ERASMUS+ KA2 Strategic Partnership
2017-1-FI01-KA203-034721
HELP – Healthcare Logistics Education and Learning Pathway

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UTBILDNINGSSTYRELSEN

Logistics: basics

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0. Agenda

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Overview

1. What ?
2. Logistics terminology
3. Decision support tools for logistics
4. Logistics performance
5. Logistics projects

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1. What ?

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Leitmotiv

"logistics is not "happening" to you,
logistics can be managed and optimized"

Logistics management is important

impact on high quality, safe patient care

impact on budgets and spending

impact on providing a professional work environment

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What is “logistics” ?

For want of a nail, a shoe was lost;
for want of a shoe, a horse was lost;
for want of a horse, a message was lost;
for want of a message, a battle was lost,
for want of a battle, a war was lost;
for want of war, a kingdom was lost;
and all for the loss of a nail.

Outlandish Proverbs – Herbert, 1640

Logistics is about providing

“the right ‘thing’
at the right place,
at the right time,
in the right way,
in the right condition,
at the right cost”

patients, staff, materials, devices, information

as planned

safe

prepared, temperature-controlled

trade-off service vs cost

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History

Think e.g. of Hannibal

Pioneers:
H. Ford
F. Taylor
F. & L. Gilbreth

Including hospitals

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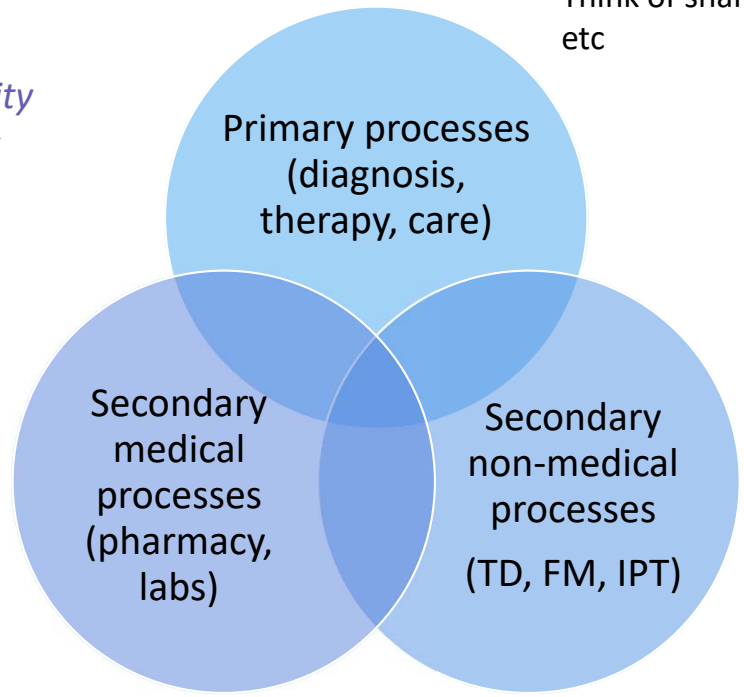
Types of logistic flows

Very diverse in nature
Variable levels of complexity
Lot of interactions present

Think of patient trajectories, care pathways, …
Think of shared resources: operating rooms, scanners,…
etc



Think of samples
Think of analyzers
Think of medication
Think of medical material
etc

Think of technology management
Think of catering and cooking
Think of patient movements
Think of linnen and clothing
etc

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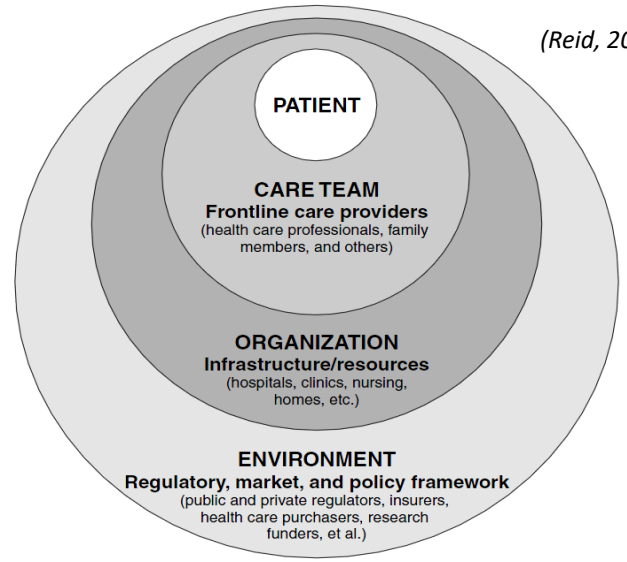
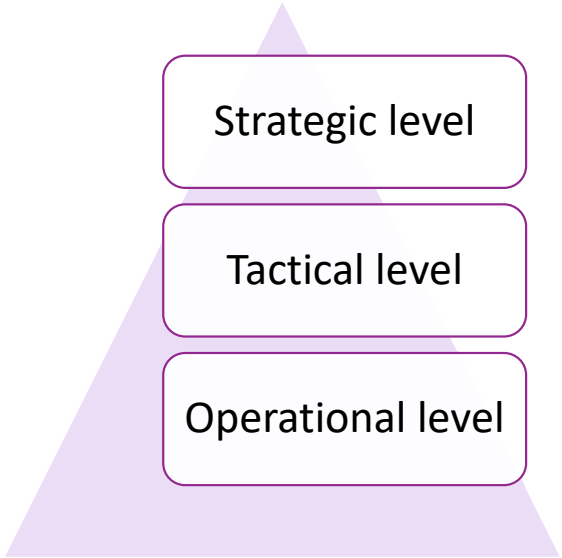
Managerial decision making

The system

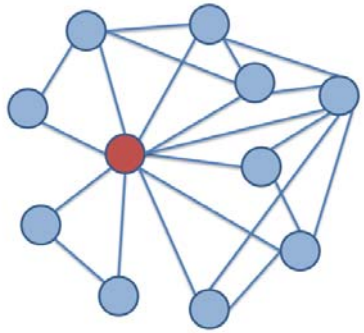


(Reid, 2005)

The levels



The partners



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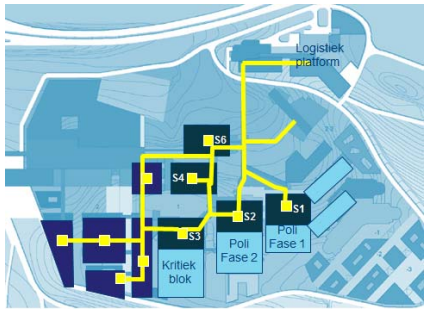
Scale: illustration

2000 beds
Consultations: > 650000 per year
Day clinic: 100000 per year
Patient in-hospital transports: 900 – 1000 per work day
Dagopnames: iets minder dan 100.000 per jaar



1850 suppliers
1 Mio order lines a year
800 interne receiving addresses

Laundry (linnen, clothing): 2300000 kg per year
Meals: 2000000 per year

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Trends

Research area:

logistics healthcare engineering/management

Practice:

professionalization

networking & outsourcing

I(o)T, AI, …

technological innovation

globalization

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2. Logistics terminology

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Introductory example

A typical outpatient journey

Parking, busstop
(transfer)
Reception/Secretariat
(transfer)
Waiting room 1
Examination
(transfer)
Waiting room 2
Medical imaging
Waiting room 2 (bis)
Consultation MD
(transfer)
Reception/Secretariat
(transfer)
Parking/busstop

Critical reflection

Patient logistics

Chain of medical and administrative steps, some have "value", some have not but can be necessary

Different units involved
Coordination needed

Besides time component, also a spatial component

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Visualizing the flow

Symbols (to map)

Process (action)

E.g. surgical intervention, consultation, medication preparation

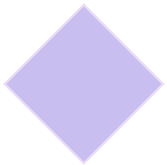
Transfer (transport)

E.g. patient from room to OR, medication from pharmacy to nursing unit

Buffer (waiting, storage)

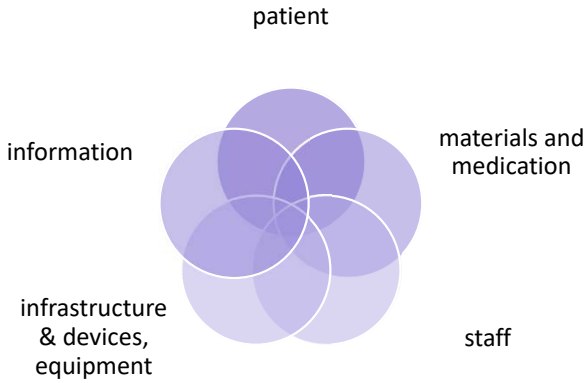
E.g. waiting room, storage of medical materials

Decision point (chain split)



E.g. triage in the ED

Involved …



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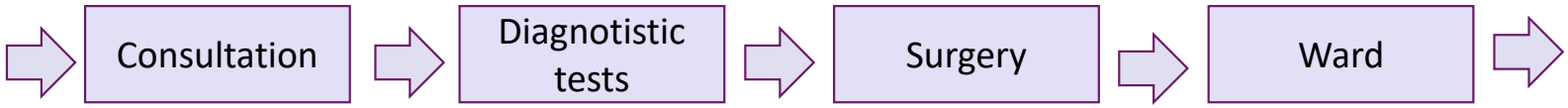
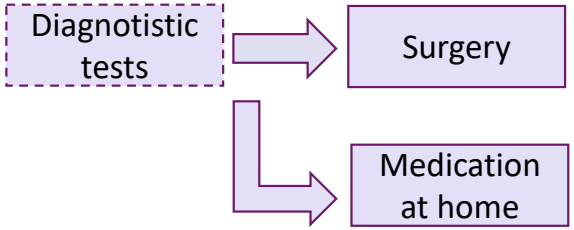
Logistic chain

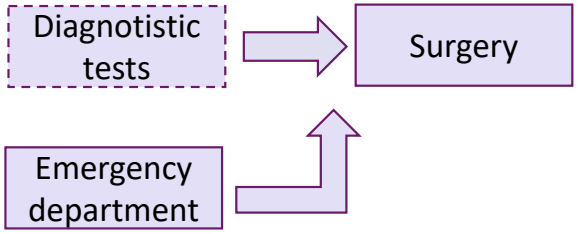
Simple chain



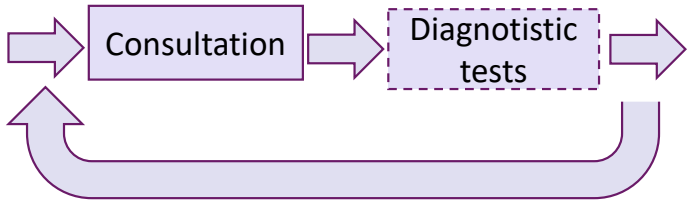
Chain divergence



Chain convergence



Loop



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	Unit	Chain	Network
What?	Functional unit	Trajectory; different units	Intertwined trajectories, different units
Mgmt focus	Processes	Patient flow	Interactions
Optimalization	Capacity	Throughput	Coordination
Example	Stroke unit	CVA care pathway	Hospital – Revalidation center – Nursing home

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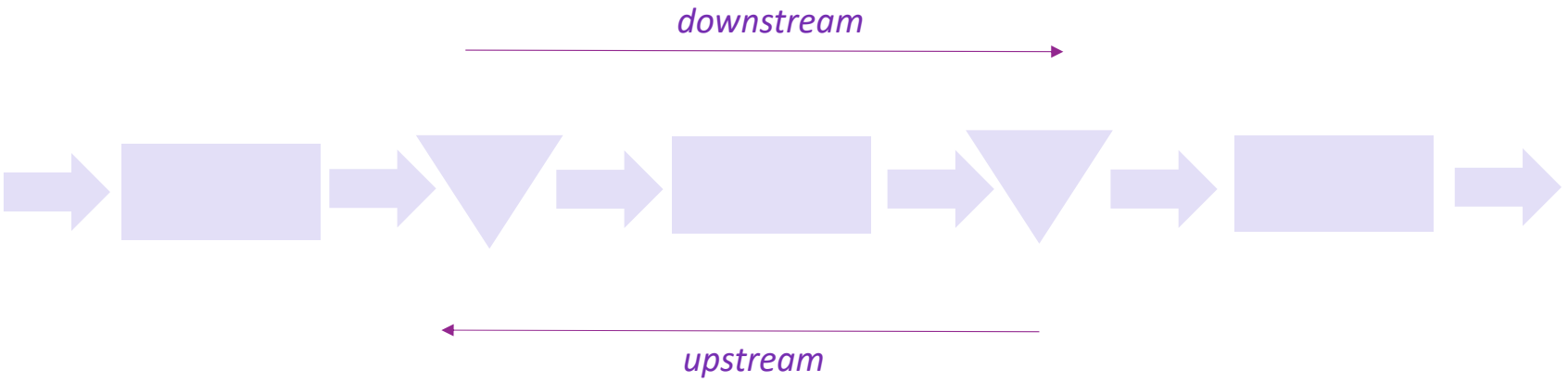
Logistic elements & control



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Bottleneck

The bottleneck is critical for the functioning of the chain. It is the limit to the chain's capacity.

A bottleneck causes "idling" and/or blocking": the system gets stuck.

Sometimes there is a shifting bottleneck, its position can change in time (e.g. am vs pm).

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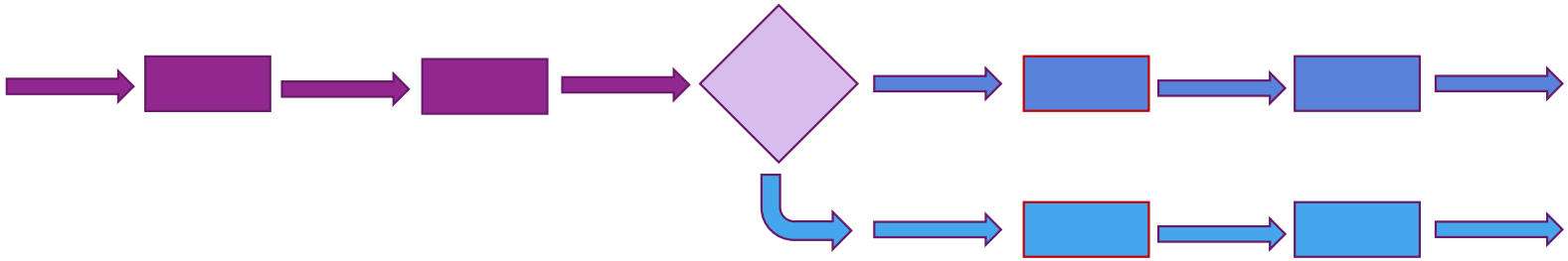
Penetration point

The penetration point is the point in the chain where the chain becomes patient specific.

The more the penetration point is upstream (←), the more difficult the logistics managment;
The more the penetration point is downstream (→), the easier the logistics management.
Reasons are standardization and planning complexity issues.



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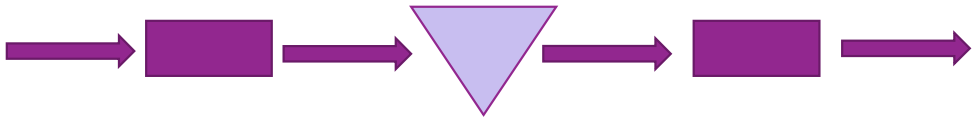
Buffer

Buffers are needed if there is no perfect synchronization between in-flow and out-flow of materials/people.

Buffers ensure a smooth coupling between processes, however they create waiting time and inventory, they require space,



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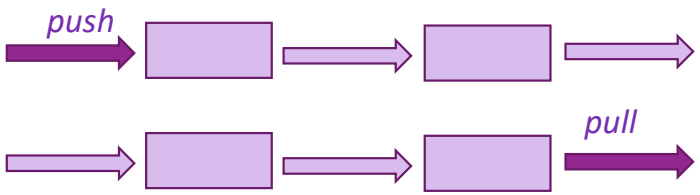
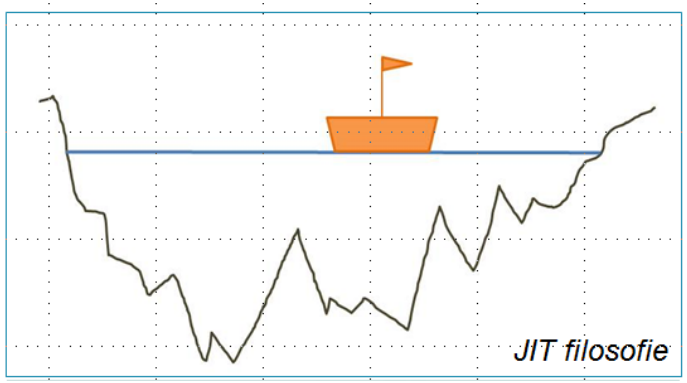
Push/pull control

Push: “customer” is pushed through the system – the process is the main concern
Pull: “customer” pulls the system – the customer is the main concern

Note: “customer” can be a patient (e.g. needing a scan) or a caregiver (e.g. MD ordering a lab test)





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3. Decision support tools for logistics

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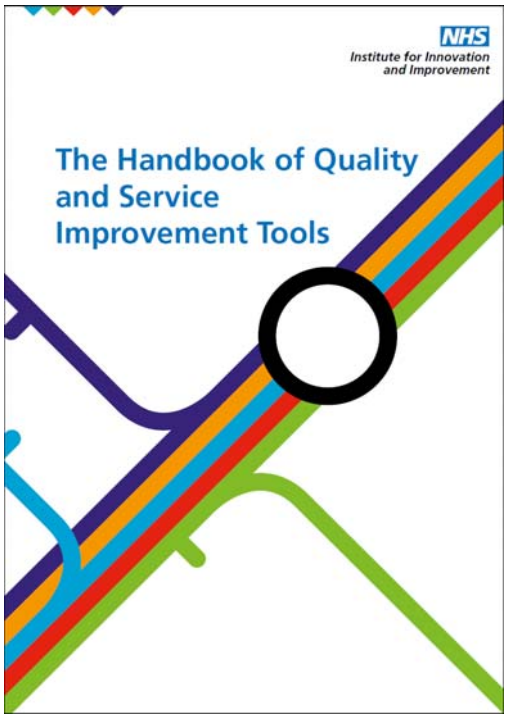
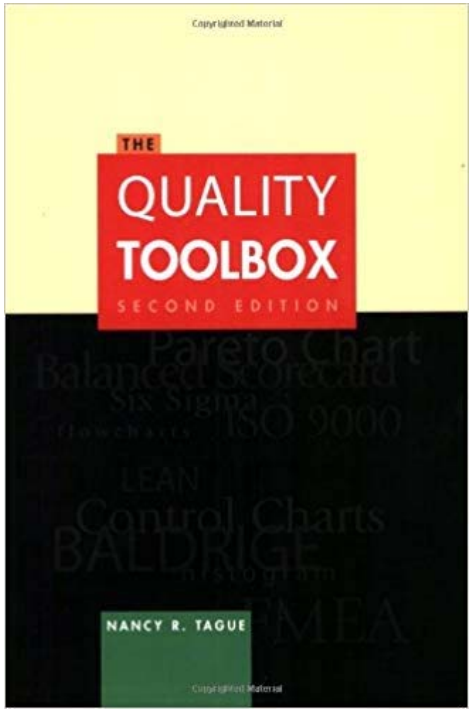
Lean thinking/Quality tools





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Examples

simple quality tools, e.g. Ishikawa diagram, Pareto chart

process mapping, e.g. flowchart, multi-actor flowchart, spaghetti diagram, VSM (value stream mapping) + process mining

risk management, retrospective: RCA (root cause analysis): e.g. 5WHYs

risk management, prospective: FMEA (failure mode effect analysis)

other: SMED, 5S, waste analysis, A3 report, poka yoke

further tools, see e.g. Lean, 6sigma and TOC (theory of constraints)

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Algorithms & guidelines from OR/MS – I&SE

examples

data analysis / statistics

e.g. math modeling (stochastic)

e.g. queueing, simulation

e.g. MCDM

Scheduling and Sequencing	Inventory control	Capacity management	Purchasing

e.g. rules of thumb, heuristics, algorithms (MP), AI

Architecture & layout	Storage, transportation, tracking

[See later for more detailed discussion]

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4. Logistics performance

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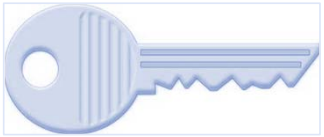
Data

contextualized
categorized
calculated
corrected
condensed

comparison
consequences
connections
conversation

objectives
culture
ethics

(guesses) (opinions) → data → information → knowledge → wisdom → **action**



KPI (key performance indicators)

Data from HIS or ERP
Data mining, process mining, …
Measurements
(manual, RFID tracking, …)

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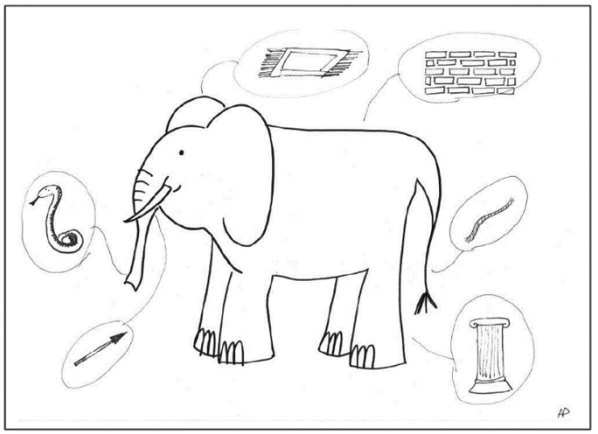
KPI pitfalls in quotes

"If you can not **measure** it, you can not improve it. I often say that when you can **measure** what you are speaking about, and express it in numbers, you know something about it; but when you cannot **measure** it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind." (Lord Kelvin, 1824-1907)

"People do what you inspect, not what you expect" (Lou Gerstner, 1942-)

"Not everything that can be counted, necessarily counts and not everything that counts cannot necessarily be counted" (Albert Einstein, 1879-1955)

"Would you tell me, please, which way I ought to go from here?"
"That depends a good deal on where you want to get to," said the Cat.
"I don't much care where—" said Alice.
"Then it doesn't matter which way you go," said the Cat.
"—so long as I get somewhere," Alice added as an explanation.
"Oh, you're sure to do that," said the Cat, "if you only walk long enough." — Chapter 6, Pig and Pepper, Alice in Wonderland – Lewis Carroll, 1832-1898)



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KPI definition principles

SMART

S: specific, stimulating, simple

M: measurable, motivating

A: achievable, **agreed**, attainable, assignable, appropriate, actionable

R: relevant, realistic, results/results-focused/results-oriented, resourced

T: timely, **time-bound**, time framed, timed, time-based, timeboxed, time-specific, timetabled, trackable

*E: **exciting**, evaluated*

*R: **recorded**, rewarding, reviewed*

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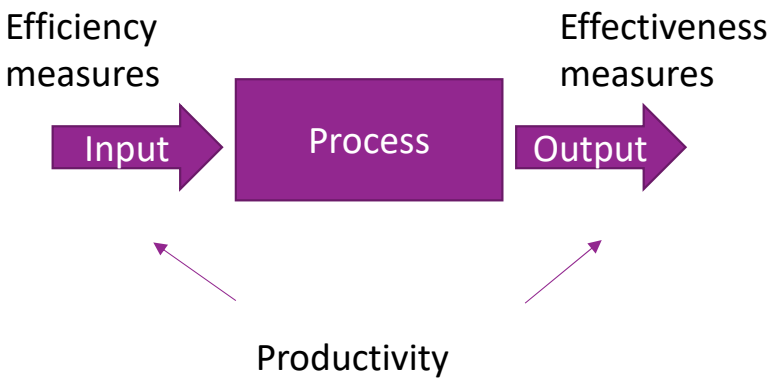
KPI examples



Throughput time

Waiting time

Leadtime

Service level

Capacity utilization

Errors

Usage

…

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KPI analysis

Snap shots/Spot checks 

e.g. pie charts, bar charts, stacked bar charts, radar plots, ….

Follow-up/Forecasting 

causal models

(e.g. y=mx+b)

time series models

(e.g. naive models, moving average, exponential smoothing, ARIMA)

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5. Logistics projects

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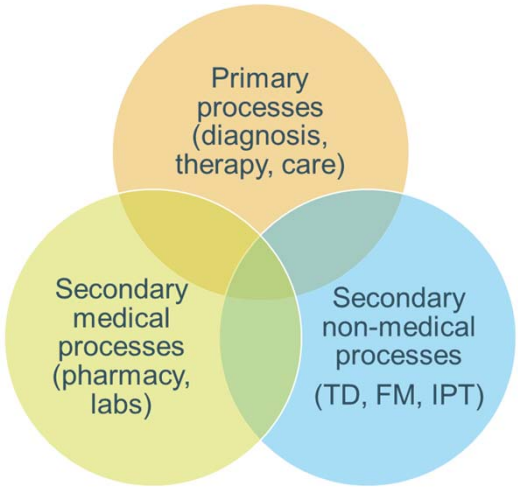
Examples (see pre-assignment package)

Stroke unit: Patient flow and bed utilization	ODCU: Waiting times and throughput times	Consultation Glaucoma: Waiting times	Histopathology lab: Organization and planning
ED: Overcrowding	Operating rooms: Planning and utilization	Pharmacy: Organization (incl. automization) and distribution	Blood transfusion: Logistics and patient safety
Equipment & devices: Risk management (usage)	Equipment & devices: Risk management (engineering design)	Primary care: Device maintenance and calibration	Hospital-at-home: Logistics and patient safety
Nursing home: Wheel chair management	Materiaals management: Ordering, storage, distribution	Networks: Logistics cooperation	Biomedical engineering & logistics in developing countries



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Generic approach

- Opportunity. / Problem.
- Scope. Objectives.
- Analysis. Further research.
- Recommendations.
- Implementation.
- Quality assurance. Follow-up.

Do not forget to involve all stakeholders

Work data-driven and in a structured way

Visualize flows and decision points for easy communication

Be aware that iterations may be needed

Make good use of decision support tools and models

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6. Wrap-up

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Overview

1. What ?
2. Logistics terminology
3. Decision support tools for logistics
4. Logistics performance
5. Logistics projects

"Vocabulary"
[Basic insights]

Operations research
Discrete event simulation
Inventory
MCDM
Risk: technology mgmt
Risk: safety science
Pathways

Case discussions

Case presentations

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