When the "world of ideas" meets the ground: Stories of applied Operations Research (and Machine Learning) in real life

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Web-conference 5th October 2020

3rd conference of the EURO Working Group
on the Practice of Operations Research
Challenges in the deployment of OR projects

Our profile … we live of OR projects!

Accredited Spin-off of the Alma Mater Università di Bologna (Operations Research and Management Science)

We design, develop and provide state-of-art Solutions and Services in Advanced Analytics and Optimization

We integrate the talent of over 40 skilled Data Scientists, Business Consultants and SW Development Engineers to support our Customers and Partners in their Digital Innovation roadmap

We enable efficiency and effectiveness for medium and large enterprises in several industries (Energy, Waste, Logistics, Retail), unlocking exceptional returns on investments (ROI)

Bologna: Consultancy Services and Commercial HQ

Cesena: Software Factory

The OR project's process (basic)

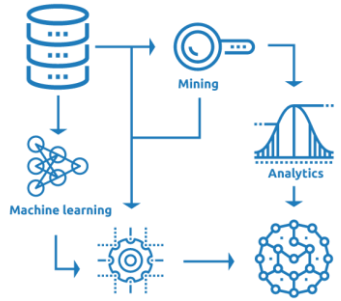
PROBLEM DESCRIPTION

Analyse and qualify the **business issue**, to describe the problem that will be object of analysis, agreeing on the desired objectives

DATA MANAGEMENT

Search and analyze (sometimes big) **data** to build adequate use cases and qualify future process data flows

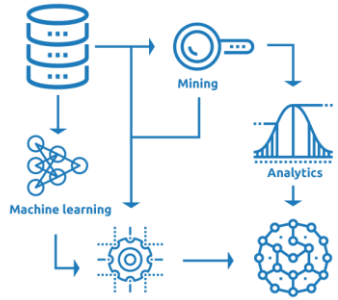
MODELLING, ANALYTICS AND OPTIMIZATION

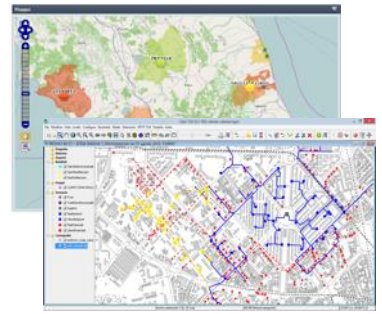


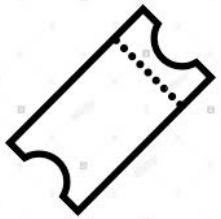
Use **Operations Research** (and other) techniques to design and develop the model to achieve the set objectives. Release the algorithm to the user

The OR project's process (full)

PROJECT'S / SOLUTION'S SALE → **PROBLEM DESCRIPTION** → **DATA MANAGEMENT** → **MODELLING, ANALYTICS & OPTIMIZATION** → **SOLUTION'S DEVELOPMENT** → **MAINTAIN & EVOLVE**







Position company, marketing and lead generation, identify opportunity, build trust, propose and qualify business idea, close contract

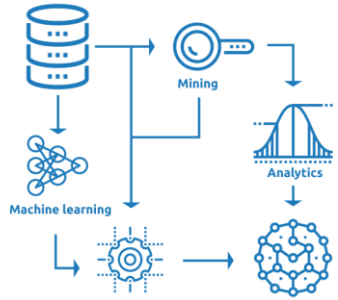
Develop, deploy Decision Support Systems, (from custom APIs to Enterprise Applications), to optimize business process

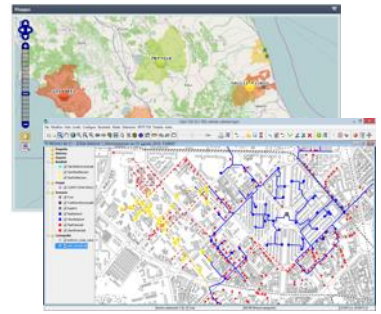
Provide Helpdesk (SLAs), application and evolutionary maintenance, SaaS, ensure longevity wrt technological advances

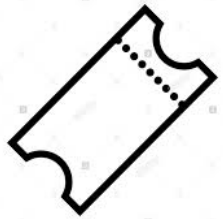
DIGITAL INNOVATION SUPPORT

Core competences & skills … so much more that sound OR modelling!

PROJECT'S / SOLUTION'S SALE → PROBLEM DESCRIPTION → DATA MANAGEMENT → MODELLING, ANALYTICS & OPTIMIZATION → SOLUTION'S DEVELOPMENT → MAINTAIN & EVOLVE







COM, MARKETING & SALES

CUSTOMER SUPPORT

BUSINESS PROCESS

OPERATIONS RESEARCH / ADVANCED ANALYTICS

LEGAL & IPR

SW ENGINEERING

Managing multiple stakeholders and expectations

B.U. MANAGER

- Budget owner
- Economic impact

PROCESS OWNER

- Efficiency
- Organisational impact

ICT MANAGER

- ICT governance
- Data security

TOP MANAGER

- Strategic fit
- Innovation level

PLANNER/USER

- UX
- Flexibility (vs. XLS)

PROCUREMENT

- Cost
- Conditions

AFC REFERENCE

- ROI
- Data availability

BENEFICIARY

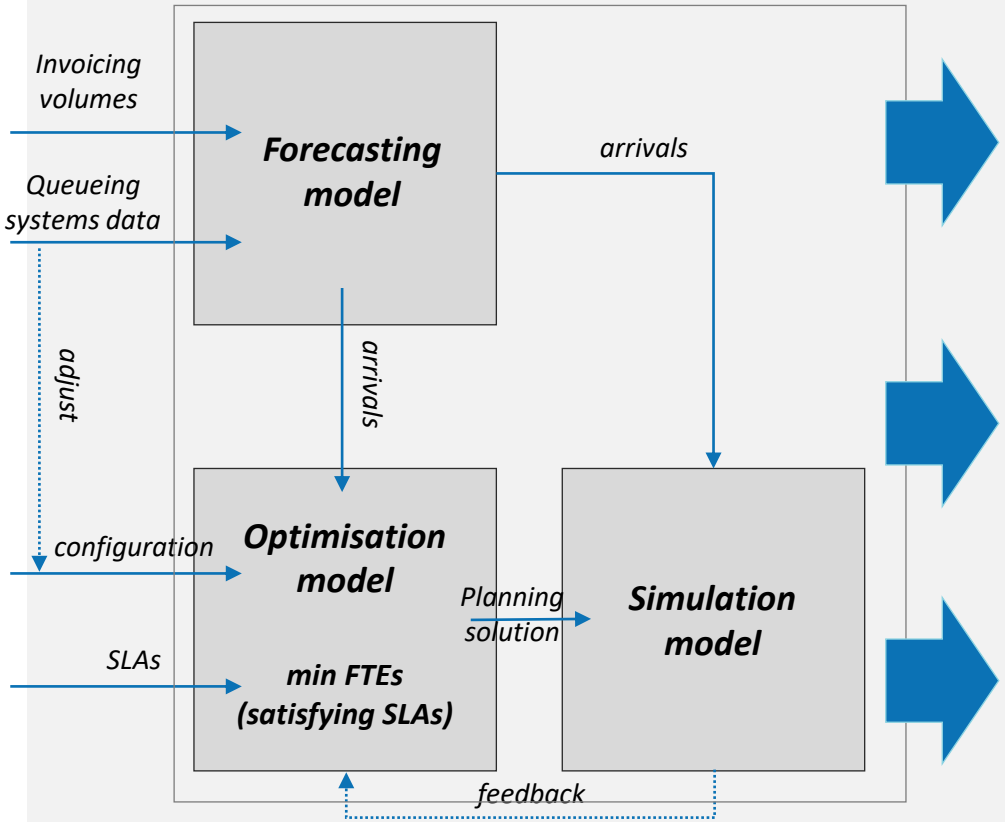
- UX
- Feasibility

R&D STAFF

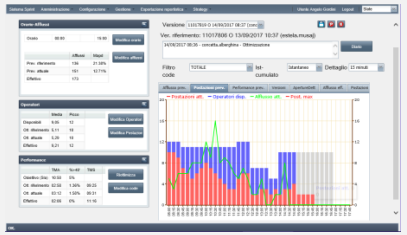
- Know-how
- IPR

Managing organizational changes …

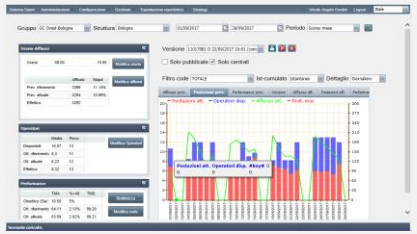
Success metrics: Customer Support Staff Scheduling



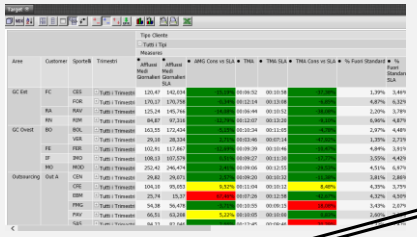
Operational planning (day-schedule)



Mid-term planning



(online) Reporting



	1 yr following adoption	3 yr following adoption
Service demand increase	+16%	+26%
Average waiting times	-36%	-35%
Customer Satisfaction Index	+6 points	+9 points
Back office backlog	-85%	-94%
Increased commercial activities	+241%	+706%

KEY SUCCESS METRIC TO ACHIEVE CUSTOMER ACCEPTANCE WAS ....
ARRIVALS FORECASTING ACCURACY

SIMPLIFIED

EURO 2012 25th European Conference on Operational Research 8-11 July 2012

informs

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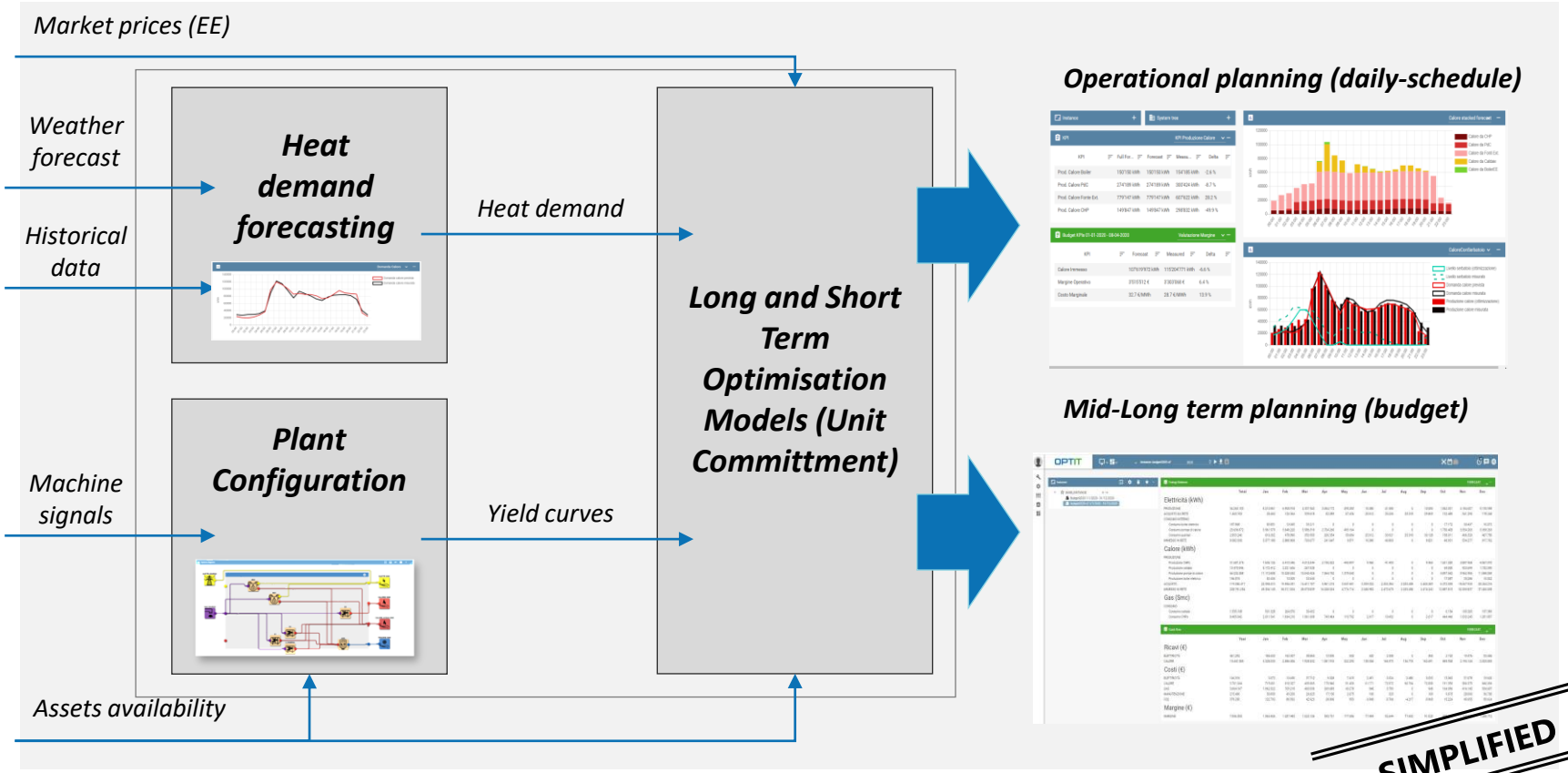
Success metrics: ENERGY PRODUCTION OPTIMISATION project



SIMPLIFIED

KEY SUCCESS METRIC TO ACHIEVE CUSTOMER ACCEPTANCE WERE ....

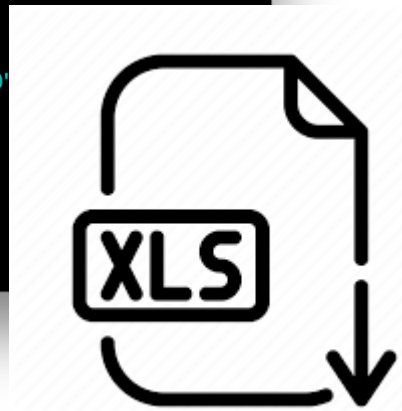
HEAT DEMAND FORECASTING ACCURACY

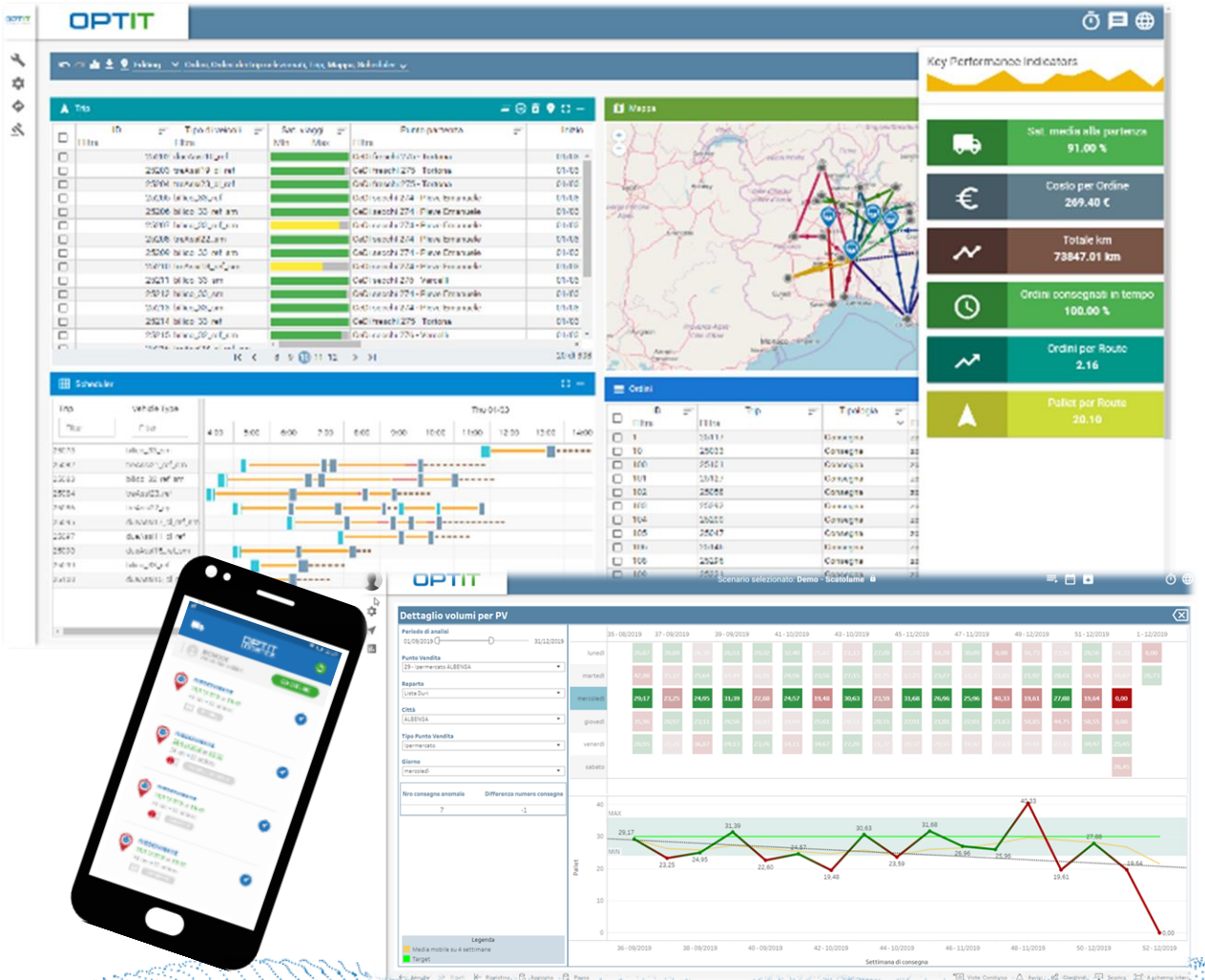
COMPETITION AGAINST MANUALLY CONSTRUCTED SOLUTIONS (OVER 0,1% DIFFERENCE ON MARGINS)

User Experience and GUI

```
1. bram@alatariel: ~ (zsh)
bram@alatariel ~ $ http "http://localhost:9000/api/tokens?token=$API_TOKEN"
HTTP/1.1 200 OK
Content-Length: 316
Content-Type: application/json; charset=utf-8

{
    "items": [
        {
            "code": "fb4f51fc-2ffb-422f-961d-58c121e5eed5",
            "createdAt": 1435755065889,
            "expired": false,
            "id": 2,
            "name": "Default - managed",
            "netmask": null,
            "seats": null
        },
        {
            "code": "c12c4c61-8b2f-49ec-9593-f5d87066c529"
            "createdAt": 1435755078286,
            "expired": false,
            "id": 3,
            "name": "Default - floating",
            "netmask": null,
            "seats": null
        }
```





How do we cope with this in Optit?

Competence mix: specialization vs. common objectives

Develop specific industry expertise

ANALYTICS & OPTIMIZATION

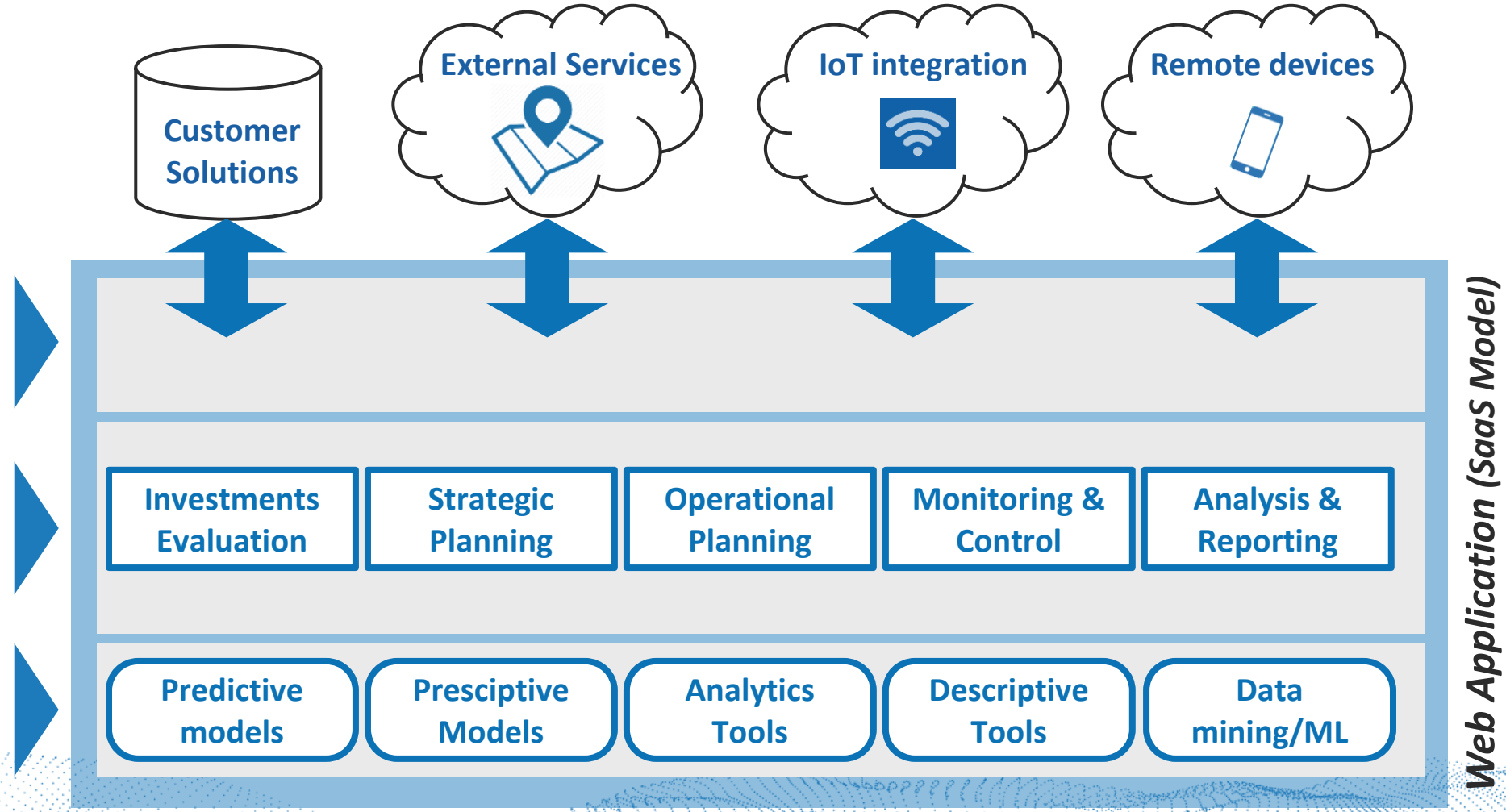
DIGITAL INNOVATION

ENERGY

WASTE

LOGISTICS & SUPPLY CHAIN

Investment on flexible Enterprise Framework (Platform)



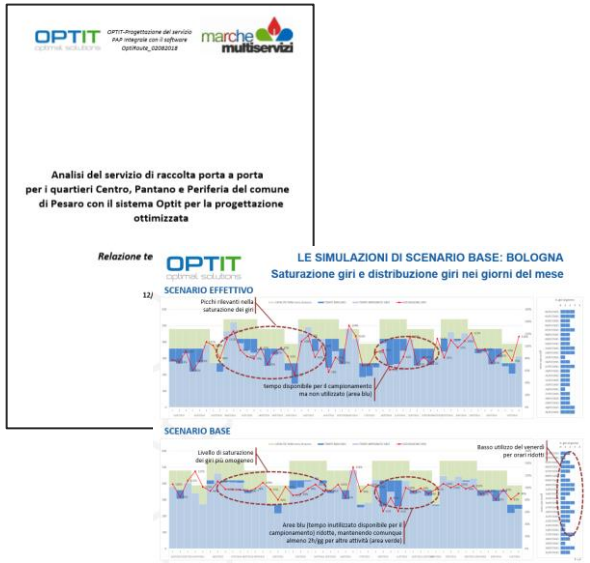
Flexible / custom delivery models

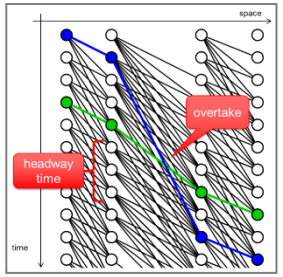
Consulting powered by Analytics & OR

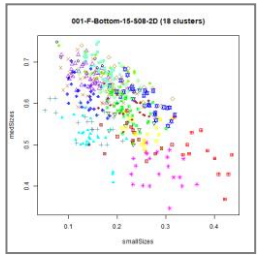
Machine Learning & OR Models & Algorithms

Smart Components & Services

Integrated Enterprise Solutions





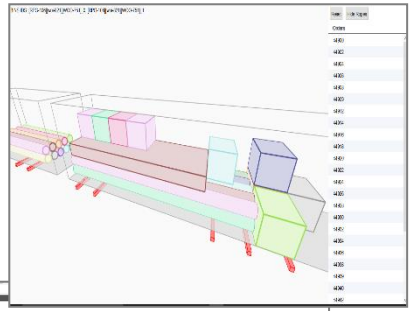


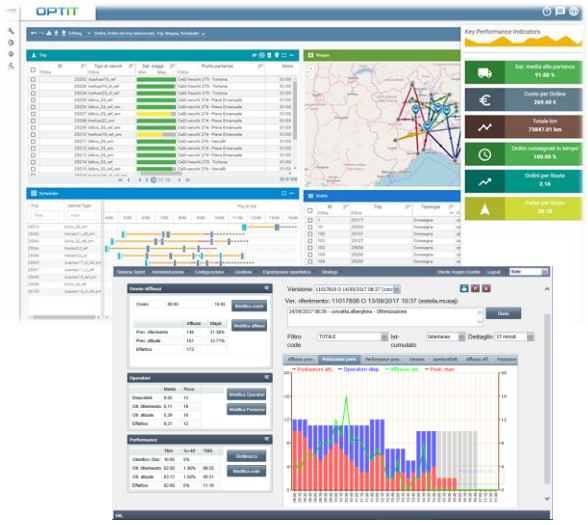

```
featureNames = {'eurpln':['price'], 'de1yt':['price'], 'pl10yt': ['pr
targetNames = {'eurpln':['price']}
n_in = 3
n_out = 2

models = []
models.append(('DTR', DecisionTreeRegressor()))
models.append(('RFR', RandomForestRegressor()))

features, targets = get_inputs(data, featureNames = featureNames, tar

regression_models(features, targets, models = models, plot = True, sc
```





Gradual apprach: start simple and build on

1. Analysis

- Process review
- IT Infrastructure
- I/O Data Req's
- Business Goals
- Customization needs

2. Pilot Project

- Proof of Concept
- Off-line Prototype
- Core Models dev't
- Calibration & Testing
- Scenario Analysis

3. Engineered solution

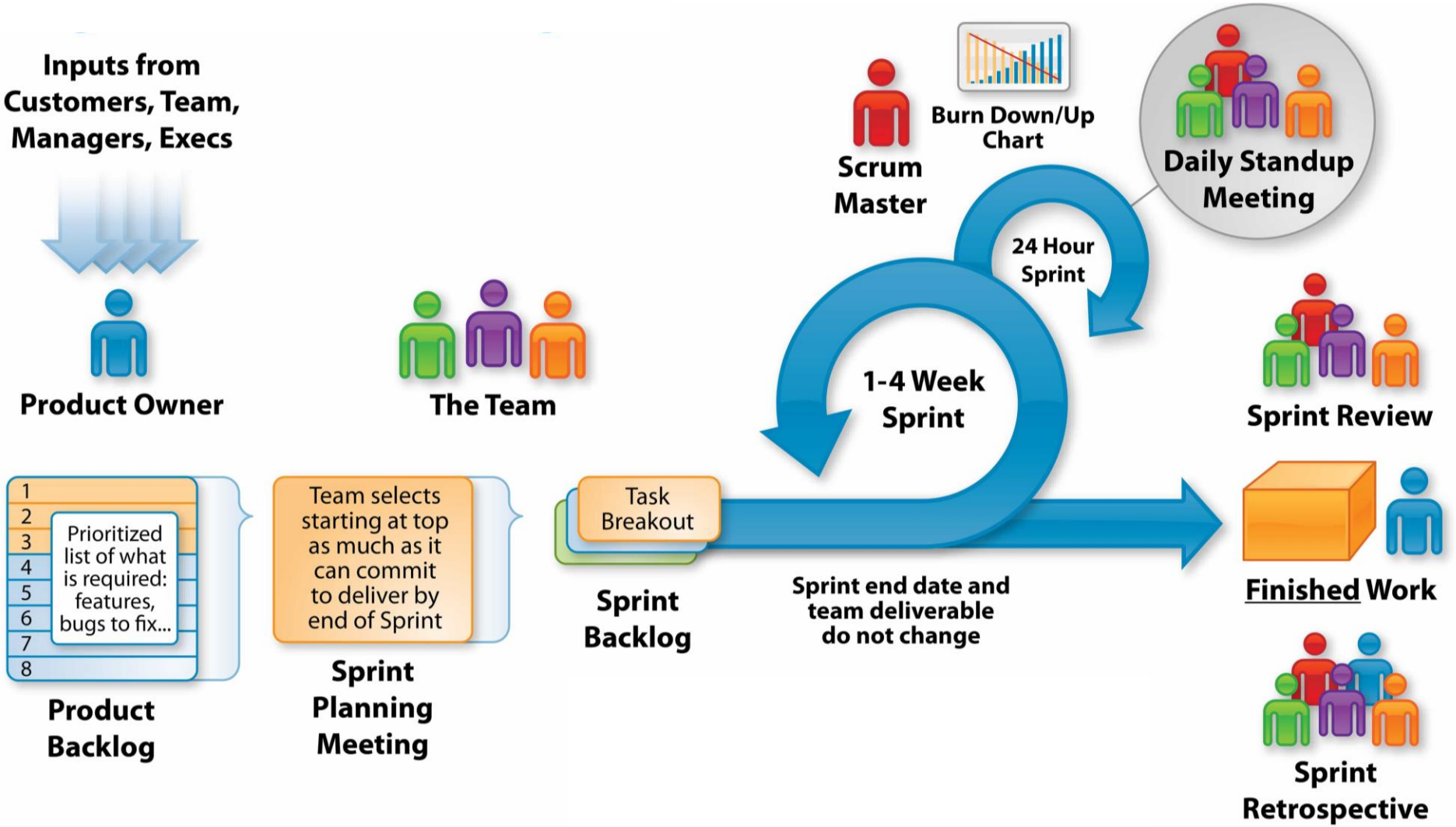
- Build/custom solution
- System Integration
- Deploy
- System fine tuning
- Start-Up Support

4. Management

- SW and Models Maintenance
- Continuous Updates
- Support on variations

Consulting → Solution / Software as a Service

When it comes to engineering a solution …. Agile development



The real OR project's asset: people, values and vision

OPTIT
optimal solutions

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Thank You for your kind attention!