rhythm

From math to meaningful impact: applying quantitative thinking in (Healthcare) logistics

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UNIVERSITY OF TWENTE.
Spin-off

Ineke Meuffels Ph.D.

Thank you for the invitation!

Study: Econometrics & Operations Research, Tilburg University (2003 – 2007)

Ph.D. Candidate Tilburg University (2007 – 2015)
The Design of Road and Air Networks for Express Service Providers

ORTEC: Logistics Consultant (2007 – 2020)

Rhythm: Head of Product Development

Healthcare Workforce Challenge

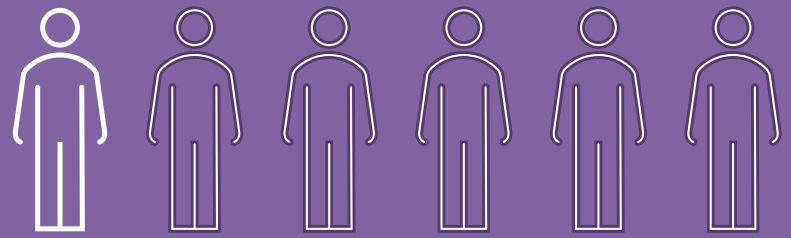
Currently, about 1 in 6 people in the Netherlands works in healthcare (around 17% of the workforce)

If nothing changes, projections show that by 2040, this will need to increase to 1 in 4 people to meet the growing demand for care.

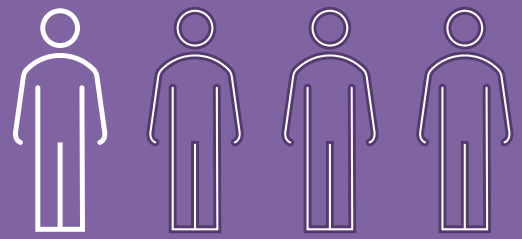
How to manage that our healthcare stays accessible, affordable, and at high quality?

One of the answers: **Integral Capacity Management**

From 1 in 6 today



1 in 4 needed in 2040



Rhythm – Our Mission

Health is our greatest asset. Sooner or later, we ourselves or someone we care about will depend on healthcare.

How important it is then to quickly access the best care and to be helped smoothly and clearly by doctors and nurses who have the right time and attention for you.

And how complex it is to make that happen…

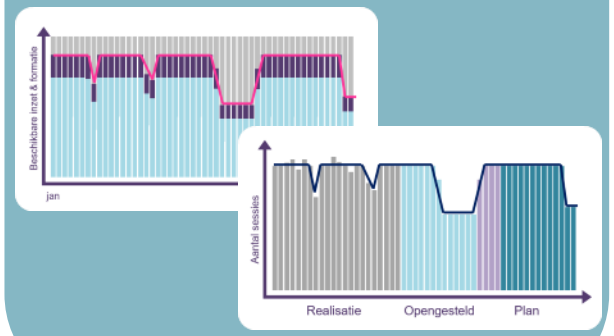
“A better world through smarter Healthcare”

Our Services

To make an impact on societal challenges, we provide services through smart technology (Healthcare Suite), consulting services (impact projects), and training (Rhythm Academy), which can be deployed separately or as an integrated solution

Impact Projects

Improving performance through the introduction of the annual cycle, enabling the organization to consistently make the right planning decisions for the efficient deployment of people and capacities.



Healthcare Suite

The Healthcare Suite supports integrated capacity decisions—over time and across the entire care chain.

Academy

Training ICM staff and users through a broad training program to enable the organization to correctly apply ICM and continue developing it independently.

rhythm academy

Agenda for today

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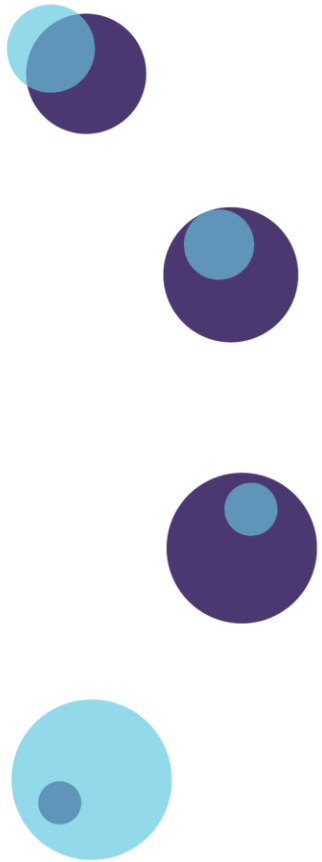


From theory to practice: some real-life examples

Differences between theory and practice – key learnings

Agenda for today

Thank you for the invitation!

From theory to practice: some real-life examples

Differences between theory and practice – key learnings

Example: Air Transport

KLM

- Ever asked the person next to you on the plane what they paid for their seat?

- Ever seen “No seats available”?
- And then checked again the next day… only to find seats suddenly available?

Example: Air Transport

KLM

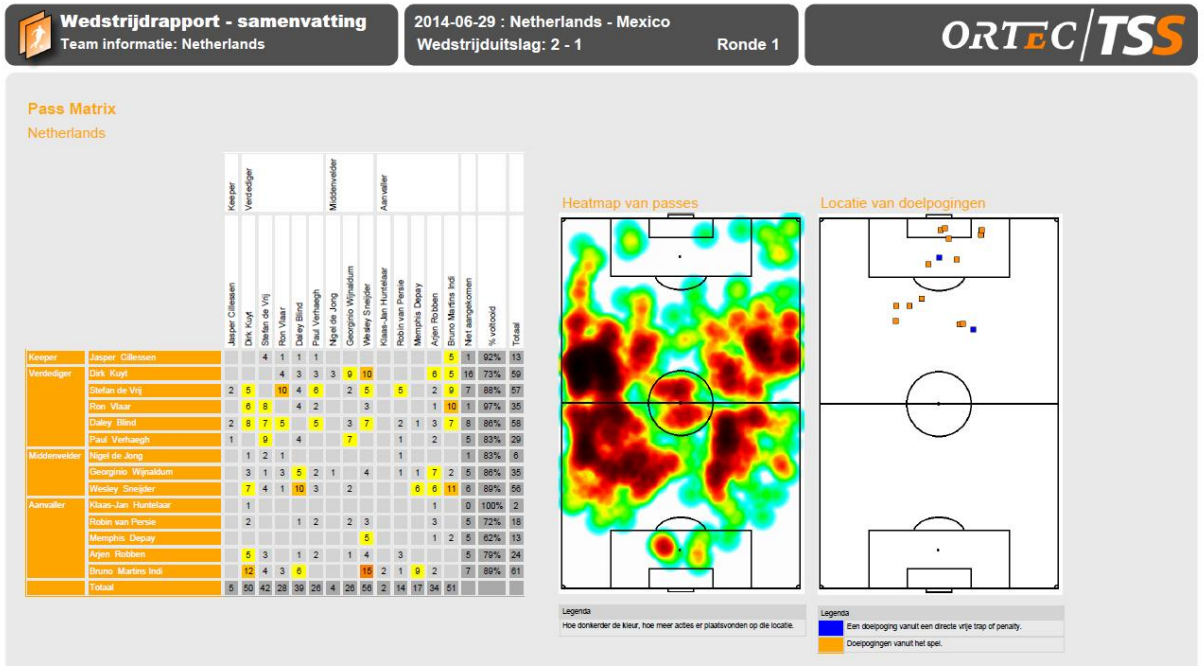
Using a mix of historical patterns and live data, KLM can dynamically steer:

- How much seats cost
- How many seats are available in each cabin class
- How far to overbook a flight (because cancellations will occur)
- Which promotions or campaigns to launch
- …and much more to optimize revenue and capacity

Example: Sports

Supporting van Gaal in World Championship 2014

- What is the best team combination?
- What are strengths and weaknesses of players (average vs. exceptions)?

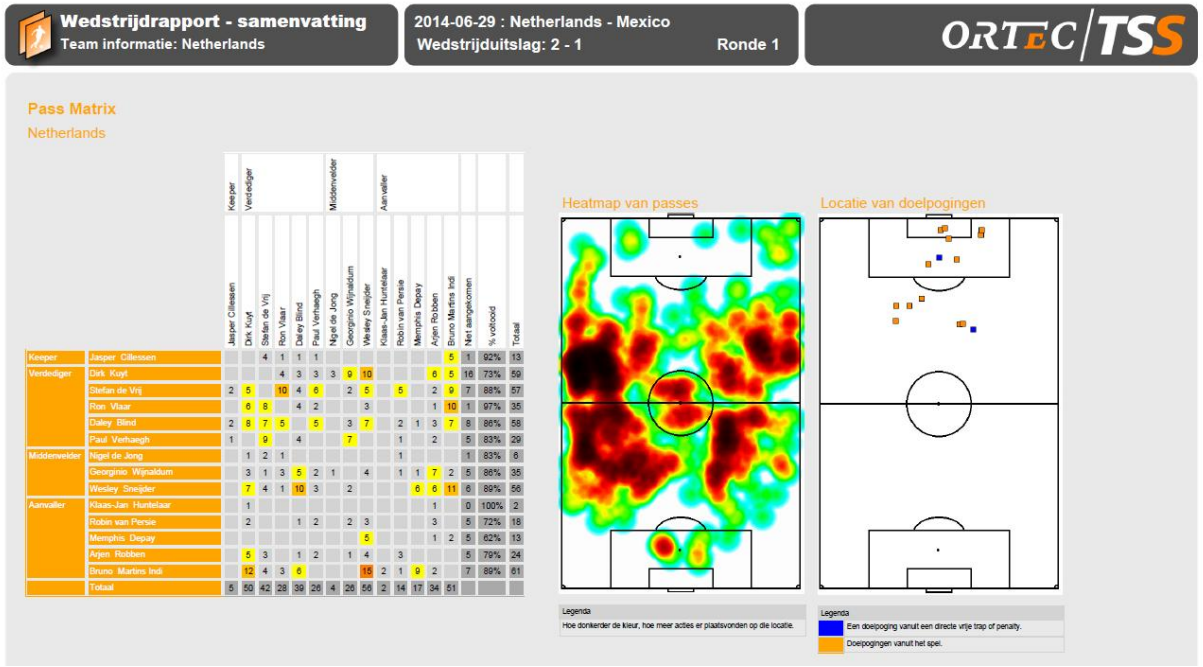


Example: Sports

Supporting van Gaal in World Championship 2014

Various challenges:

- What is useful information?
- Agreeing on definitions (offside is the easy one…)
- How to collect data?



Example: Development Aid

North Start Alliance

- Prevent the spread of sexual transmitted infections
- North Star has been establishing a network of drop-in health clinics, called **Wellness Centers**, at truck stops, ports, rail junctions and border crossings in low-income countries such as Africa
- The Wellness Centers offer information and healthcare to transport workers

Example: Development Aid

North Start Alliance

What was needed:

- Develop a client health registration system (COMETS)
- Determine the optimal location of Roadside Wellness Centers
- Determine the number of employees needed in these RWCs

Example: Planning in a Ward

VieCurri

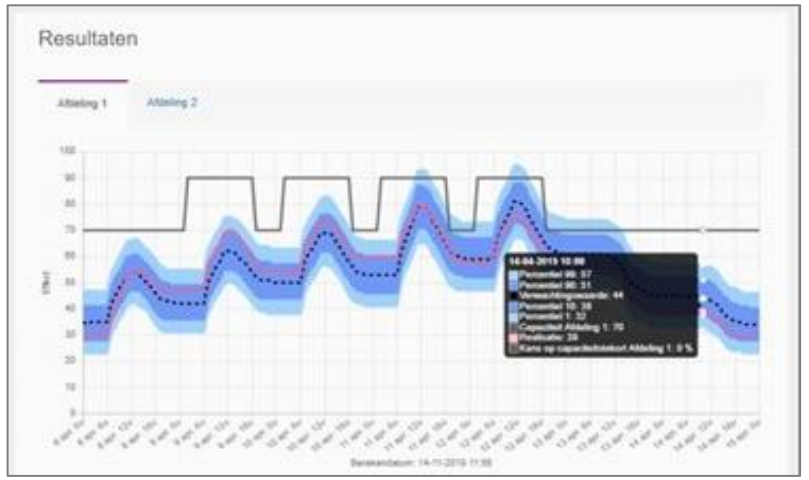
- Staff schedules must be released 3 months in advance
- Individual patients can arrive at any time and for any service (orthopedics, urology, cardiology, internal medicine, gastroenterology, …)
- How can we reduce constant rushing and waiting while treating as many patients as possible?

Example: Planning in a Ward

VieCuri

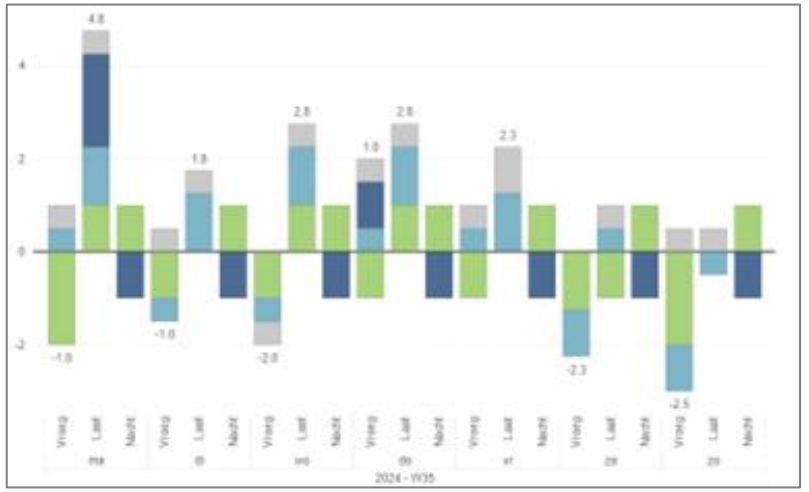
The solution:

- Individual patient visits are unpredictable, but total patient volume is predictable
- Peak workload can be reduced by surgery planning
- Workload analysis helps determine required staffing
- Comparing required vs. available staff enables solutions like cross-department exchanges



Patient Prediction

Surgery → Ward



Over- and understaffing per specialty

Agenda for today

Thank you for the invitation!

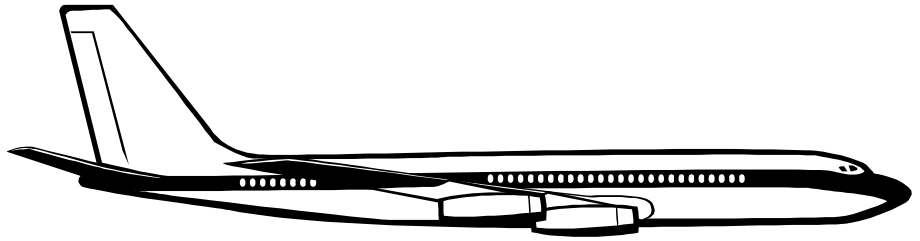
From theory to practice: some real-life examples

Differences between theory and practice – key learnings

Example: my first job in logistics

Context:

- Early 2008 marked the start of the economic downturn



Impact on transportation:

- Volumes dropped significantly in the market.
- Costs remained stable, putting pressure on profitability.

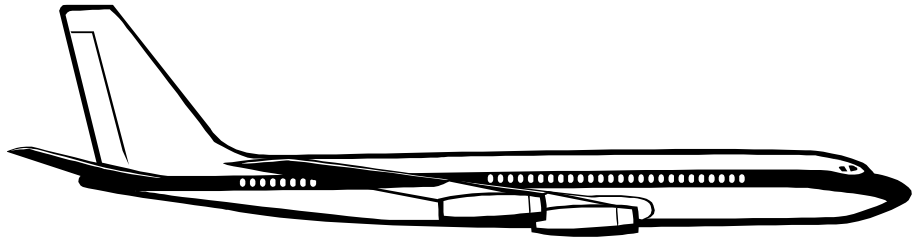
Key question:

- How can costs be reduced without causing any further drop in volumes

Example: my first job in logistics

The challenge:

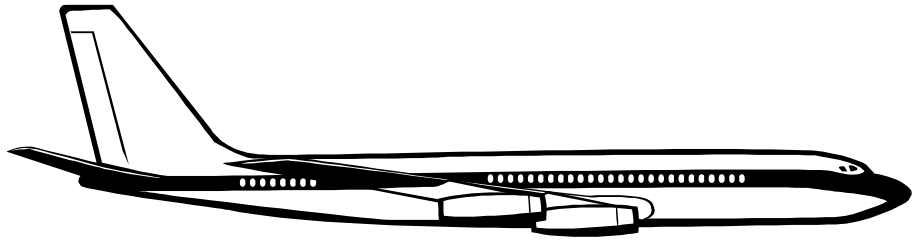
- There is no one telling you “use this or that algorithm”
- Nor is there anyone that tells you what type of answer is preferred….



Example: my first job in logistics

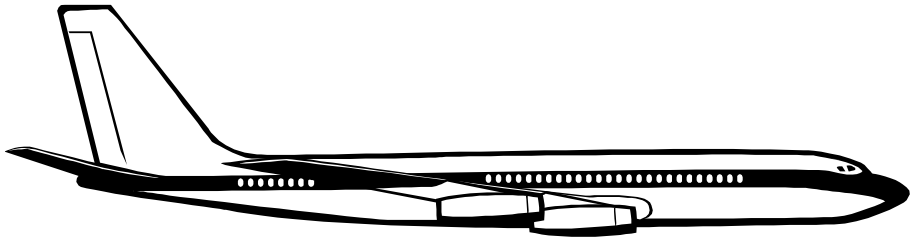
The challenge:

- The only thing that is very clear is that the pressure is on!
- The earlier the solution is implemented, the earlier savings are achieved (so better to have the answer yesterday than tomorrow)
- And there is no room (in time and budget) for long research to find the optimal answer



Example: my first job in logistics

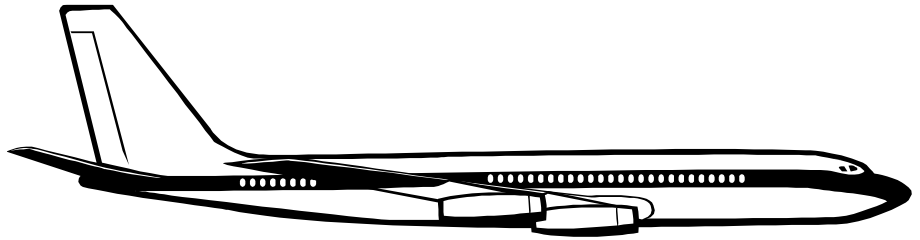
Step 1: Define and discuss possible alternatives



- Use different transport modes: e.g., road instead of air
- Acquire or lease different types of aircraft to match demand
- Attract additional volumes from new customers or markets
- Adjust service frequency: e.g., twice a week instead of daily
- …

Example: my first job in logistics

Step 2: Design the solution

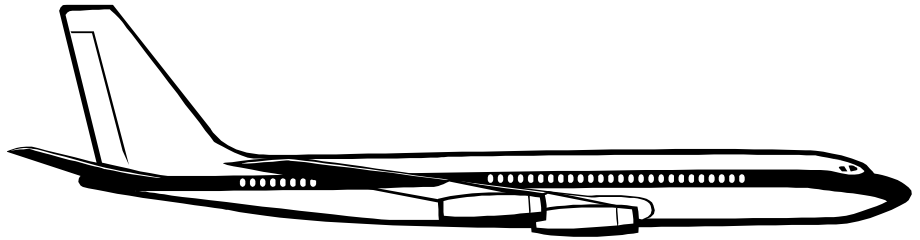


- Identify suitable techniques: Which methods or models fit the problem?
- Consider optimality: can we aim for an optimal solution, or do we need a practical approximation?
- Assess available data: What data can we use?

Often, data collection and preparation is the most time-consuming part of the process!

Example: my first job in logistics

Step 3: Model, analyze, discuss and advise



- **Data preparation**: once the data is cleansed, the model can be applied.
- **Baseline** creation: establish a baseline representing the current situation.
- **Model tuning**: adjust the model to ensure it reflects reality accurately.
- **Scenario** analysis: run different scenarios to evaluate possible outcomes.
- **Recommendation**: provide actionable advice to the customer based on results.
- **Implementation**: time to put the recommended solution into practice.

Example: my first job in Home Care

- The challenge: delivering high-quality home care efficiently under time and resource pressure
- Key question: Can we optimize the routes in which nurses, with different skill levels, deliver care to patients at their homes?
- Goal: minimize travel time, balance workload, and ensure patients receive care on schedule

Example: my first job in Home Care

Challenges that come across

- Acceptance of new routes (also for good reasons)
- Hard constraints (time windows) that in the actual situation are violated
- Solving the right problem: having the right numbers of FTE?

As a mathematician, YOU can make a big impact!

- **Through logical thinking** – breaking down complex problems step by step
- **By defining the right problem** – understanding what truly needs solving
- **By overseeing the problem** – seeing the big picture and all its dimensions
- **By finding solutions** – applying mathematics creatively and effectively

And… by realizing it's not just about mathematics

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Rhythm – Follow us on LinkedIn

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