management on workers' commitment=
(management's program commitment-program commitment workers)/days per year
~ Dmnl/Day
~ |

E experiences on improvement capabilities=

0.2
~ Dmnl
~ |

E training on improvement capabilities=

0.8
~ Dmnl
~ |

increase in memories in lay offs=

MAX("average. lay offs"-perceived job security, 0)/ST memmroies lay offs
~ Dmnl/(Day*Day)
~ |

hiring=

willingness to hire*MAX(Workerlücke/EINSTELLUNGVERZÖGERUNGSZEIT+perceived
fluctuation\
,0)
~ Worker/Day
~ |

EINSTELLUNGVERZÖGERUNGSZEIT=

90
~ Day
~ |

laying off=

willingness to lay off*MAX(Workerlücke*(-1),0)/DT laying off
~ Worker/Day
~ |

willingness to lay off=

GAME(1)
~ Dmnl
~ |

DT laying off=

90
~ Day
~ |

on the job experiences=

work force*program commitment workers*work day*"max. fraction working day for improvements"
~ Hour/Day
~ |

workers' experiences= INTEG (

gains in experience through hiring+gains in experience-loses in experience from fluctuation and laying
off\
-loses in experiences from forgetting,
INI experience level)
~ Hour
~ |

loses in experience from fluctuation and laying off=

"averag. experiences"*(laying off+fluctuation)
~ Hour/Day
~ |

loses in experiences from forgetting=

workers' experiences/DT forgetting time experiences

~ Hour/Day
~ |

gains in experience=

E experiences on gain in experiences*on the job experiences

~ Hour/Day
~ |

perceived job security= INTEG (

+increase in memmories in lay offs-decline in memmories in lay offs,
laying off/work force)

~ Dmnl/Day
~ |

DT forgetting time training=

1800

~ Day
~ |

perceived inventory turnover=

SMOOTH(inventory turnover, ST perceived inventory turnover)

~ Day
~ |

work force= INTEG (

hiring-laying off-fluctuation,
desired work force)

~ Worker
~ |

intensity of training=

management's training goal*"max. averag. training level"/days per year

~ Hour/(Day*Worker)
~ |

T E delivery dependability on market share(

[(0,0)-(2,1)],(0,0.4),(0.3,0.425),(0.575,0.525),(0.8,0.7),(0.9,0.9),(1,1),(2,1))

~ Dmnl
~ |

T E management support(

[(0,-1)-(2,1)],(0,1),(1,1),(1.05,0.825),(1.1,0.025),(1.25,-0.55),(1.35,-0.8),(1.5,-0.95\

),(2,-1))
~ Dmnl
~ |

T E quality on market share(

[(0.75,0)-(1.25,2)],(1.25,1.6),(1.2,1.4),(1.15,1.25),(1.1,1.15),(1.05,1.05),(1,1),(0.95\

,0.95),(0.9,0.85),(0.85,0.75),(0.8,0.6),(0.75,0.4))
~ Dmnl
~ |

ST memmroies lay offs=

1
~ Day
~ |

desired production rate=

desired throughput/perceived process yield

~ Unit/Day
~ |

ST forgetting lay offs=
1800

~ Day

~

days per year=

360

~ Day

~

traditional market share=

SMOOTHi(market share,ST market share,INI traditional market share)

~ Dmnl

~

ST fluctuation=

14

~ Day

~

price level competitors= INITIAL(

INI price level*price)

~ €Unit

~

production capacity=

min(machinery capacity,fraction of labor productivity for production)

~ Unit/Day

~

workers' training level= INTEG (

gains in training through hiring+training-loses in training from fluctuation and laying off\

-loses in training from forgetting,

INI training level)

~ Hour

~

gains in training through hiring=

hiring*"averag. training new recruits"

~ Hour/Day

~

loses in training from fluctuation and laying off=

"averag. training level"*(laying off+fluctuation)

~ Hour/Day

~

loses in training from forgetting=

workers' training level/DT forgetting time training

~ Hour/Day

~

fraction of labor productivity for production=

work force*worker productivity*(1-training effort-fraction of training effort)

~ Unit/Day

~

customer order rate=

market demand*market share

~ Unit/Day

~

WOM=

E commitment on gains in commitment*(E management support+E perceived job security on commitment)
+E improvement results on commitment)/3
~ Dmnl
~ |

ST market share=

360
~ Day
~ |

desired work force=

desired gross production rate/Perceived Workers' Productivity/fraction of workers' productivity for training
~ Worker
~ |

change in workers' commitment=

WOM/T communication
~ Dmnl/Day
~ |

training=

intensity of training*work force*E training on gain in training
~ Hour/Day
~ |

Workerlücke=

desired work force-work force
~ Worker
~ |

Perceived Workers' Productivity=

SMOOTHi(worker productivity, ST workers' productivity,INI workers' productivity)
~ Unit/(Day*Worker)
~ |

T communication=

30
~ Day
~ |

INI traditional market share=

0.1
~ Dmnl
~ |

"max. averag. training level"=

40
~ Hour/Worker
~ |

management's training goal=

GAME(0.5)
~ Dmnl
~ |

quality level=

1-fraction of defects in supply
~ Dmnl
~ |

"max. fraction working day for improvements"=

GAME(0.1)

~ Dmnl

~

"max. averag. experience level"=

100

~ Hour/Worker

~

management support=

desired management support per worker*work force*management's program commitment

~ Hour/Day

~

quality level competitors= INITIAL(

INI perceived quality level*quality level)

~ Dmnl

~

INI perceived process yield=

1-quality control*(likelihood of defects introduction-likelihood of defects introduction\
*fraction of defects from suppliers

+fraction of defects from suppliers)

~ Dmnl

~

perceived process yield=

SMOOTHi(ratio net to gross production , ST process yield ,INI perceived process yield\
)

~ Dmnl

~

INI finanzielle mittel=

1e+006

~ €

~

revenues=

net production rate*price

~ €/Day

~

ET processing time=

1080

~ Day

~

ET quality control=

1080

~ Day

~

ET worker productivity=

1080

~ Day

~

ET fraction of defects from suppliers=

1080

~ Day

~ |
 AT price=
 30
 ~ Day
 ~ |
 desired margin=
 GAME(0.15)
 ~ Dmnl
 ~ |
 KAPITALKOSTEN=
 100
 ~ €
 ~ |
 days per month=
 30
 ~ Day/Month
 ~ |
 deliveries=
 DELAY1(orders,DT deliveries)
 ~ Unit/Day
 ~ |
 fraction of defects in supply=
 ZIDZ(undetected defects,net production rate)
 ~ Dmnl
 ~ |
 market demand=
 5000
 ~ Unit/Day
 ~ |
 material costs=
 10
 ~ €Unit
 ~ |
 INTERNER ZINSSATZ=
 0.1
 ~ Dmnl
 ~ |
 undetected defects=
 defects in production-defects elimination
 ~ Unit/Day
 ~ |
 ST market=
 60
 ~ Day
 ~ |
 desired WIP level=
 desired production rate*processing time
 ~ Einheit
 ~ |

defects elimination=
quality control*defects in production
~ Unit/Day
~ |

INI quality control=
0.9
~ Dmnl
~ |

WIP= INTEG (
+feeding in processes-gross production rate,
desired WIP level)
~ Unit
~ |

"max. quality control"=
1
~ Dmnl
~ |

"half-life time quality control"=
150
~ Day
~ |

"max. worker productivity"=
12
~ Unit/(Worker*Day)
~ |

INI worker productivity=
10
~ Unit/(Day*Worker)
~ |

"half-life time worker productivity"=
350
~ Day
~ |

INI fraction of defects from suppliers=
0.2
~ Dmnl
~ |

INI processing time=
2
~ Day
~ |

"min. fraction of defects from suppliers"=
0
~ Dmnl
~ |

"min. machinery down time"=
0
~ Dmnl
~ |

"half-life time machinery down time"=

500
~ Day
~ |

"half-life time processing time"=
400
~ Day
~ |

"half-life time fraction of defects from suppliers"=
700
~ Day
~ |

"half-life time likelihood of defects introduction"=
400
~ Day
~ |

"min. likelihood of defects introduction"=
0
~ Dmnl
~ |

inventory turnover=
inventory turnover WIP+inventory turnover materials
~ Day
~ |

INI likelihood of defects introduction=
0.2
~ Dmnl
~ |

feeding in processes=
min(desired gross production rate,materials/setup time)
~ Unit/Day
~ |

ET likelihood of defects introduction=
1080
~ Day
~ |

orders=
MAX(0, desired gross production rate+correction materials)
~ Unit/Day
~ |

ratio net to gross production=
ZIDZ(net production rate, gross production rate)
~ Dmnl
~ |

desired materials=
desired gross production rate*desired materials coverage
~ Unit
~ |

inventory turnover materials=
ZIDZ(materials, feeding in processes)
~ Day

INI machinery down time=
0.1
~ Dmnl
~

setup time=
1
~ Day
~

inventory turnover WIP=
ZIDZ(WIP, net production rate)
~ Day
~

ST perceived inventory turnover=
7
~ Day
~

ST process yield=
7
~ Day
~

defects in materials= INTEG (
defects form supplier-defects feeding in processes,
fraction of defects from suppliers*desired materials)
~ Unit
~

defects in WIP= INTEG (
defects feeding in processes+defects introduction due to processes-defects in production\
,
feeding in processes*(likelihood of defects introduction-likelihood of defects introduction\
*fraction of defects in materials+fraction of defects in materials)*processing time\
)
~ Unit
~

defects introduction due to processes=
likelihood of defects introduction*(feeding in processes-defects feeding in processes\
)
~ Unit/Day
~

delivering=
net production rate
~ Unit/Day
~

materials= INTEG (
+deliveries-feeding in processes,
desired materials)
~ Unit
~

net production rate=
gross production rate-defects elimination
~ Unit/Day

~ |
 backlog= INTEG (
 ordering-delivering,
 desired throughput time*ordering)
 ~ Unit
 ~ |
 desired materials coverage=
 14
 ~ Day
 ~ |
 correction time materials=
 14
 ~ Day
 ~ |
 desired gross production rate=
 MAX(0,desired production rate+correctionWIP)
 ~ Unit/Day
 ~ |
 correction materials=
 (desired materials-materials)/correction time materials
 ~ Unit/Day
 ~ |
 desired throughput=
 backlog/desired throughput time
 ~ Unit/Day
 ~ |
 desired throughput time=
 2
 ~ Day
 ~ |
 correctionWIP=
 (desired WIP level-WIP)/correction time WIP
 ~ Unit/Day
 ~ |
 correction time WIP=
 7
 ~ Day
 ~ |
 DT deliveries=
 7
 ~ Day
 ~ |
 fraction of defects in WIP=
 defects in WIP/WIP
 ~ Dmnl
 ~ |
 defects in production=
 gross production rate*fraction of defects in WIP
 ~ Unit/Day
 ~ |

defects from supplier=
deliveries*fraction of defects from suppliers
~ Unit/Day
~ |

defects feeding in processes=
fraction of defects in materials*feeding in processes
~ Unit/Day
~ |

fraction of defects in materials=
defects in materials/materials
~ Dmnl
~ |