



POLITECNICO
MILANO 1863

MANAGING CAPACITY AND DEMAND

Service Management

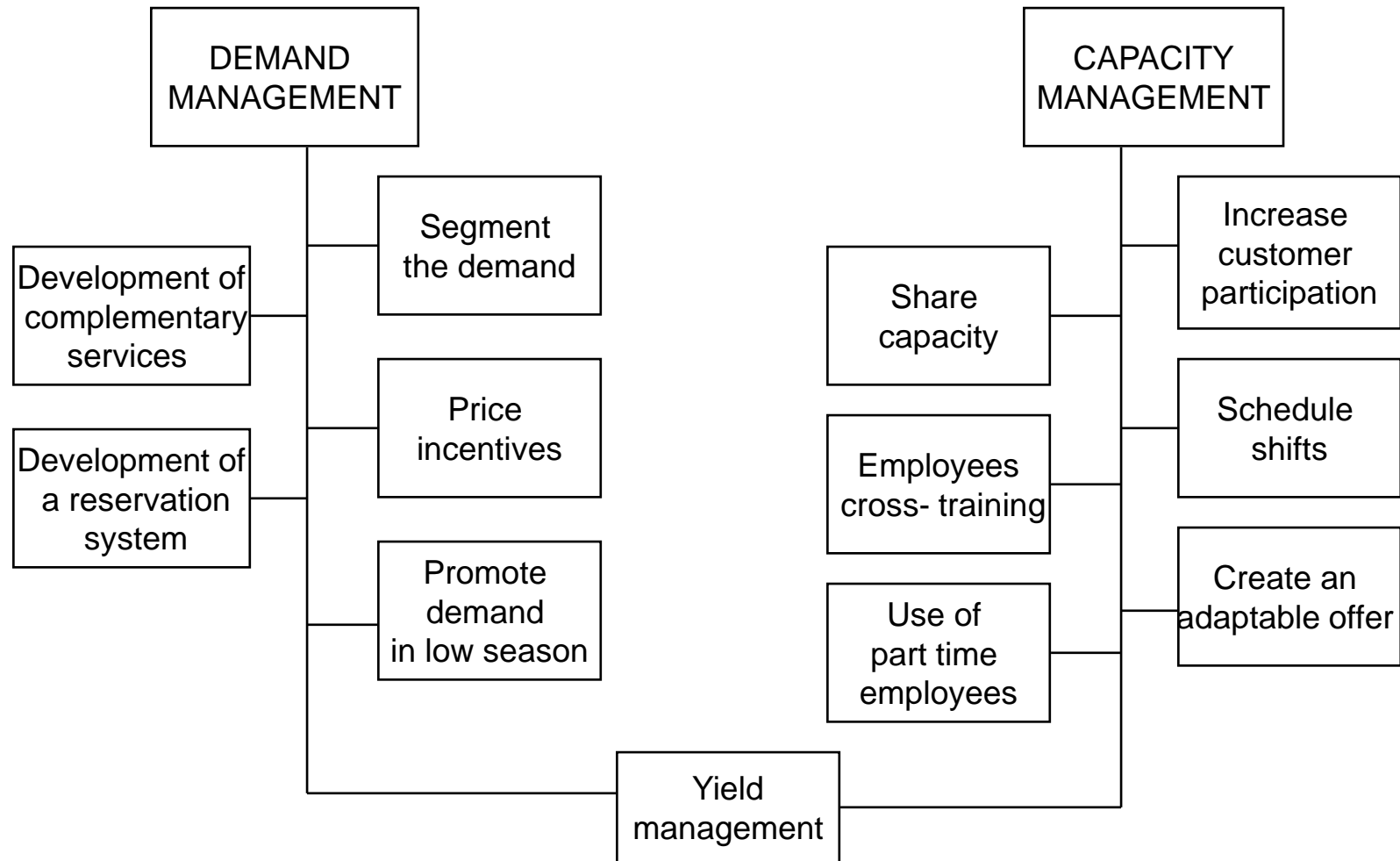
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Aligning capacity and demand

Tools and practices

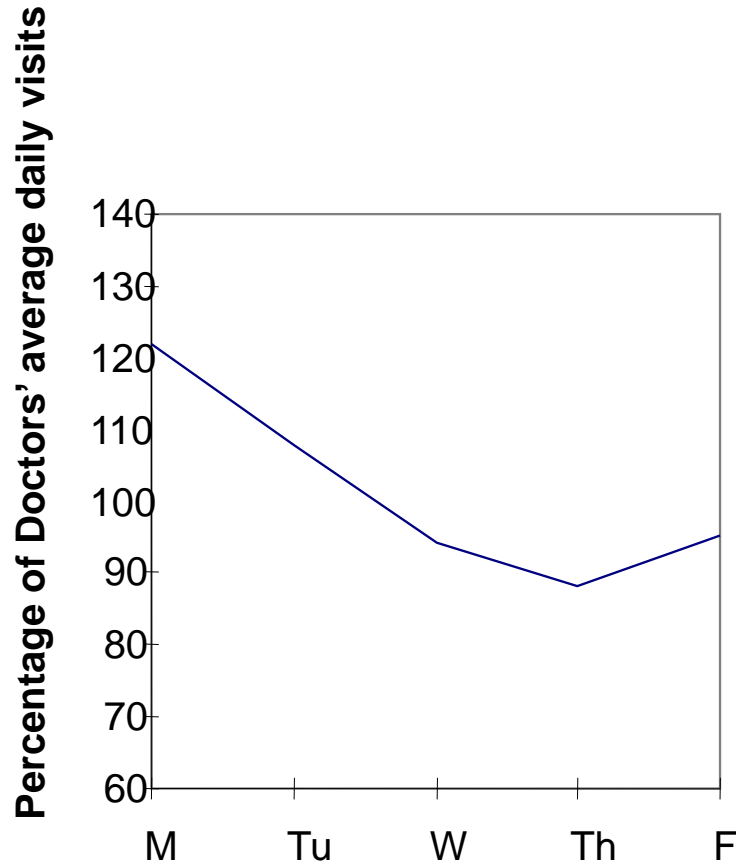


- You rarely serve only one single market segment
- Often, customers' needs and behaviors are different
- Proper data analysis allows us to identify opportunities for segmentation, differentiating services and thus improving performances

Demand segmentation at Healthy Clinic

- Doctors complain for the excessive workload
- Patients complain for excessive waiting
- Average daily visits: 200
- Variability: 170-240

Demand segmentation at Healthy Clinic



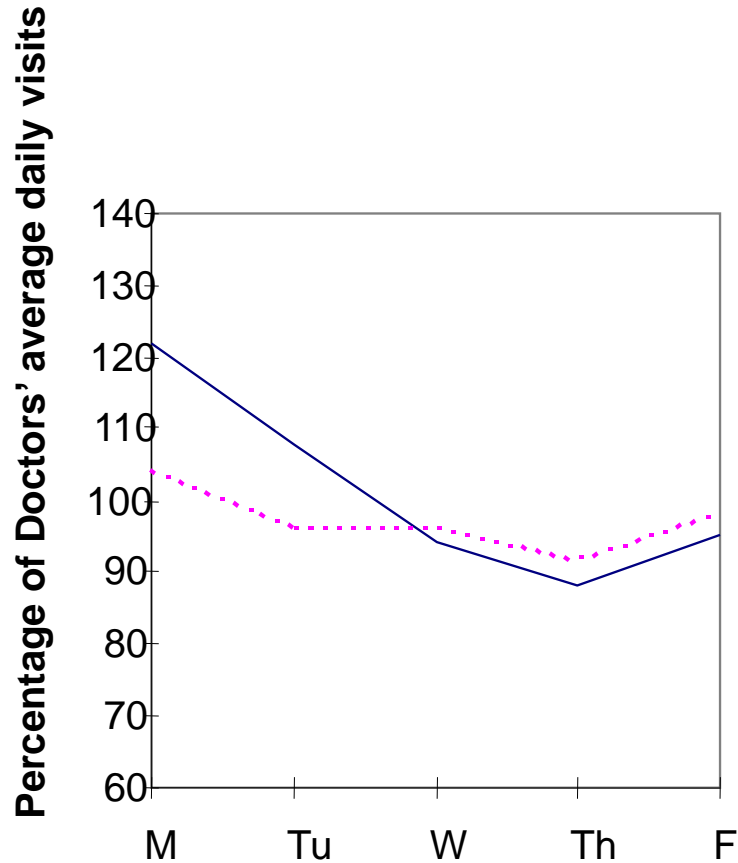
Reduce demand variability fixing appointments in an appropriate way

Day	Appointments
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Monday	84
Tuesday	89
Wednesday	124
Thursday	129
Friday	114

best idea is to cope with it! make the service available for all them.

Demand segmentation at Healthy Clinic



distribute the demand to other days.
the idea of demand segmentation

Set price incentives

In periods of low demand, lower prices will be offered



This will move price sensitive customers to periods when demand is lower, thus leveling the request

E.g. train operators make ticket prices that are differentiated by day of the week and time

Promote demand in low season



Looking for other services to offer

promote the demand

Development of complementary services



- Complementary to do more and better businesses
- Complementary for synergies/pairing
- Complementary for seasonality

Development of reservation system

- With a reservation, you almost have an early sale.
- The advantages are significant for customers:
i.e. reserved seat, welcome, ...

Managing capacity

Increase customer participation

automatic cashiers in supermarket
customer engagement, participation

- When demand increases, also capacity increases: therefore fewer resources are needed to deal with increase in demand.
- The degree of customer participation can be varied according to demand.

Make a part of the capacity variable

1. Flexible solutions through outsourcing
2. First class - economy distribution

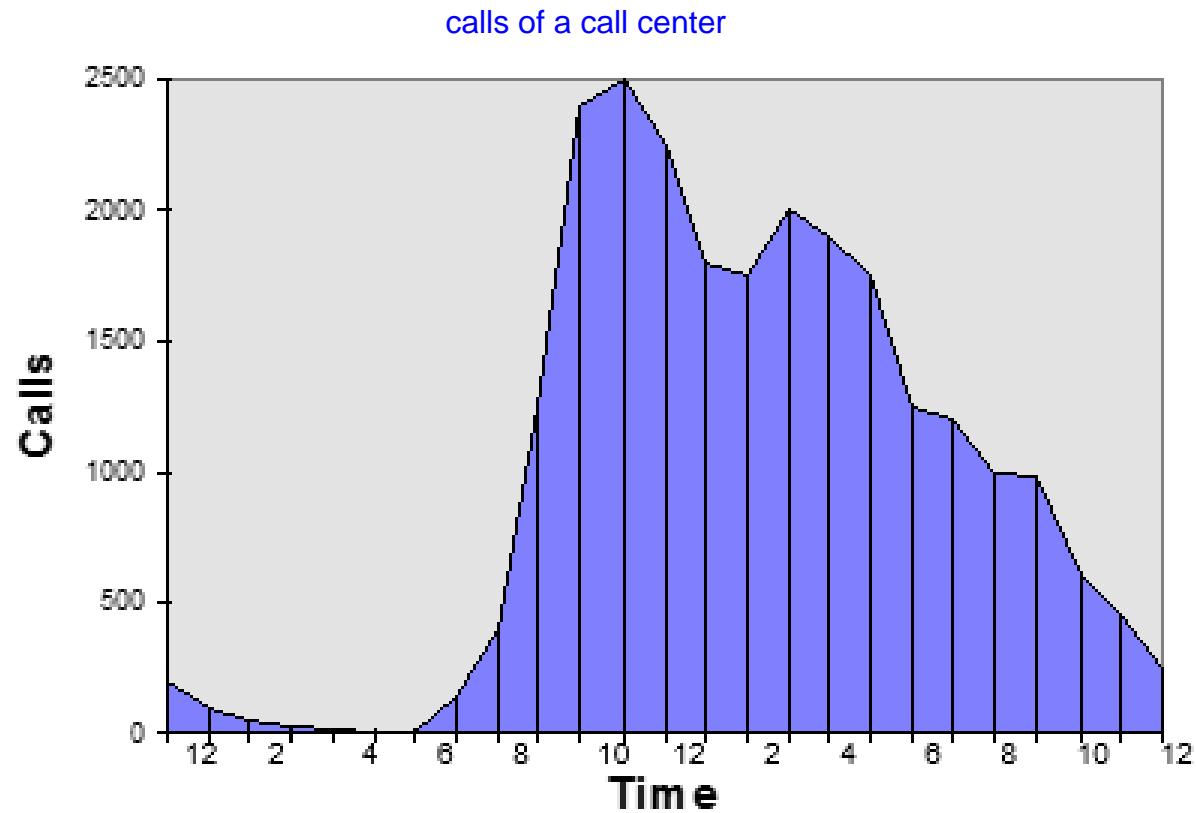
- Some airlines make their own aircrafts available to other companies in period of low demand (they also change the fuselage decorations)
- Multi property apartments
- Sharing of resources between branches

- Having a few operators with extensive expertise allows to answer local peaks of demand for specific activities
- Supermarket (eg. TESCO)
- Bank

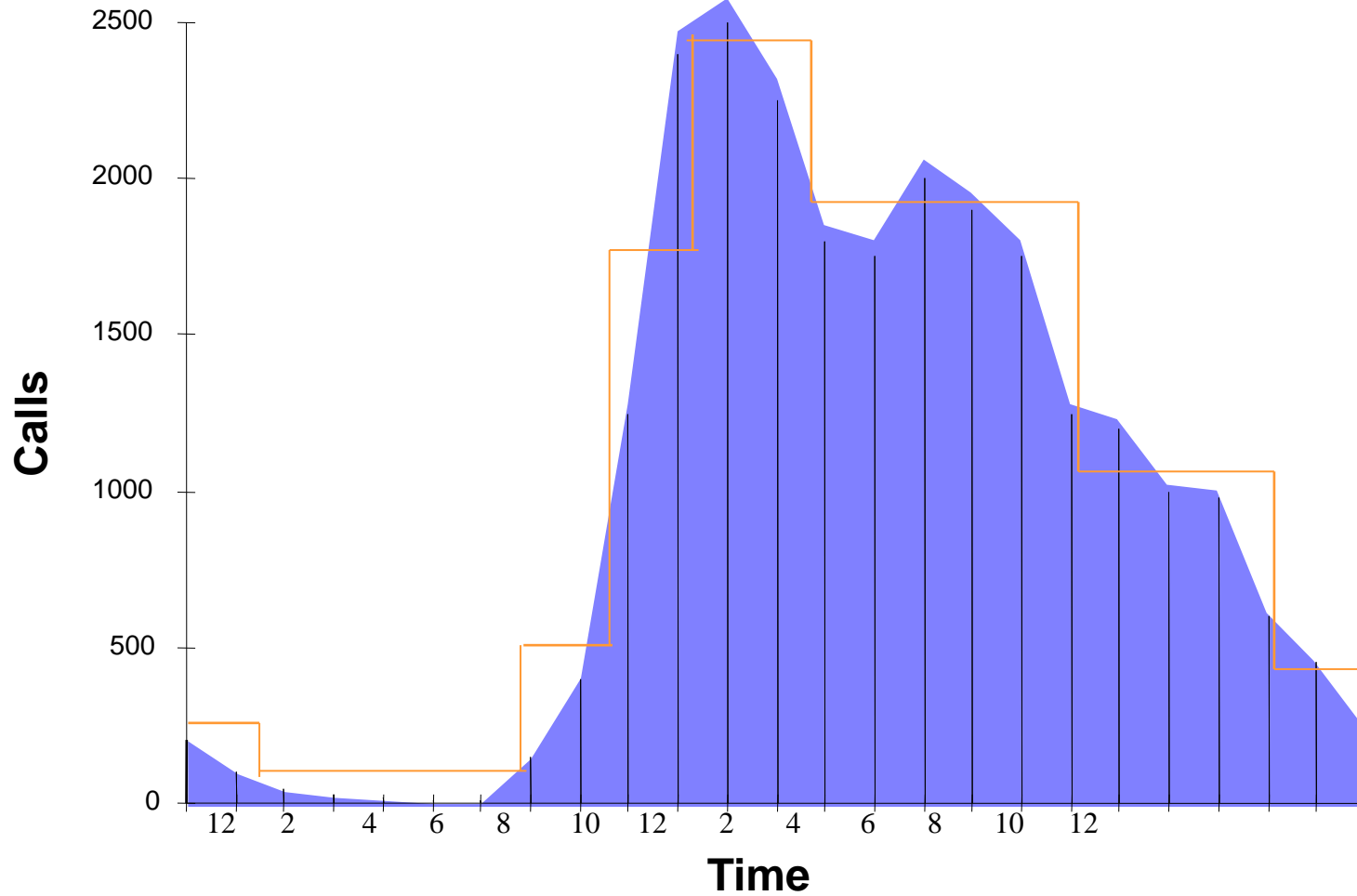
Use part-time employees

- If variability is predictable enough, you can use part-time staff
- In Italy, the use of part-time is still limited compared to other European countries even if it has great potential

Shifts scheduling



Shifts scheduling



Daily shifts scheduling

- Demand forecast
- Calculate the needs of operators (it is computed using Q theory with a limit on the minimum service level)
- Identify the types of possible shifts (national contracts, union agreements)
- Shifts scheduling (eg. minimize $\sum x_i$)
- Assign people to shifts

Scheduling weekly shifts with rest days

- Define the type of shift to implement (eg. 5d work followed by 2 of rest)
- Model the problem with Integer Linear Programming
- Solve the ILP problem
- Assign people to shifts

Scheduling weekly shifts with rest days

Objective function:

Minimize $x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7$

Restrains:

Sunday $x_2 + x_3 + x_4 + x_5 + x_6$ ≤ 3

Monday $x_3 + x_4 + x_5 + x_6 + x_7$ ≤ 6

Tuesday $x_1 + x_4 + x_5 + x_6 + x_7$ ≤ 5

Wednesday $x_1 + x_2 + x_5 + x_6 + x_7$ ≤ 6

Thursday $x_1 + x_2 + x_3 + x_6 + x_7$ ≤ 5

Friday $x_1 + x_2 + x_3 + x_4 + x_7$ ≤ 5

Saturday $x_1 + x_2 + x_3 + x_4 + x_5$ ≤ 5

x_i Number of people assigned to shift i

$x_i \geq 0$ and integer

Solution

$1 x_1$ $1 x_2$

$2 x_3$ $0 x_4$

$3 x_5$ $0 x_6$

$1 x_7$

Schedule matrix, x = day of rest

Operator	Sun	Mo	Tu	We	Thu	Fri	Sa
1	x	x	...	...	...	...	...
2	...	x	x	...	...	...	...
3	...	...	x	x	...	...	...
4	...	...	x	x	...	...	...
5	...	...	...	...	x	x	...
6	...	...	...	...	x	x	...
7	...	...	...	...	x	x	...
8	x	...	...	...	...	...	x
Total	6	6	5	6	5	5	7
Requested	3	6	5	6	5	5	5
Exceeding	3	0	0	0	0	0	2

How does the system change if you also introduce the following possibilities?

- 1 shift with Sun and Thur as rest days and the others as working days
- 1 shift with Sun as rest day and the others as working days
- The solution will be better, worse, or the same as the previous case? Why?



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