Yield Management (OM) Introduction

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Some OM methods

- Theory of Constraints
- Balanced Scorecard
- Project Management methods (**Critical Chain**, SCRUM,…)
- Material Requirement Planning and Just-in-Time – part of MS Dynamics NAV
- CONWIP (will be presented on 14.12.)
- Boston, SWOT and Magic Quadrant Matrices
- Little ´s Law (relations between WIP, Throughput and Cycle time) (will be presented on 23.11.)
- Linear programming (will be presented on 30.11.)
- Yield Management (will be presented on 23.11.)
- Kepner-Tregoe-support of decision making (will be presented on 7.12.)
- Drum-Buffer-Rope (will be presented on 30.11.)

Another point of view (plan-do-check-act)

This will be modified in following **South African** project show (use of Balanced Score Card)

Project management

Theory of constraints

Production

Linear programming

Total quality management

Product postitioning

Business Intelligence

Workflow

Critical chain

Drum –Buffer-Rope

MRP-MRP-II,JIT,APS

Cutting, blending

Pareto, ishikawa

Boston Matrix

Gartner QM

Decision Making

SCRUM

CONWIP

Logistics

Pareto, Ishikawa

Product Life Cycle

Kepner-Tregoe

EOQ and BEP analysis

Six Sigma

Yield management

Hurwitz

Prospect Theory

ABC

LEAN

Function block Logistic more in detail will be presented later in this show

Little´s law

Used abbreviations : QM– Quadrant Matrix; **CONWIP –** Constant Work in Progress; **EOQ** – Economic Order Quantity ; **MRP** - Material Requirement Planning

Yield Management (YM)-definition

- YM seeks to maximize yield or profit from time-sensitive products and services.
- Used in industries with flexible and expensive capacities, perishable products and uncertain demand. It is part of **revenue management**.
- **Type of problems** :
  - overbooking (airlines, hotel industry,..)
  - partitioning demand into fare classes
  - single order quantities

YIELD : to produce or furnish (payment, profit, or interest): a trust fund that yields ten percent interest annually; That investment will yield a handsome return.

Yield Management (YM)-definition

- Simply put, the purpose of Yield Management is to achieve **maximum revenue/profit**.
- To do this, a **yield management** strategy needs to be both **reflective** and **forward-looking**. Yield managers should attain a clear and detailed understanding of what has happened before and what is happening now.
- The most efficient way to do this is to draw from historical data to predict what may happen in the future. So, the process of effective yield management involves understanding, anticipating, and reacting to consumer behavior (to maximize revenue ultimately).

Single Order Quantity

The single order is concerned with the planning and control of inventory items that are either purchased only once during a time period or for only one production run. The familiar inventory models (EOQ, EOI, and EPQ) do not readily apply to the single order because (1) demand is not a continuous event (2) the demand level may change drastically from time period to time period, or (3) the product's market life may be very short due to obsolescence or perishability. The single order quantity problem is frequently referred to in the literature as the Christmas tree problem or the newsboy problem.

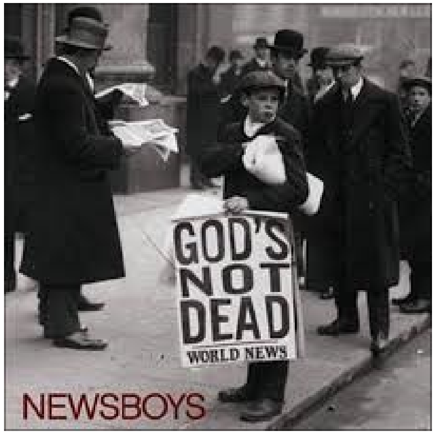
Newsboy problem – see next slide and slide number 11 as well !!!

Newsboy problem

Often managers have to make decisions about **inventory level** over a very limited period. This is the case, for example with seasonal goods such as Christmas cards that should satisfy all demand in December, but any cards left in January have almost no value. These single-period decision models are phrased as the **Newsboy Problem**. For a newsboy who sells papers on a street corner, the demand is uncertain, and the newsboy must decide how many papers to buy from his supplier.

If he buys too many papers he is left with unsold papers that have no value at the end of the day.

If he buys too few papers he has lost the opportunity of making a higher profit.

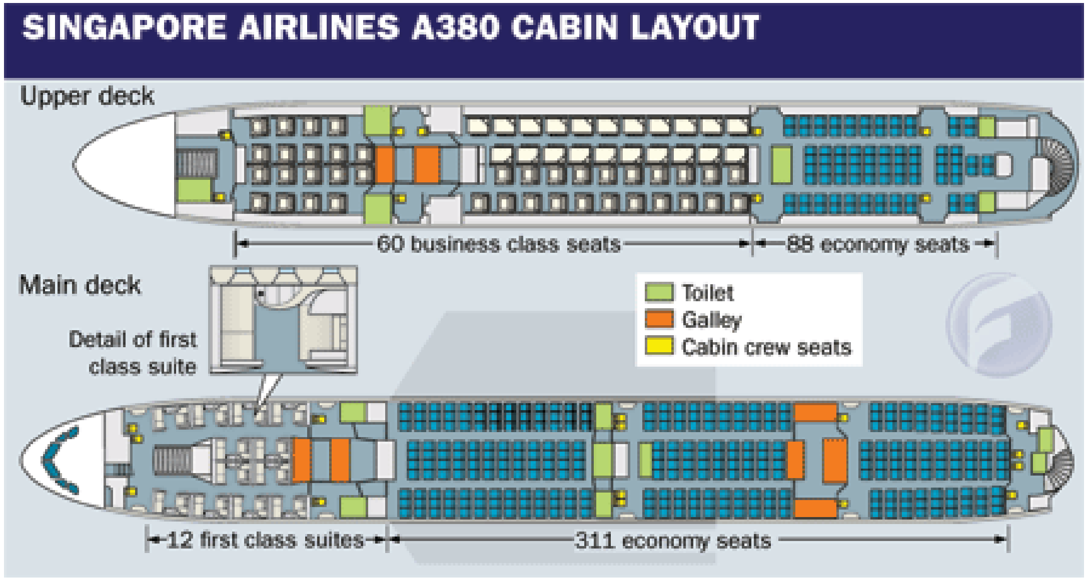


Prices and demand

- **Prices can be determined by:**
  - Service
  - Group of services
  - Market (consumer type or geographical area) or
  - A combination of the above

- **And the demand side is characterized with**:
  - Variability of demand
  - Variability of value

Overbooking (hotels, airlines,..)



7 % out of 311=22

10%-30 % of **no-show** (traveler reserved ticket, but cancel it at the last minute).
So airline companies **overbook** their capacities. The **no-show** ratio is sometimes lower than overbooking ratio, so „bumped" client will be compensated by providing the free of charge service at another time or place. They are so called „**offloaded**" to other routes.

Example:

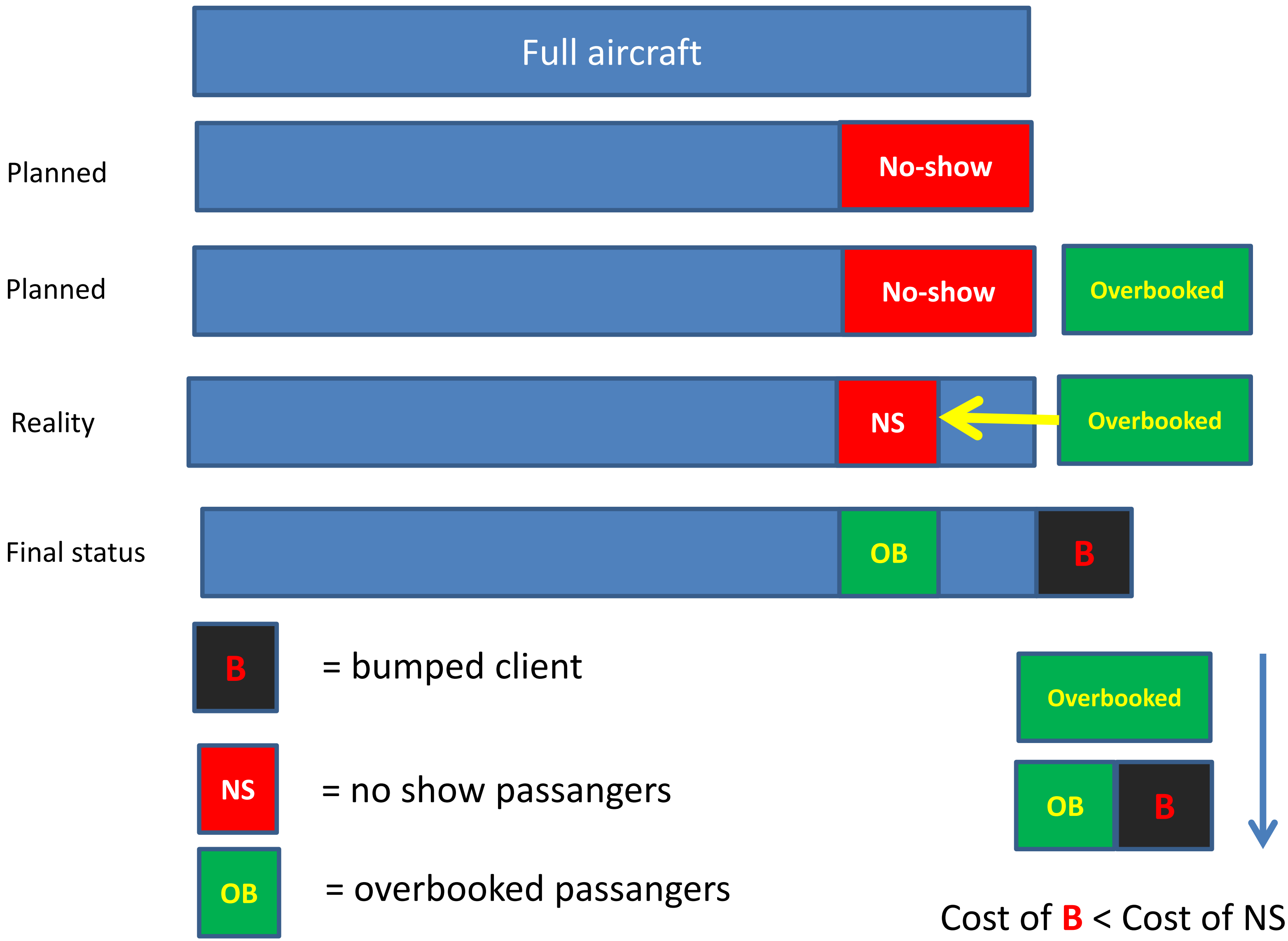
311 economy seats, estimation of 10 % no-show-> **31** places would be lost (only 280 seats occupied).
If overbooked by 10 % (31 more tickets offered) and no-show ratio on reality is only 7 %->only 22 clients cancelled - > 311-22=289 seats occupied ->289 + **31**=320->320-311=9 clients have to be „bumped" (or 31-22=9) and provided by free air tickets, which is better than the loss of not sold 31 places.

You have to calculate loss of 31 places -22 sold tickets =amount which must cover expenses for 9 bumped clients

Basic calculations

- Air ticket in economy class =10000
- 31 no show – los = 310 000
- 9 bumped travellers – granted business class instead ->one air ticekt =30000
- Cost of bumping = 270 000
- Difference = 310000-270000=40000

Overbooking<->No-Show



Cost of B < Cost of NS

Overbooking - claims

- Do not settle! Instead get up to €600 +hotel +meals +expenses +new ticket!

Delta Air Lines has increased the amounts passengers can be offered to give up their seats to up to almost US$10,000 in extreme cases — something passengers can take advantage of if they act in collusion (secret deal).

Single order quantities

- Newspapers
- Magazines
- Florists
- Bakeries
- Fresh fishes

Single order quantities

- **N** = number of items that can be sold (expected optimum)
- **X** = number of items ordered
- C_0 = Cost of overestimating demand (rest of the flowers faded and are not sold)
- C_u = Cost of underestimating demand (customers like to buy more and you do not have enough of roses)
- **Cu>= C**$_0$
- P(N<X) = probability of overestimating demand or no-show
- P(X<=N)= probability of underestimating demand or no-show

$P(X<=N)*C_u >= P(N<X)*C_0$

$P(X<=N) + P(N< X) = 1 \rightarrow P(X<=N) = 1 - P(N<X)$

$(1-P(N<X))*C_u >= P(N<X) * C_0$ -> **OPTIMUM PROBABILITY**

$$P(N<X) <= \frac{Cu}{Cu + C_0}$$

Final formula for over estimating demand

(1-p)*Cu>=pCo

Cu+pCu >=pCo

Cu>=>p(Cu+Co)

Example 1 ->Single Order Quantity (hotel industry)

Manager Simon Stein of the **Best Western** in Las Vegas is tired of customers who make reservation and do not show up. Rooms rent is **100** USD a nigh and cost **25** USD to maintain per day. Overflow („bumped“) customers can be sent to **Motel 7** for **70** USD a night.

Simon´s records of no-show over past six months are given below. Should Best Western start overbooking If so, how many rooms should be overbooked?

No-Show	Probability
0	0,15
1	0,25
2	0,30
[redacted]	0,30

Solution : C_o = 70 USD - cost of overestimating demand

C_u = **100** USD-**25** USD =75 USD - cost of underestimating demand

$$P(N<X) <= \frac{Cu}{Cu + C_o} = 75/(75+70)=75/145 = \mathbf{0,517}$$

No-Show	Probability	P(N<X)
0	0,15	0,00
1	0,25	0,15
2	0,30	0,40
3	0,30	0,70

0,15+0,25=0,40 and 0,40+0,30=0,70…

Probabilities are cumulating and choice in 0,40->0,517
Optimal probability of no-show falls between
0,40 and 0,70. So if we take less of equal to 0,517,
so next lower value is 0,40. **So two rooms have to be overbooked !!!**

Example 2 ->Single Order Quantity (Airlines)

- **FlyUS** Airlines is unhappy with the number of empty seats (same with hotel rooms) on its NY-Miami flights. To remedy the problem, the airline is offering a special discounted rate of **89** USD instead of standard fare **169** USD, but only for 7-days advance purchases and for a limited number of seats per flight. The aircraft flown from **NY** to **Miami** holds max **100** passengers. Last month´s distribution of full-fare passengers is shown below. How many seats **FlyUS** reserve for full–fare passengers ?

Aircraft capacity			100	
Full fare	No-Show	Frequency	Probability	P(N<X)
50	50	15	0,15	0,00
55	45	20	0,20	0,15
60	40	35	0,35	0,35
65	35	20	0,20	0,55
70	30	10	0,10	0,65

100= 50+50 = 55+45=60+40=65+35=70+30

Cu = 169-89=80,Co =89
P(N<X) <=Cu/(Cu+Co)=80/169=0,473

So 60 full-fare passengers have to be reserved