



Advanced Analytics &
Business Consultancy

Modelling Checkouts Behavior to Support a Retailer's Stores Operations Design

Anylogic® Conference 2022

 September 2022

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LTP is a boutique analytical-driven management consultancy

Who we are

A **proven data-driven approach** enables LTP to address the complex challenges faced by its clients.

LTP combines **advanced analytics with business expertise** to deliver significant and sustainable impact in **bottom line profitability**.



70+ consultants + extended network



300+ projects



15+ countries



>25% annual growth¹

¹ Annual growth rates always above 25% in the past 5 years

LTP has a wealth of experience in facing crucial business challenges with the same data-driven mindset

Our scope of action

NOT EXHAUSTIVE



Marketing & Sales

Growth

Market & demand

How to anticipate sales trends?

Footprint & assortment

Which products to sell?

Pricing & promotions

When and how to change prices?

Targeted marketing & customer insights

What is the next best offer for each client?

Supply Chain & Operations

Efficiency



Network design

What is the ideal supply chain configuration?

Inventory & replenishment

How to coordinate inventory with product flows?

Capacity & workforce

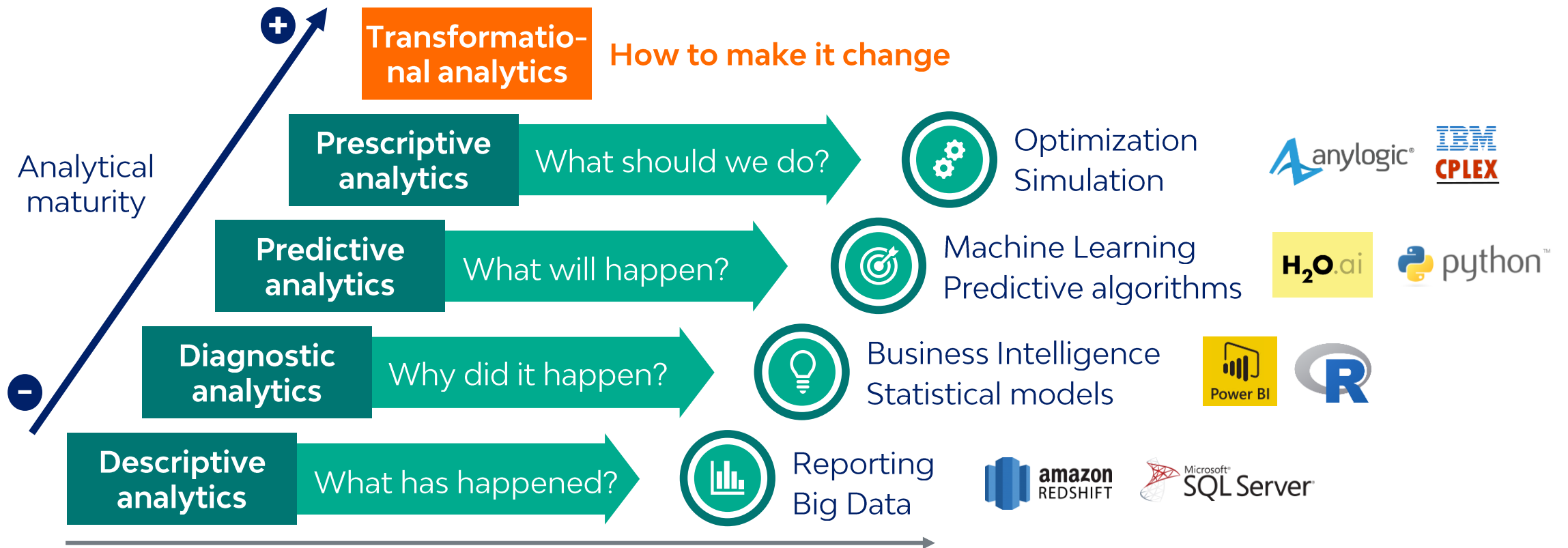
How to balance and optimize resource allocation?

Facility design

What is the optimal layout for a warehouse?

LTP's work in business analytics may be categorized in five axis: from information-driven to optimization-driven

The business analytics journey



The project was carried out at Sonae MC, a leading Portuguese food retailer

Sonae MC presentation



**5.4 k M€
turnover**

**+36k
employees**

**+1300
stores**

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Continente

Largest stores, typically found at shopping malls



Continente Modelo

Medium stores (i.e., the common supermarket)



Continente Bom Dia

Convenience stores, found in urban areas / cities' downtown

The checkout area is where the last phase of the customer in-store shopping experience occurs

Checkout area



The project is based on a food retailer and aims to improve the checkout dimensioning process

Challenges

Challenges in checkouts' business area

- Offer a **quality service** and suited to consumers' needs at a **competitive cost**
- Understand how to leverage the **wide variety of checkout solutions** available in the market



Goals

Determine the **ideal number of checkouts** of each typology to be available at the **stores**, in order to fulfill the demand and expected service level

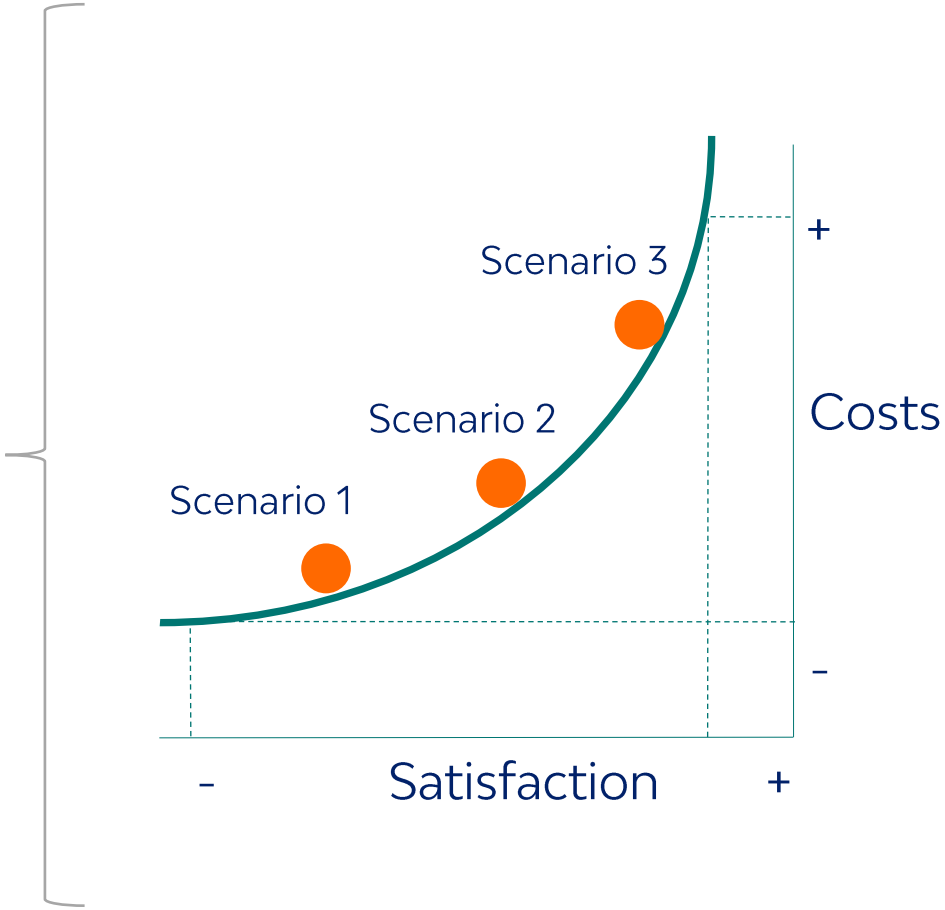
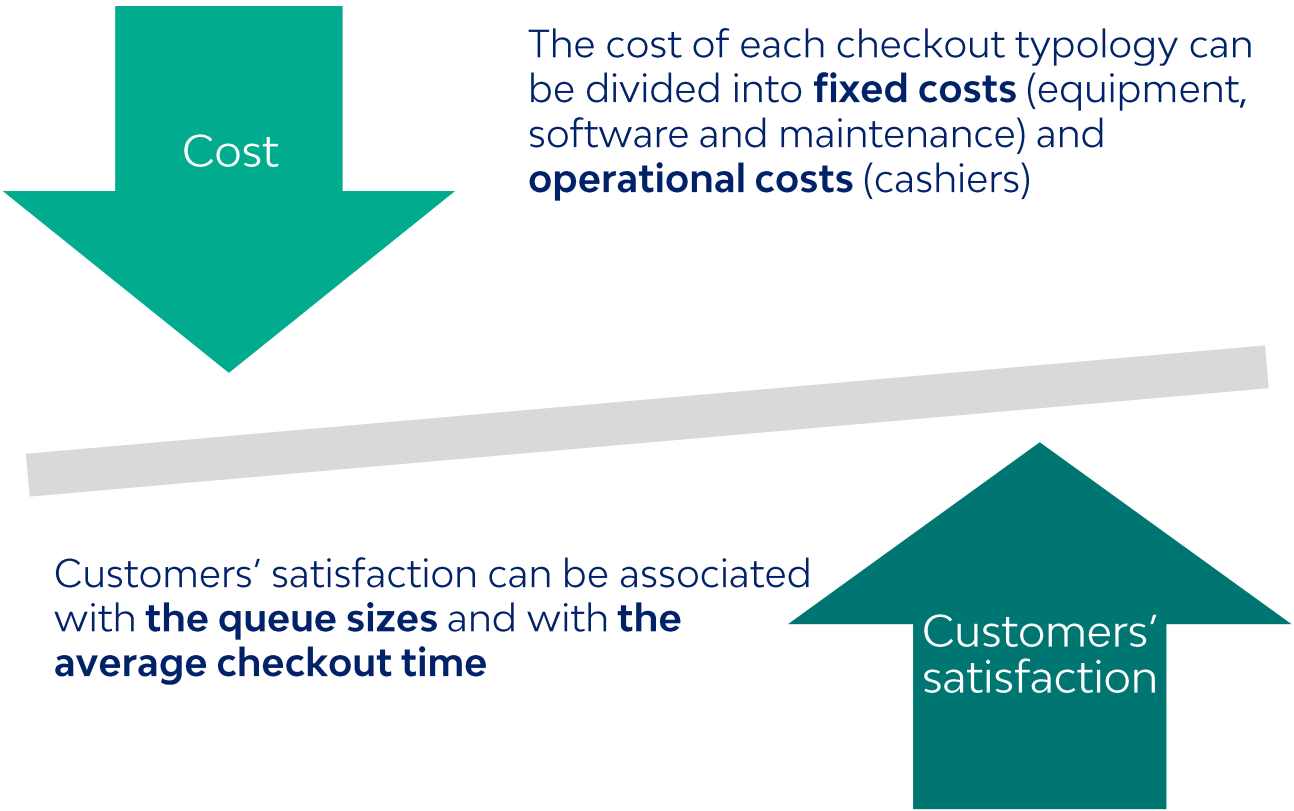
A

Identify and **prioritize the stores** in **greatest need of reconfiguration** of the checkout area

B

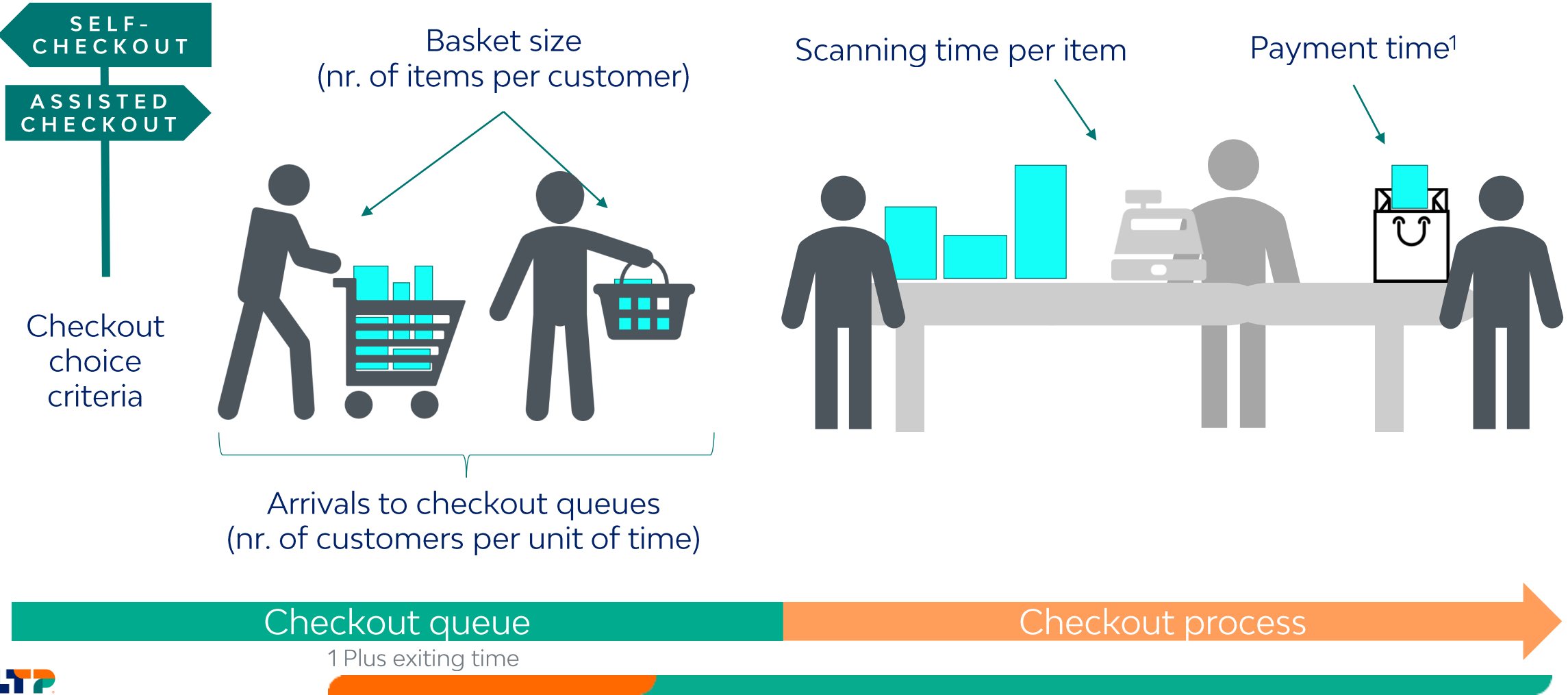
The trade-off between costs and customers' satisfaction increases the problem's complexity

Cost-satisfaction trade-off



The checkout parameters' modeling requires understanding the various stages of the process

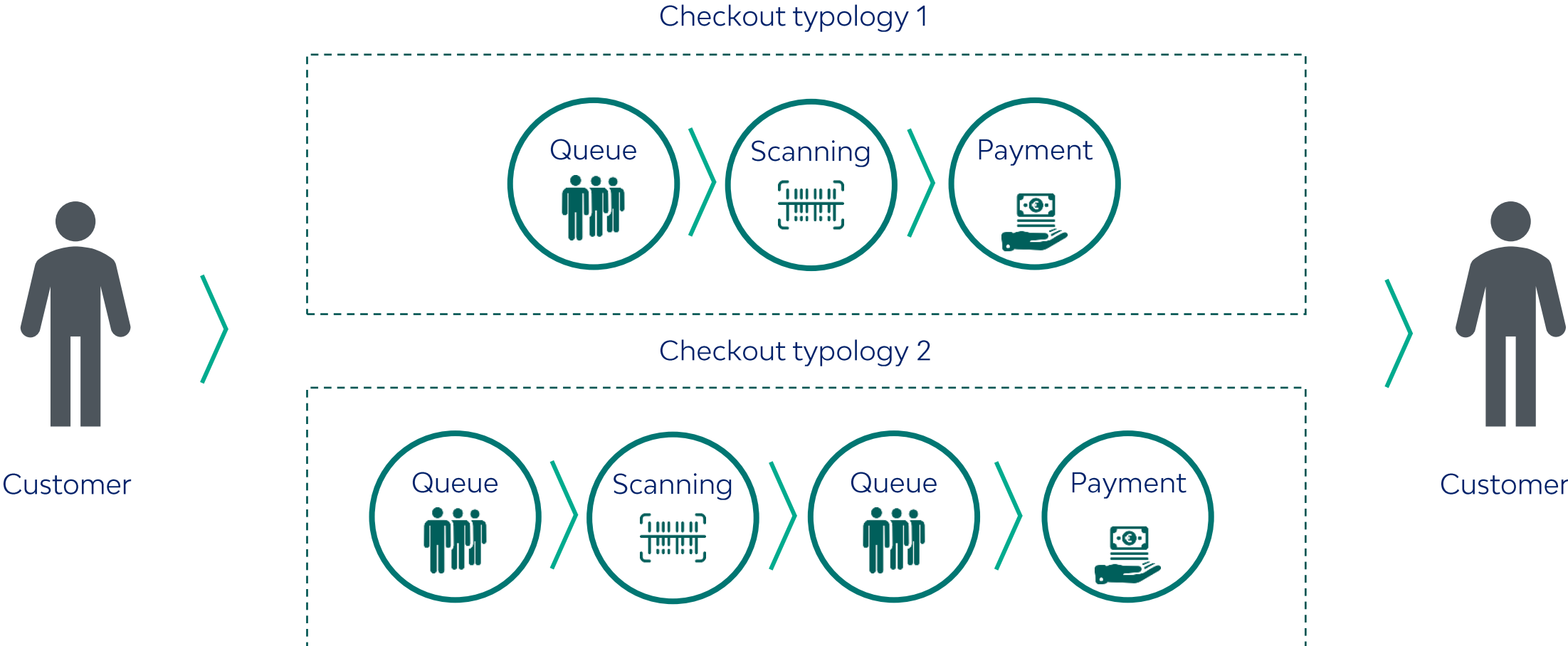
Checkout conventional process



The modular logic of the simulation model confers flexibility and adaptability to the context of multiple retailers

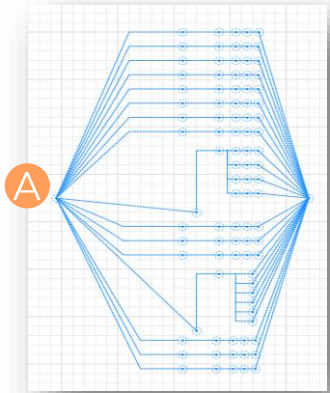
Solution approach – modular methodology

ILLUSTRATIVE



The model incorporated different simulation techniques in order to accurately describe the real system

Simulation approach – model components



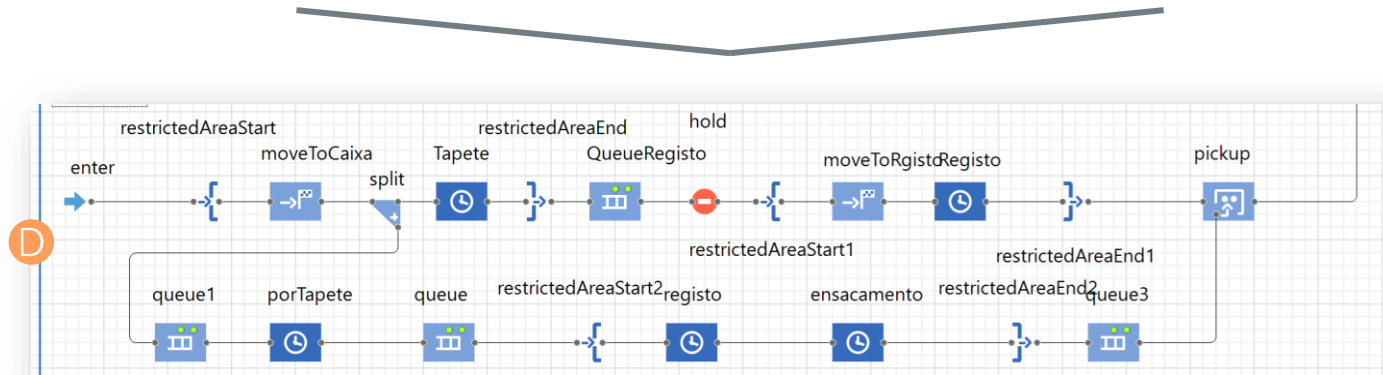
On start, the possibility to **choose the checkout configuration to simulate** (e.g. no. of checkouts)

- > Main
- > Payment
- > Person
- > Queue
- > Scanning

Agent-based simulation, with characteristics varying between runs and scenarios

- importarBasketSize
- importarTotalTicketsDia
- importarTickets15min
- importarBeepingTime
- importarEntreTaloos
- importarCriterioEscolha
- gerarEntradaPessoas
- criarPessoa
- getTempoTransacao
- getTimeKey
- getSequencia
- gerarBasketSize

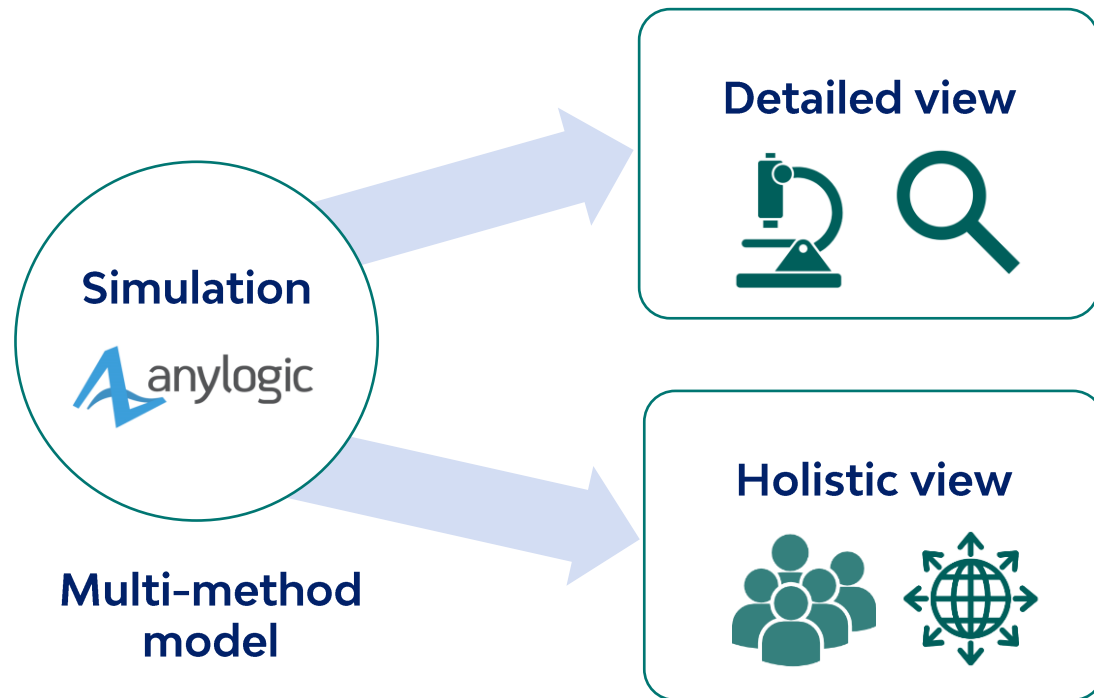
Java functions to provide the **flexibility** required to **accurately depict** the full real process



A **logical flow model**, including the multiple steps of the checkout process and splitting the “path” between people and items

Simulation arises as a decision support methodology in multiple business areas

Solution approach - simulation



Features

- Allows to **foresee KPIs**
- Enables **scenario testing** in the simulated system
- Confers **great flexibility** to the solution's development
- Allows to **test**, in virtual environment, checkout **configurations that currently do not exist**

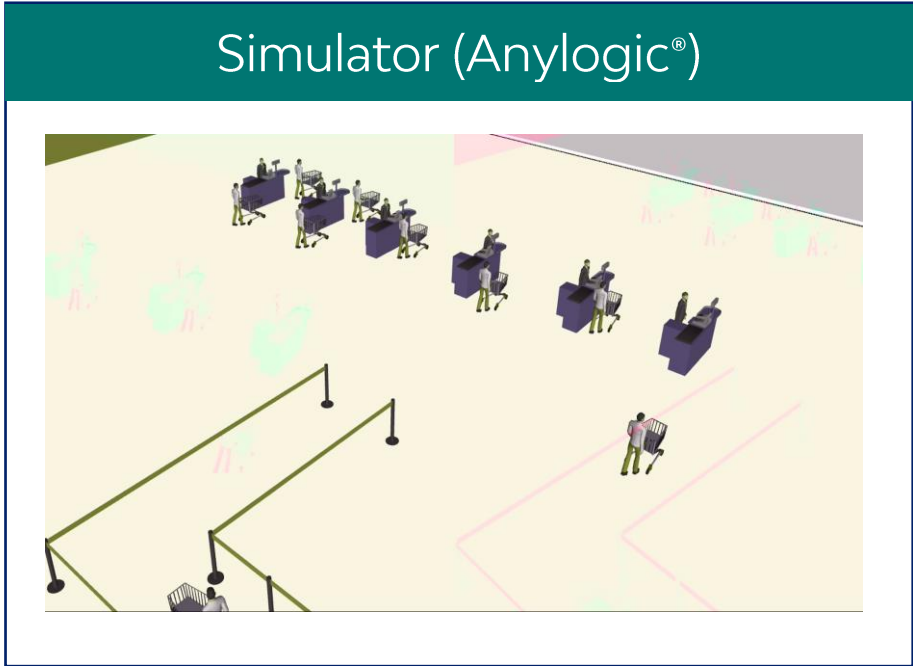
Simulation comes up as a methodology with high potential to **provide a support to the decision-making** regarding the checkout dimensioning

The simulation model allows to simulate the stores' operation and evaluate the performance of each configuration

Solution approach – simulation model

External parameters associated with the customers' profile

Arrivals to checkout queues Basket size Checkout choice criteria Payment type probability



Parameters associated with the store and with the performance of each checkout typology

- Number of checkouts per typology
- Scanning time
- Post-scanning and between-ticket time
- Checkout opening criterion

- Checkout utilization rate
- Queue size
- Customers' average checkout time
- Annual service level

KPIs

The results' presentation encompasses two distinct stages

Results



Insights retrieved



Key results

The simulation model developed enabled the retrieval of valuable insights for the business at hands

Insights retrieved



Service level provided

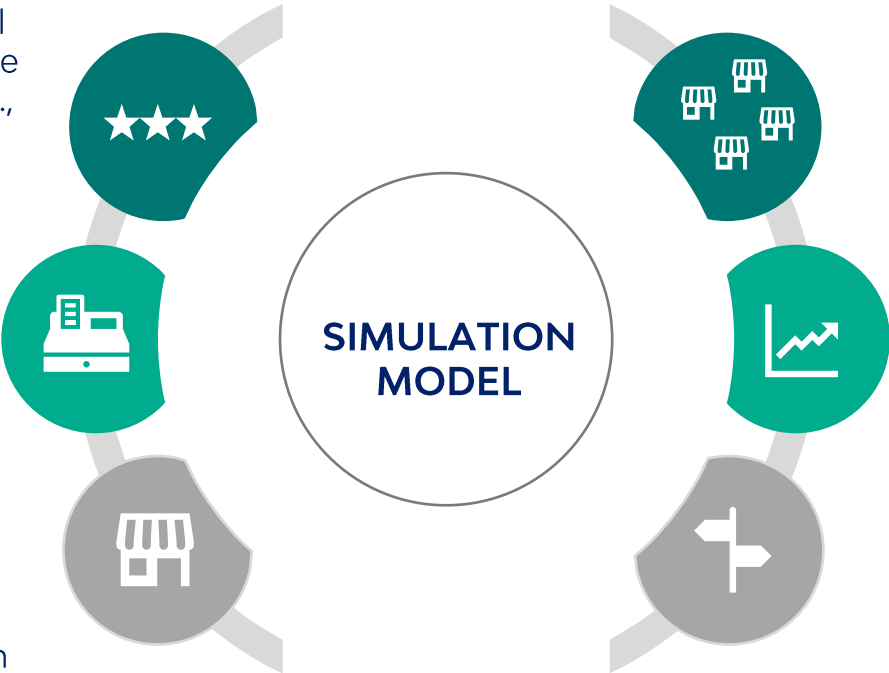
Empowered the retailer with a tool to estimate indicators related to the service provided to customers (e.g., average queue size)

New checkout typologies potential

Allowed to understand the impact of new potential checkout designs before their existence/implementation

Design new stores

Guided the checkout configuration design of opening stores through similarity assumptions



Scalability and personalization

Facilitated the reformulation of the whole set of stores while incorporating the specificities of each one

Stores' stress test

Enabled the analysis of the peak hours of each store and to test mitigation strategies

Scenario exploration

Set up the grounds for the study of unexplored solutions regarding checkout configurations¹

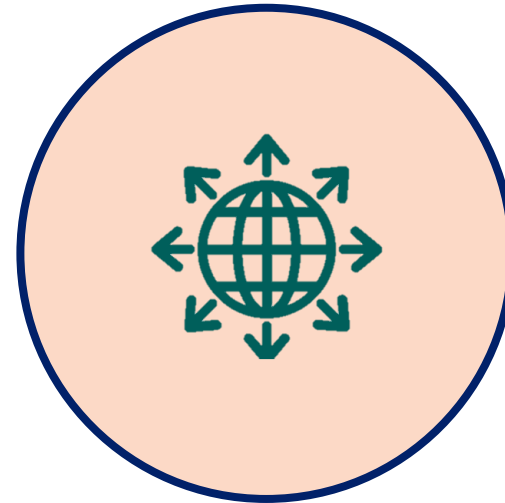
¹ Example: 5 assisted checkouts + 3 self-checkouts vs 3 assisted checkouts + 5 self-checkouts

The results' presentation encompasses two distinct stages

Results



Insights retrieved



Key results

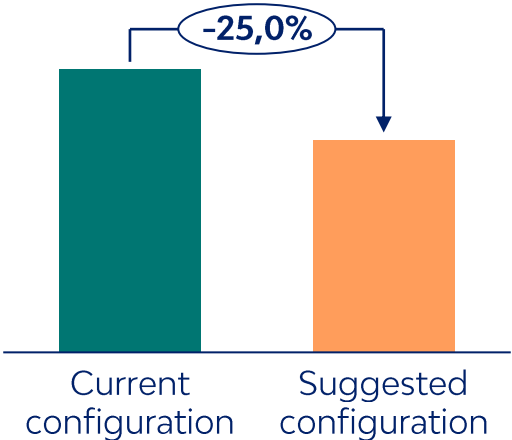
The case study conducted led to savings in the fixed costs of nearly 15% while maintaining the service level provided

Key results (1/2)

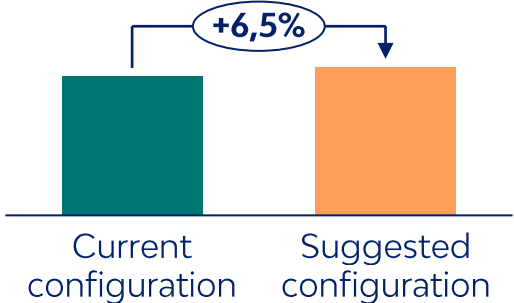


Fixed costs

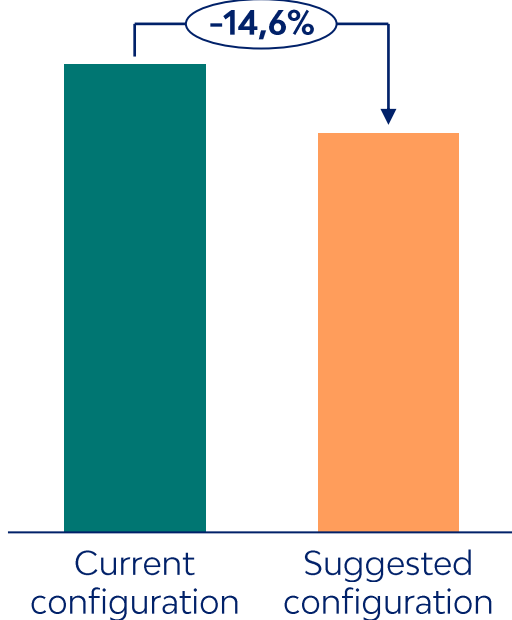
Assisted checkouts



Self-checkouts



Total

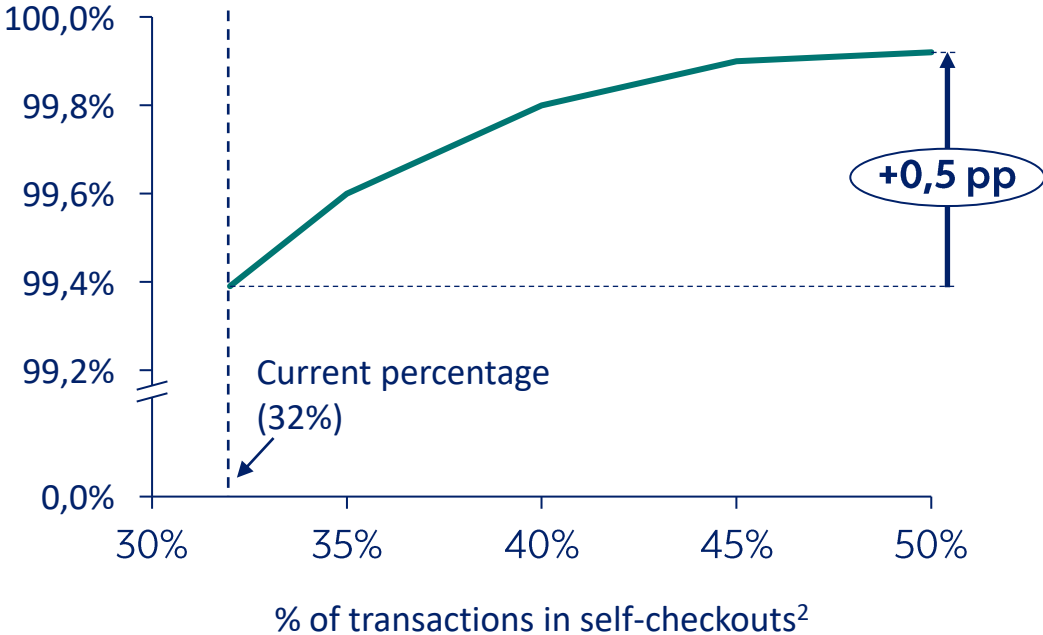


Alternative scenario testing allowed to identify possible improvement opportunities in the checkout process

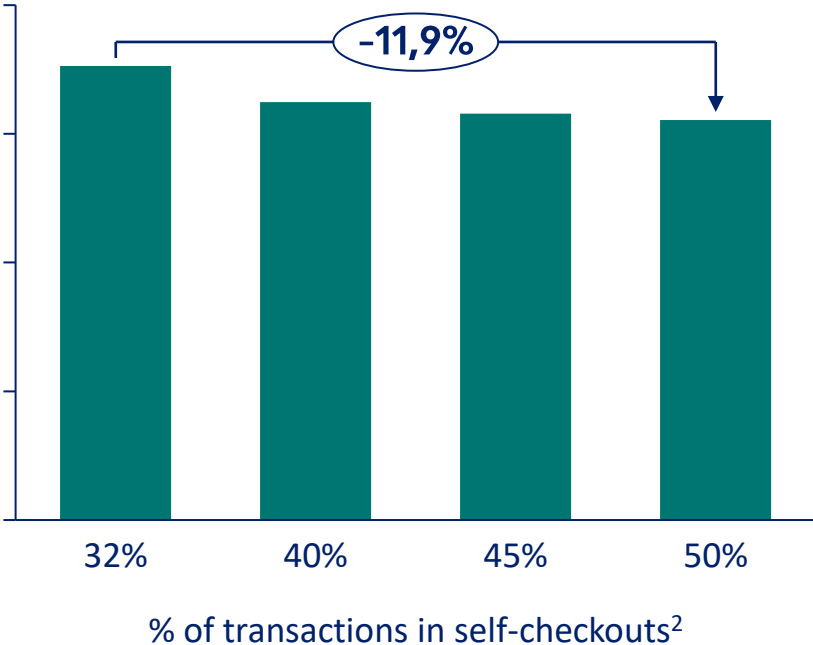
Key results (2/2)



Annual service level



Operation cost¹



Transferring part of the transactions of the assisted checkouts to the self-checkouts would enable an **improvement of the annual service level** and a **reduction of until 11,9% of the operational cost** associated with the checkout process

The work developed provided the retailer with an analytical support regarding the checkout dimensioning process

Conclusions

- **Integrated view** of the checkout area dimensioning of all the stores and **full comprehension** of each phase of the **checkout process**
- The **simulation-based** methodology confers **greater confidence and support** to the decision-making, being able to test multiple scenarios before physical transformations
- Easy identification of possible **improvement opportunities** in the checkout process
- Ability to **test and evaluate new and innovative** checkout concepts

Future work

- **Greater validation and calibration** of the simulation model to ensure an accurate and reliable representation of the reality
- More profound study regarding the **customers' preferences** for each **checkout typology**, incorporating new market tendencies and shifts



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WITH ANALYTICS

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