



# Challenges for the OR practitioner

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# Outline

Experiences

Challenges

Solutions?



# Background

Completed PhD in Engineering Science in 2008

The Optima Corporation 2008 – 2013

Since last year at Merlot Aero Limited

‘Core’ optimisation jobs

Model and

Develop optimisation solutions

# What is an optimal solution?

Objective value guaranteed to be best possible.

“Optimised” solution

Find one (fast)

Improve on manual solution

Automated solution

Best possible solution

Optimiser is as good as time permitted

# The Optima Corporation

Founded in 1998

Operations Research specialists

OR expertise from University of Auckland

Resource scheduling and staff rostering

Airline scheduling

Emergency services

Offices in New Zealand, UK, and US

Clients in UK, Canada, Australia, NZ, Denmark,  
Netherlands, and USA

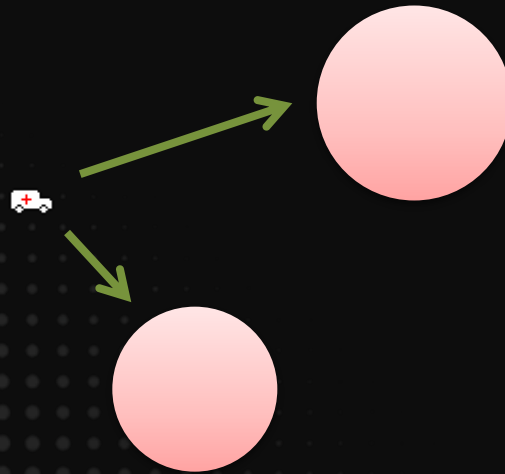
# Ambulance service modelling

Resource planning and analysis

Simulation model

What-if analysis

Locate ambulances where they are likely to be needed most



# Challenge: Model real world

Replicate real-life performance with a mathematical model

Implementation process

Data analysis

Data processing

Understand operating practice

Calibrate model

# Role of 'real' OR

Data analysis  
Data processing  
Customer communication

Modelling



# Challenge: Data

Missing

Incorrect

Incomplete

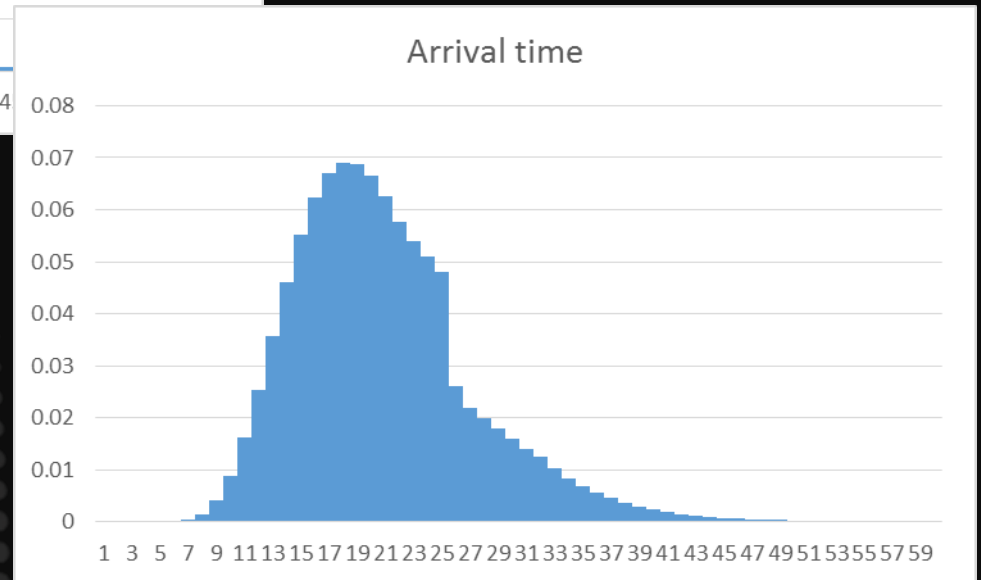
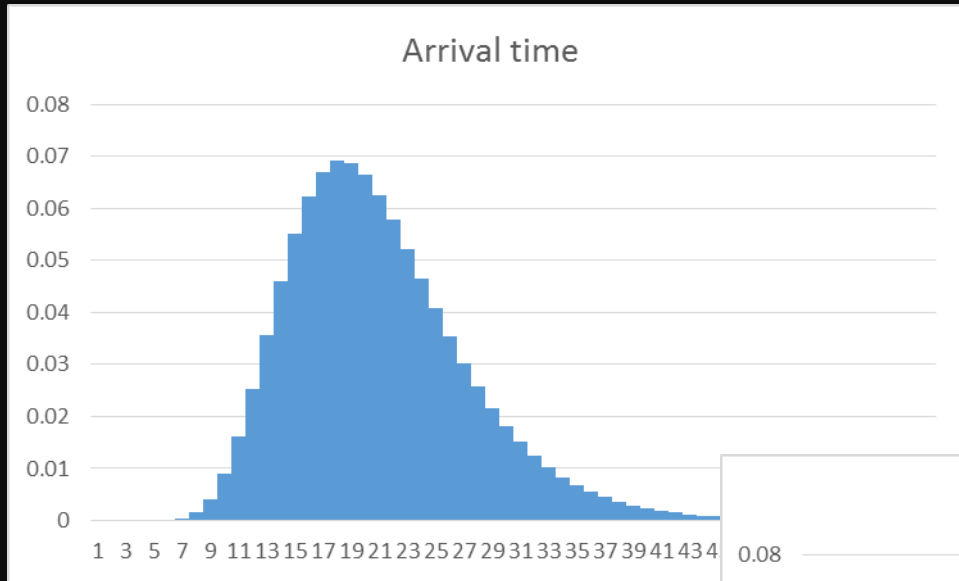
Contradicting

Inconsistent

Not linked

Client specific

# Expected vs actual



# Challenge: Optimise people

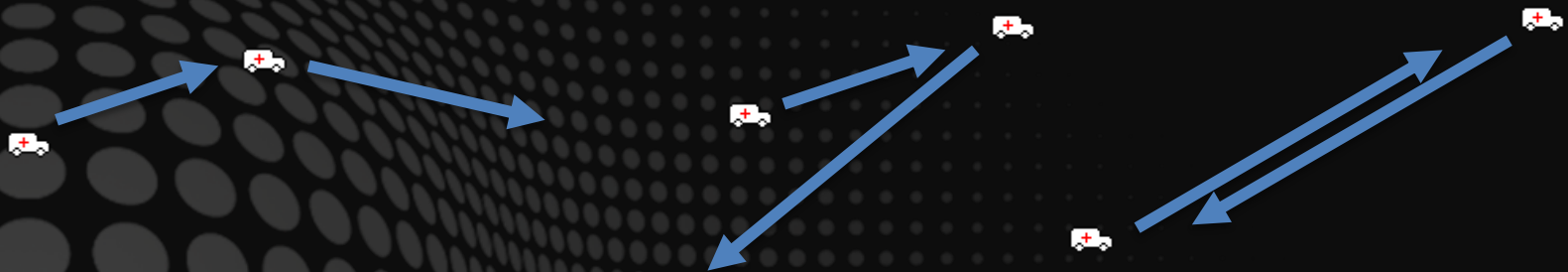
Real time vs planned

Data constantly changing

Big picture vs local view

Optimised vs practical solution?

Recovery



# Merlot Aero

Airline management software

Crew

Aircraft

Planning/operations

Cloud based

Established 2008

36 customers

Global team, 40 employees

# Building a pairing optimizer

Set of flights

Build crew itineraries to cover all flights

Subject to many rules

- Maximum flying time

- Maximum duty time

- Minimum rest

Most difficult constraint: finish by March

# Role of 'real' OR

Interface  
Rules

Real world  
User Interface  
Data

Integer  
program

# Challenge: Visuals

Progress bar more important  
than runtime

Usability

Look and feel

Flight	Equipment	Designator	Departure Port	Departure Time	Arrival Port	Arrival Time
983	M83	G4	ABE	3/2/2014 5:20:00 PM	PGD	3/2/2014 7:55:00 PM
889	M83	G4	ABE	3/5/2014 5:14:00 PM	PIE	3/5/2014 7:51:00 PM
625	M83	G4	ABE	3/6/2014 3:01:00 PM	SFB	3/6/2014 5:28:00 PM
983	M83	G4	ABE	3/6/2014 5:20:00 PM	PGD	3/6/2014 7:55:00 PM
889	M83	G4	ABE	3/7/2014 5:14:00 PM	PIE	3/7/2014 7:51:00 PM
889	M83	G4	ABE	3/8/2014 5:14:00 PM	PIE	3/8/2014 7:51:00 PM
625	M83	G4	ABE	3/9/2014 1:06:00 AM	SFB	3/9/2014 3:33:00 PM
625	M83	G4	ABE	3/9/2014 1:11:00 PM	SFB	3/9/2014 3:38:00 PM
983	M83	G4	ABE	3/9/2014 4:20:00 PM	PGD	3/9/2014 6:55:00 PM

The screenshot shows a software interface for flight scheduling. At the top, it displays 'March 2014' with a '2' in a yellow box. Below this, there are several expandable sections: 'Flight Attendants 757', 'Captains MD80', 'INPUT DATA' (modified 01/01/01), 'CONFIGURATION' (modified 01/01/01), and 'SOLUTION'. The 'INPUT DATA' section is expanded, showing 'Flights', 'Pairings', and 'Lead-in pairings'. The 'CONFIGURATION' section is also expanded, showing 'Duty Rules', 'Pairing Rules', 'Legal Rules', 'Connection Rules', 'Deadhead Rules', 'Costs', 'Port Rules', 'Aircraft Rules', 'Force/Ban', and 'Control'. The 'SOLUTION' section is expanded, showing 'Pairings', 'Uncovered Flights', 'Report', and 'Log'. A yellow 'SOLVE' button is visible at the bottom right of the sidebar.

# Challenge: Communication

The art of asking questions

What about the other case?

Terminology

Explain details

Customers

Overseas colleagues

Technically challenging

No room for interpretation

Remote location



# Challenge: Providing the 'right' solution

Best solution is not always best.

Solution vs. need

Quality, quick, any?

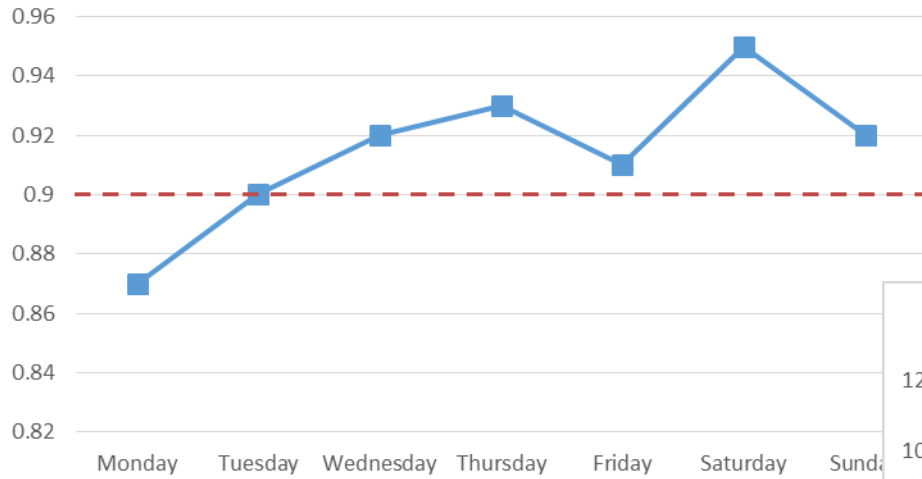
User ability/behaviour

Simple 'common sense' can fix 90% of issues

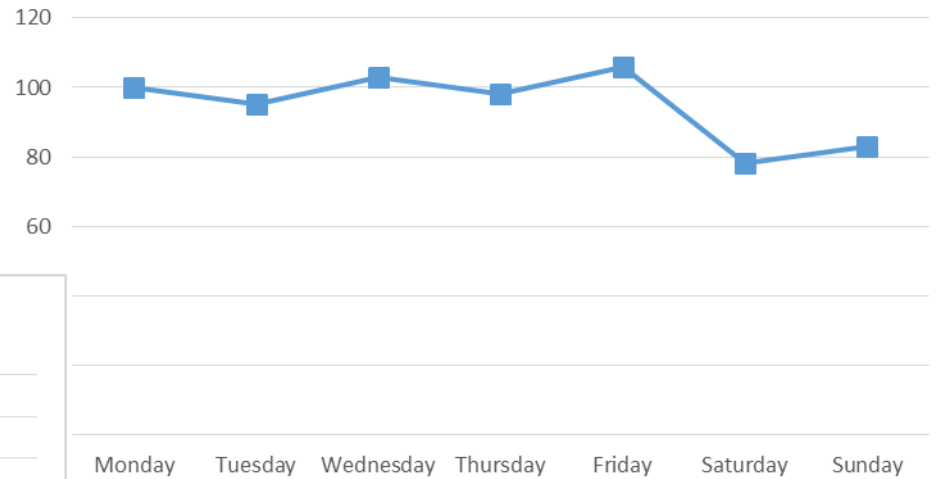
Can the problem be solved?

Environment, legacy systems

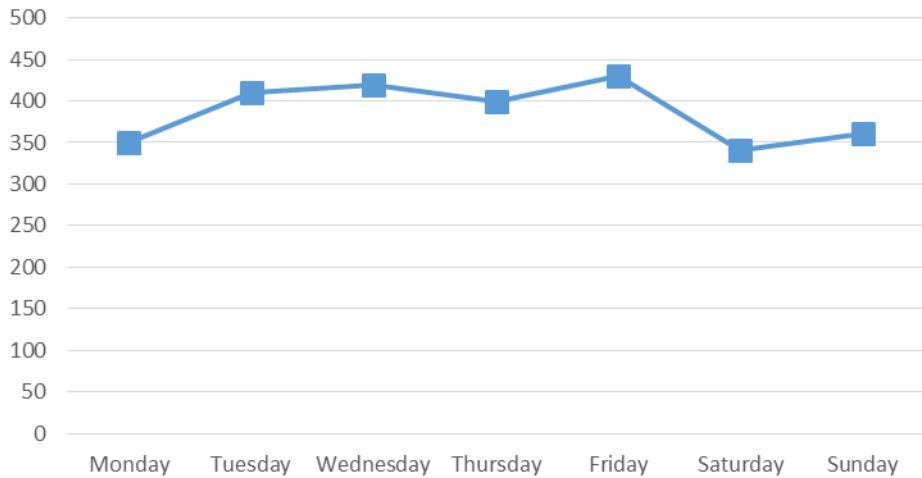
### Compliance



### Call volume



### Resources



# Challenge: Estimation

## Management

Why does this take so long?  
How complicated can it be?

## Development time


Features  
Interfaces  
Third party

## Implementation time

Customer data  
Operating characteristics

## Run time

Size  
Complexity



Depends a lot on technical details

# Challenge: Engagement

Resistance to change

Use product to its full capacity

Act on recommendation

Training

Support



How the customer explained it



How the project leader understood it



How the engineer designed it



How the programmer wrote it



How the sales executive described it



How the project was documented



What operations installed



How the customer was billed



How the helpdesk supported it



What the customer really needed

# Conclusion

OR does provide great tools

Biggest challenge is to bridge gap to real world

Interested in tackling those challenges?

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<http://merlot.aero>