



A Digital@SCM initiative

AI in Production Planning at Bayer



2023/ Frank Giroux





// **Bayer**

// The challenge

// Overview of the Production Scheduling solution at Bayer
Pharma

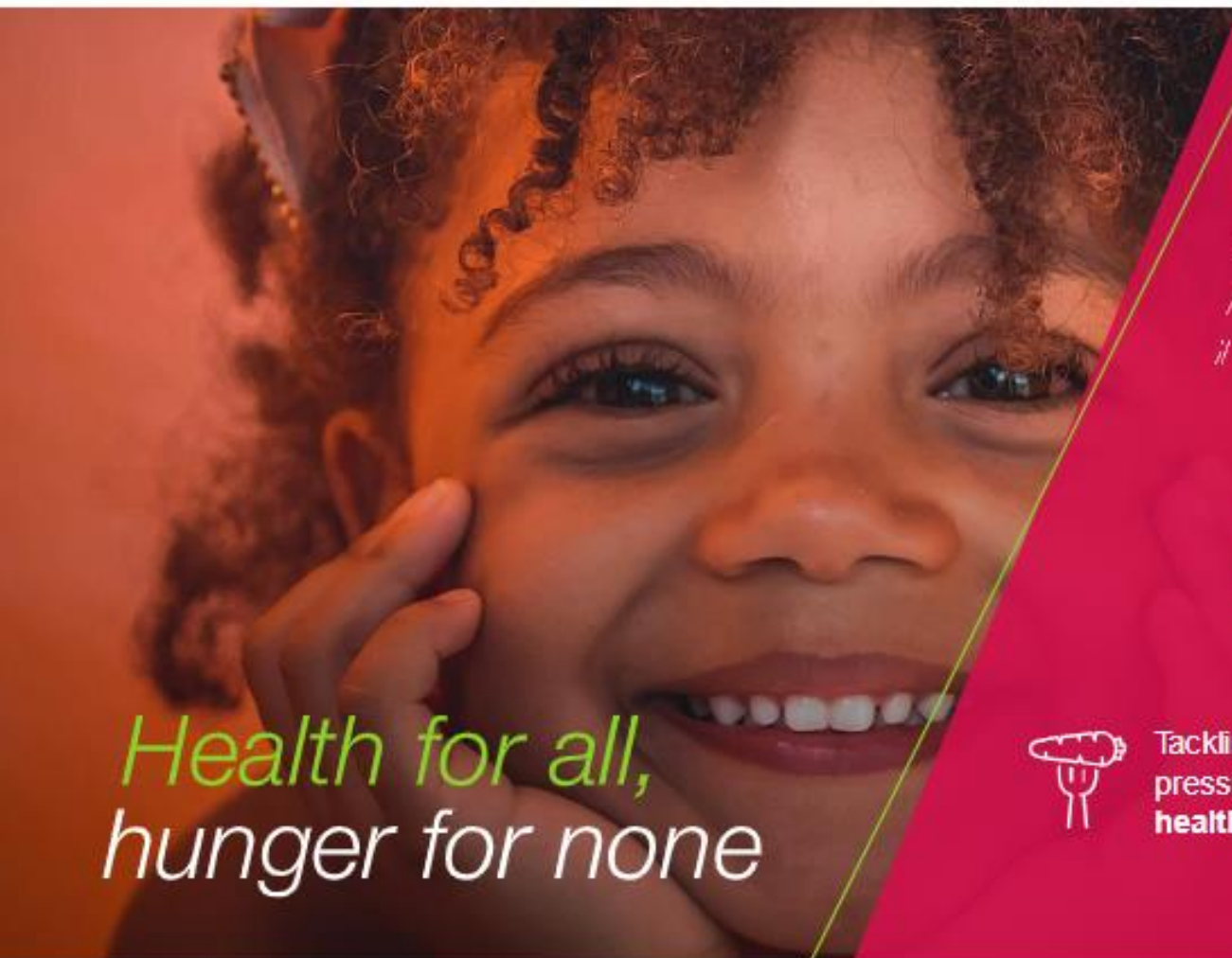
// Lessons Learned - Implementation obstacles (and possible
solutions)

// Outlook - how can the technology be scaled



Bayer at a glance

Group key data



*Health for all,
hunger for none*

3 divisions

- // Crop Science
- // Pharmaceuticals
- // Consumer Health

Represented by
354 consolidated
companies in

83
countries

101.4k

employees worldwide
in 2022*

€6.6bn

investment in R&D
in 2022

€50.7bn

sales
in FY2022



Tackling two of the most
pressing challenges of our time:
health & nutrition



Diverse, international focus
with cross-border and cross-
division **people development**

* As of December 31, 2022; employees in full-time equivalents



// Bayer

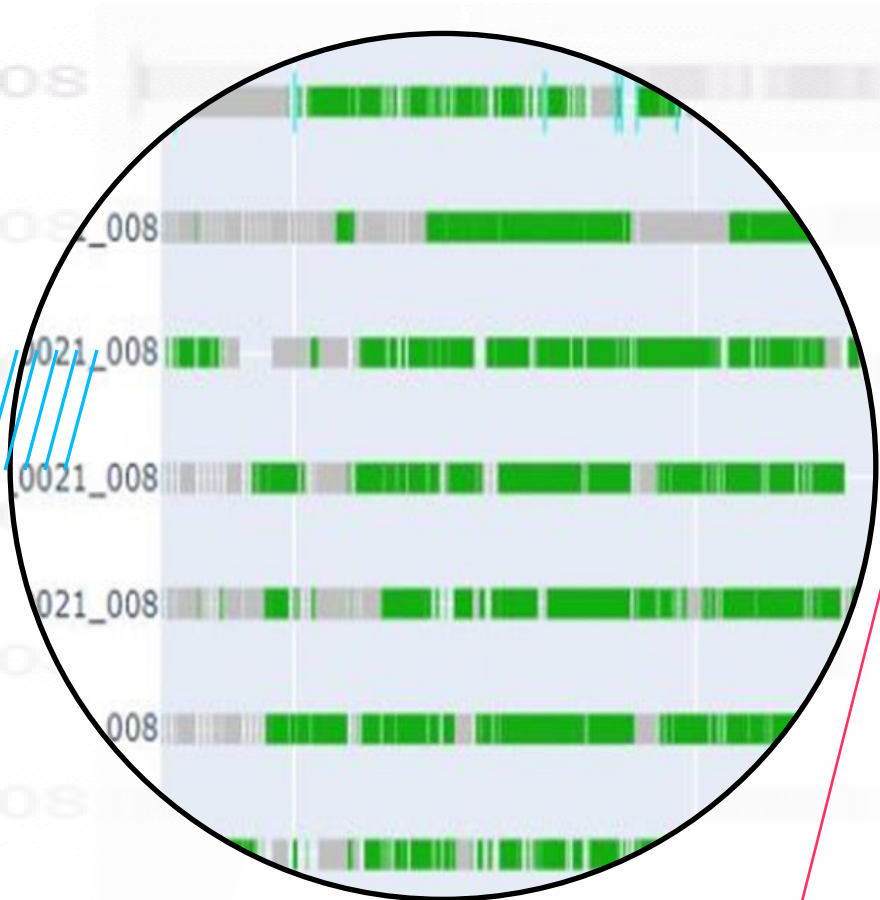
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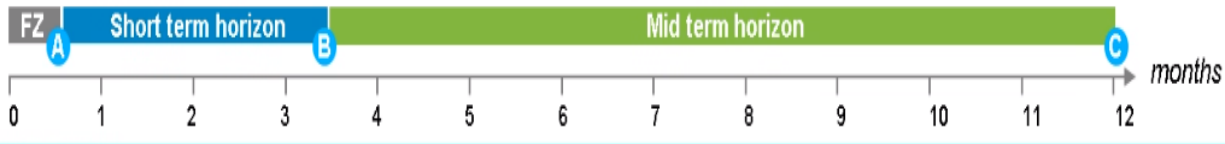
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The challenge



Find an optimal production plan for the next 3 to 12 months



Departure environment

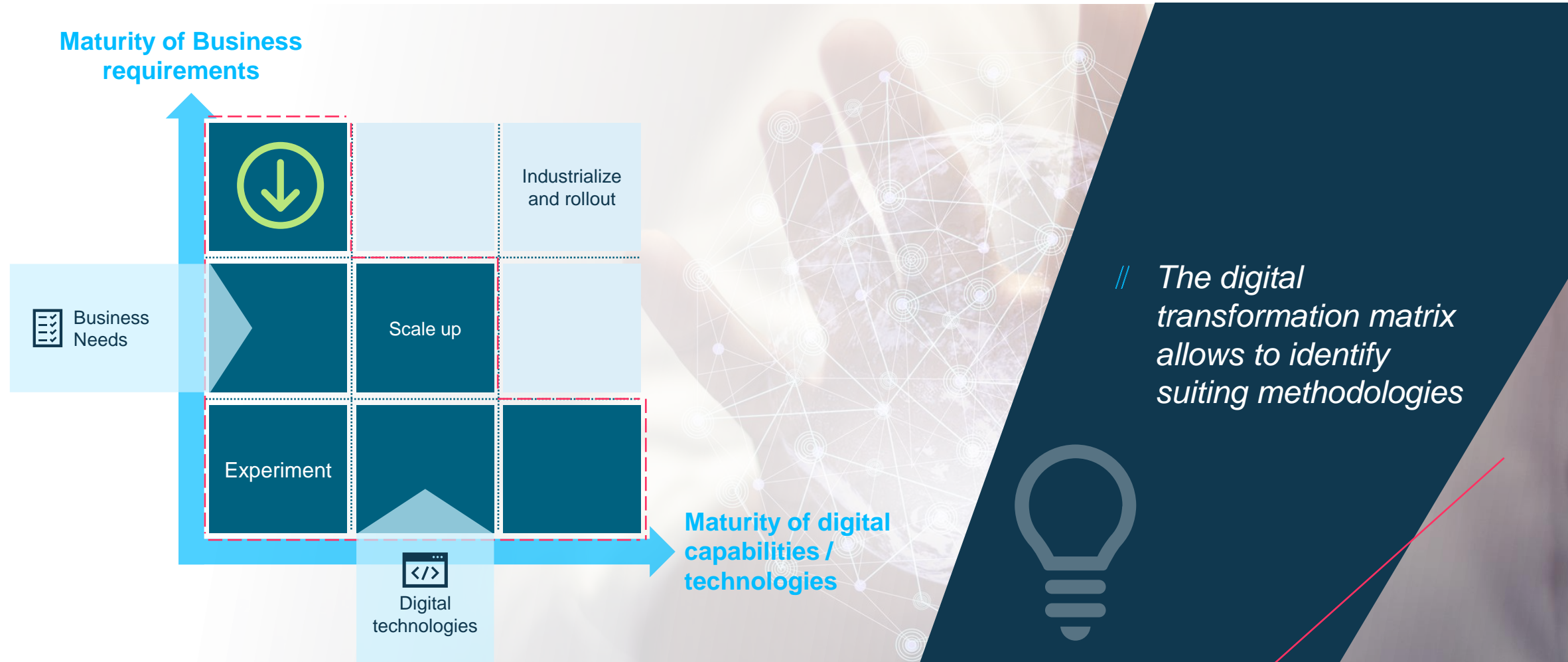
- // *Experience based planning*
- // *Limited numbers of options analyzed*

Related challenges

- // *Workload for planning team*
- // *Potentially inefficient resource usage*
- // *Risk of potentially lost sales*



Digitalization and solution maturity





Mathematical linear optimization as part of AI landscape

```

f1 = sum_mn MDATviolation_mn * (1/mdat_max) * (MDATviolation(Deadline))
f2 = sum_mn ts_mn / expectedTimeInCO * (tscoverTime)
f3 = sum_mn tg_mn / sum_mn horizonEndDates_mn * (tdletimes)
f4 = PIDSlack_min + PIDslack_max * (PlannedImplementationdate)
f5 = AOBSlack_min + AOBSlack_max * AOBs

```





// Bayer

// The challenge

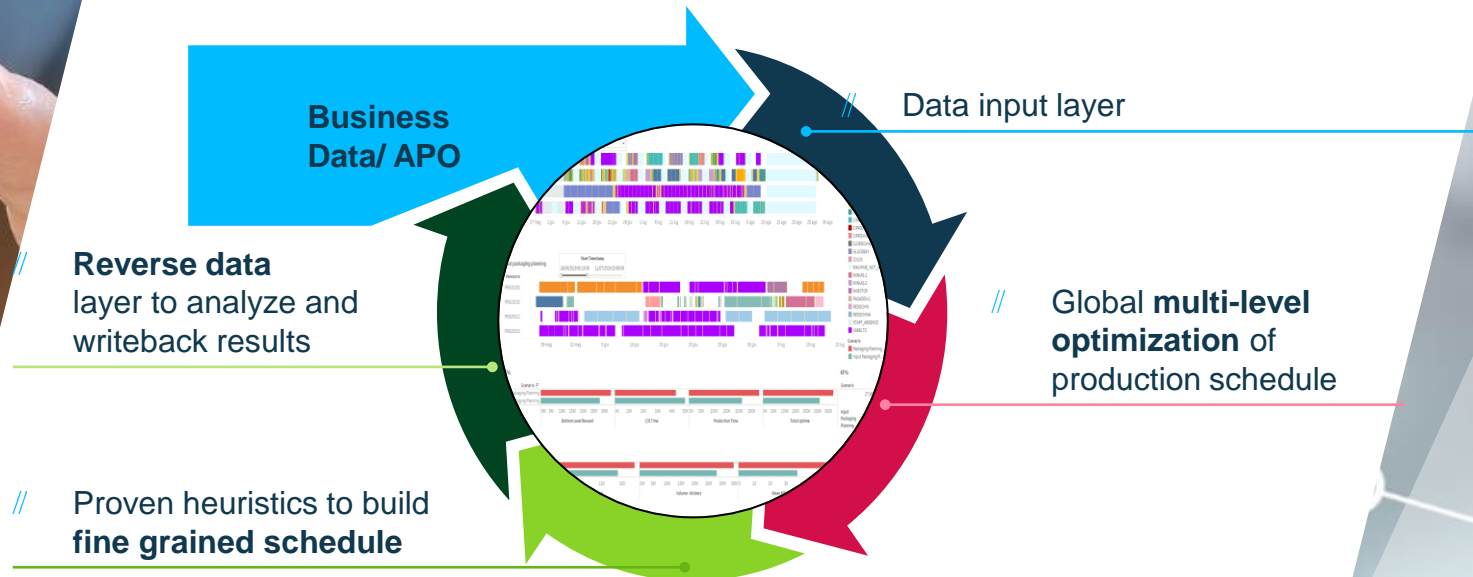
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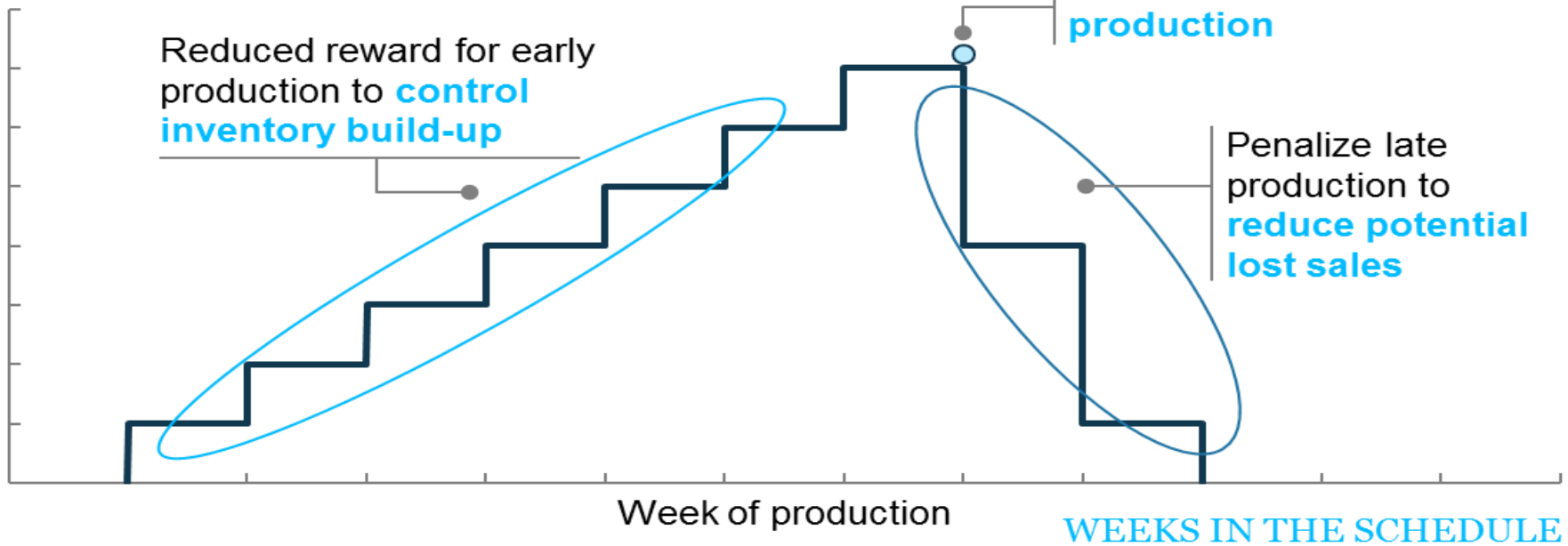
Production scheduler at a glance





Reward function

REWARD TO THE MODEL





Dashboard

Comparison – proposed vs. previous schedule



Proposed schedule

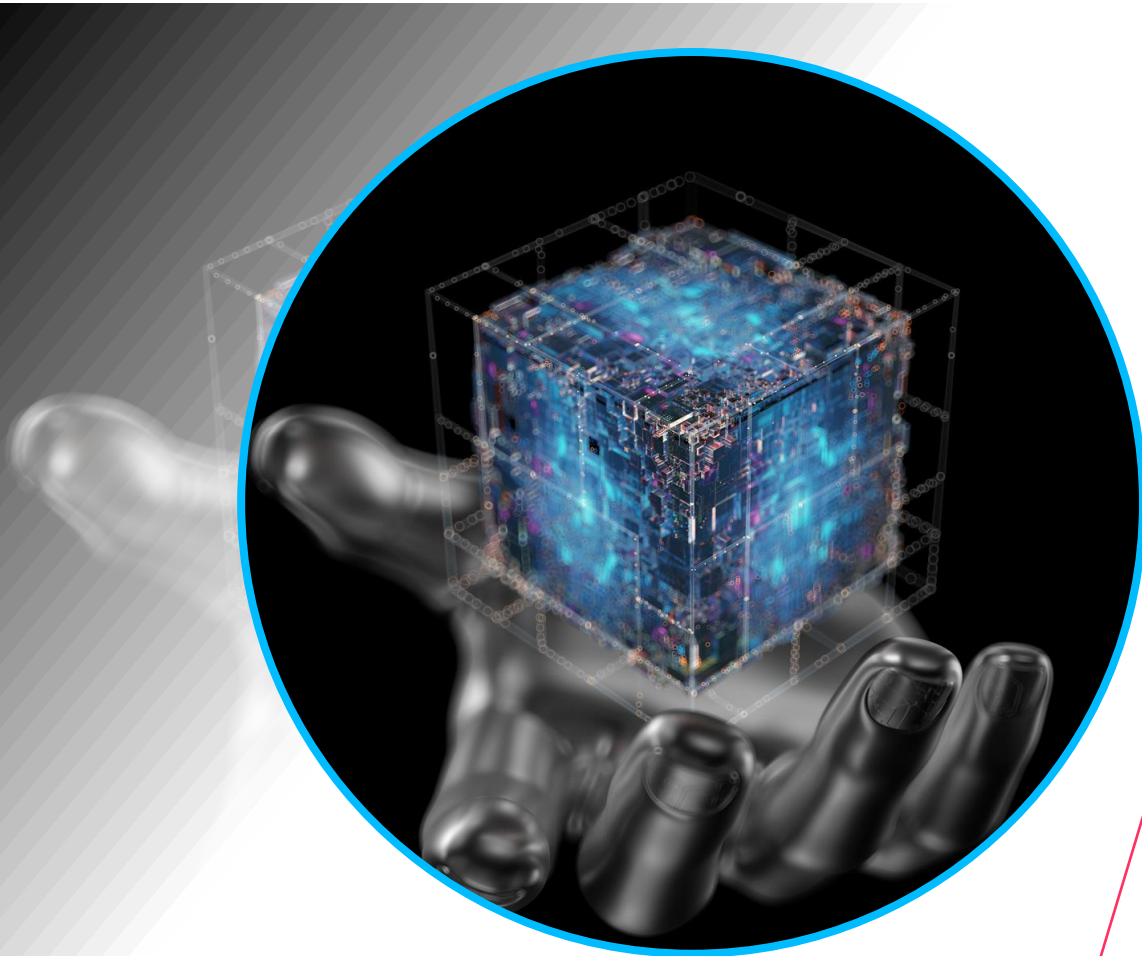
Previous schedule

KPI



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The solution is a black box to the user



- // The scheduler is a black box. There is no clear relationship between changes in the input schedule and the resulting new schedule.
- // The scheduler puts into question current planning philosophies. But the causality is not easy to interpret.
- // **Train users and stakeholders as part of project start**



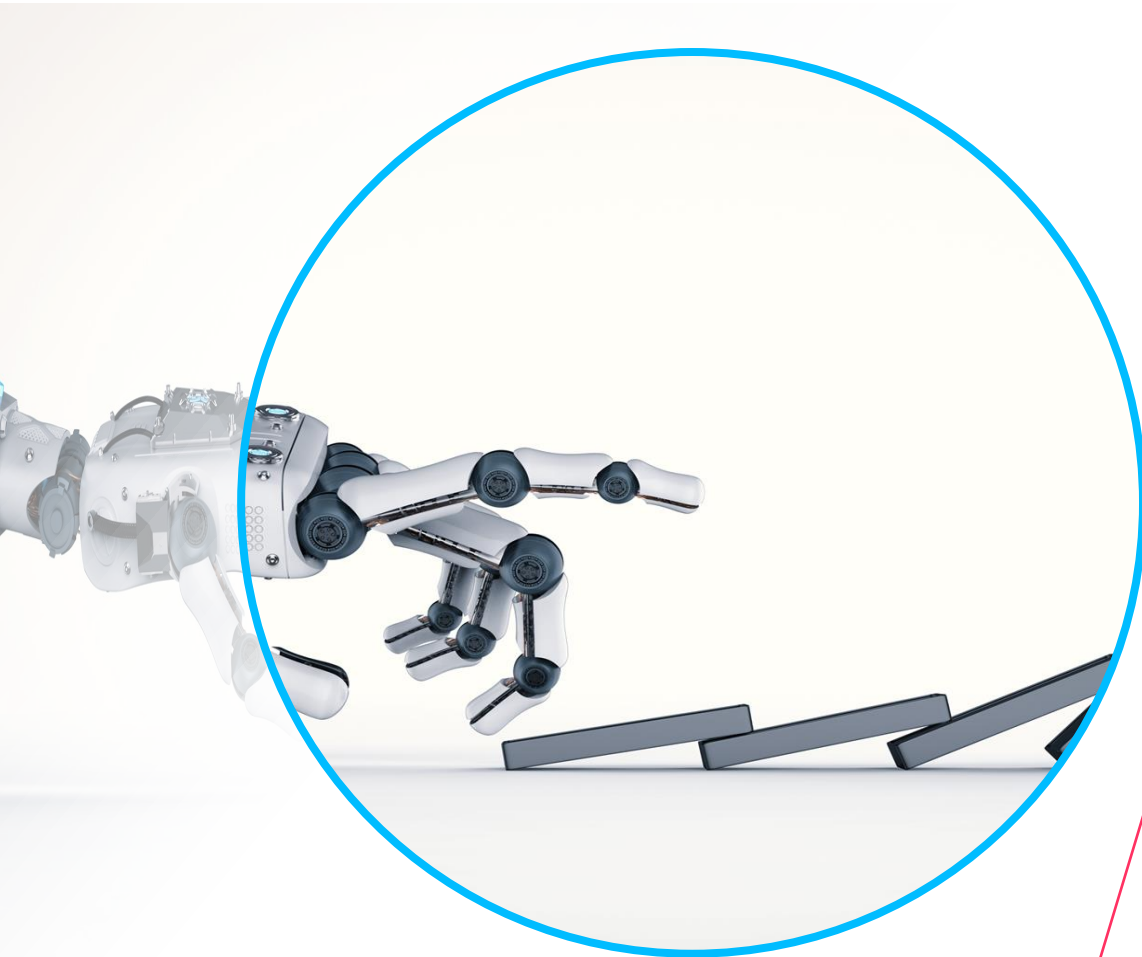
AI solutions need permanent improvement



Imagine "AI" like a mobile to be balanced

- // There is no final solution as of day one. There is no final solution ever.
- // It needs long term/ permanent re-calibration.
- // **Requirement for a permanent product team**

Master data - an expected issue



- // Master data issues are an ongoing stumble stone.
- // The uncertainty of the final functional scope leads to uncertainty on final master data requirements
- // Cross influences of master data issues to „bad“ planning results not always transparent.
- // **Ensure management support**



Lessons learned project management



- // Create transparency on uncertain character of project.
- // Develop a structure to measure digital maturities of a solution. Use this to better evaluate uncertainty.
- // Implement a weekly reporting in spoken word to the whole scheduler community in order to keep everybody on pace.
- // **Train stakeholders as part of project start**



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The production scheduler supports different environments

Frame
Production as bottleneck for order fulfilment (PLS)

Increase sales



Frame
Competitive market requires cost optimal production

Production efficiency
(Improved usage of given assets)



Frame
Increasing complexity for planning teams

Operational excellence



Potentials raised **Garbagnate**

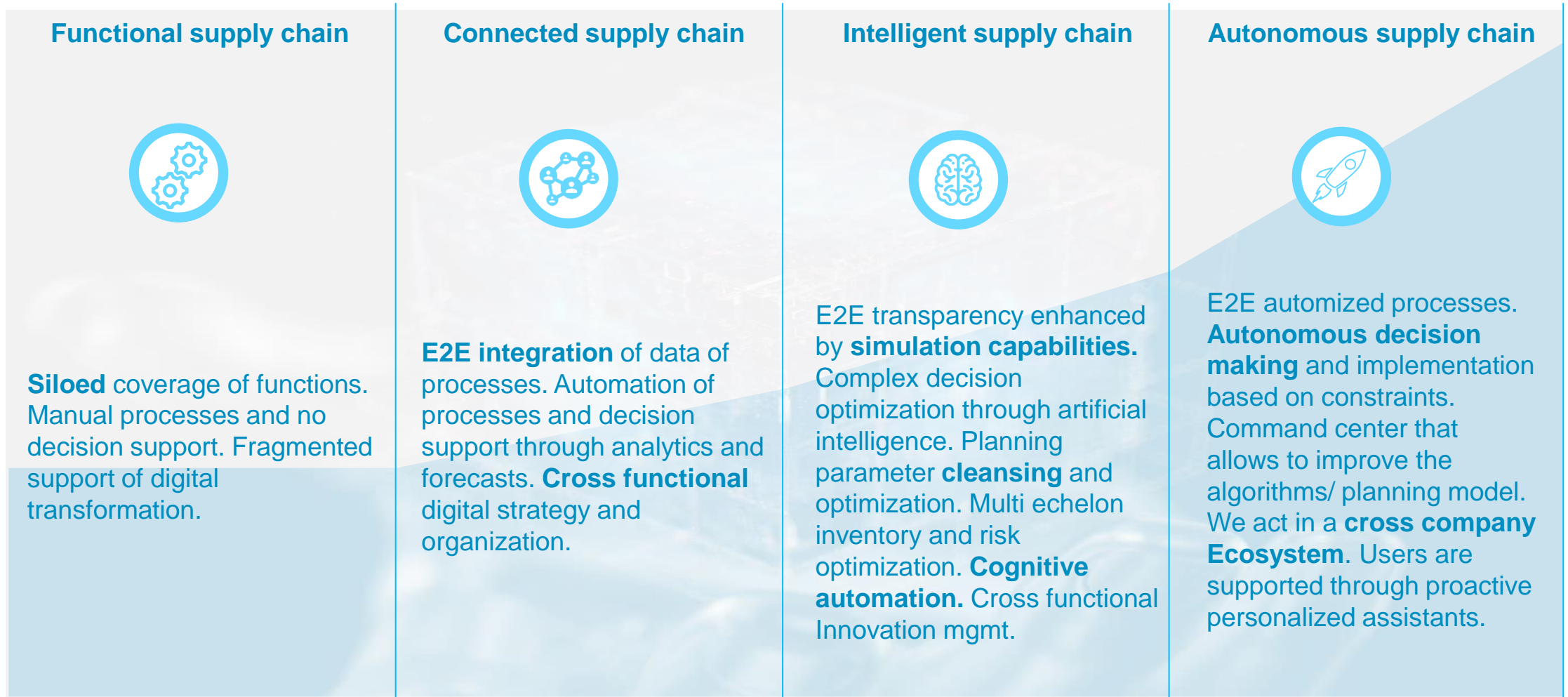
- // Significant lost sales decrease
- // Cost savings in production efficiency



Forecasted benefits **Berlin**

- // Expected break even Berlin (based on PLS improvement): 1,5 years

The usage of AI will help us to move into a more automated future





Forward-Looking Statements

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The company assumes no liability whatsoever to update these forward-looking statements or to conform them to future events or developments.



Thank you!



Frank Giroux

