AUTONOMY@WORK™

# DATA DRIVEN SMART INTRALOGISTICS

## WHITE PAPER

**THIS DOCUMENT PROVIDES READERS ACTIONABLE INSIGHTS RELATED TO THE PRACTICAL APPLICATION OF "DIGITAL TWIN" CONCEPT TO THE PROCESS OF INTRALOGISTICS PROCESS DESIGN AND EVALUATION.**

**ACTION POINTS:**

- INVESTIGATE THE OPERATIONAL AND FINANCIAL FEASIBILITY OF SMART INTRALOGISTICS AND AMR INVESTMENT USING REALISTIC SOLUTION SIMULATION.
- WHILE DIGITALLY TRANSFORMING INTRALOGISTICS USE DATA DRIVEN APPROACH TO SHORTEN TIME-TO-VALUE, MITIGATE RISKS OF PROCESS DISRUPTION AND MAXIMIZE THE RETURN ON INVESTMENT IN AMR TECHNOLOGY.

# DATA DRIVEN IMPLEMENTATION OF SMART INTRALOGISTICS SOLUTIONS

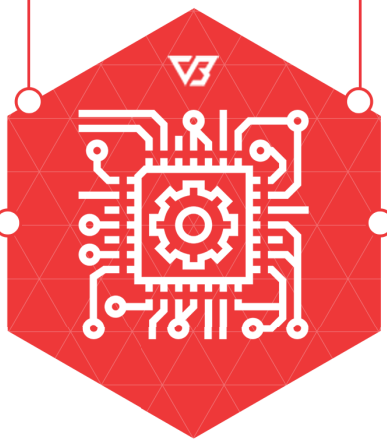
Intralogistics - the area involving internal processing of materials, components and related information - is a significant part of industrial value chain where operations need to change due to labour shortages, operational hazards and often obsolete, inefficient technology. The automation of intralogistics tasks has to meet the growing demand for flexibility of shop floor operations. Product personalisation and unpredictable fluctuations of production volumes become important aspects of modern manufacturing which challenge traditional intralogistics solutions. For this reason many manufacturing organisations select smart intralogistics as the key, enabling concept of manufacturing transformation driven by digital innovations.

## SMART MACHINES

Combining task automation, autonomy and flexibility to fill in for humans in tasks which require accuracy, repeatability, endurance and adaptability to a changing environment.

## SMART PROCESSES

Data generated by smart machines leading to more intelligent, flexible and better integrated processes.



## SMART OPERATIONS

Data used to build simulators and predictive analytics solutions (e.g. "Digital Twins") to improve efficiency and speed of operations or introduce new operating models.

## DIGITAL FACTORY

## INTRA-LOGISTICS

Area involving internal processing of materials, components and related information - is a significant part of industrial value chain where operations need to change due to labour shortages, operational hazards and often obsolete, inefficient technology.

# DIGITAL TWINS – FROM R&D TO OPERATIONS

At the core of digital factory concept is digital information. Data generated, integrated and used to better understand and improve the operations based on virtual representations of devices, processes, and systems – their Digital Twins. Manufacturing organizations understand well the value of simulations in product design. Designing and testing new physical components using software is much cheaper, faster, safer and more effective than doing the same with physical components in the physical world.

Such approach should be used for managing the changes in factory or warehouse operations. Introducing new machines and processes in the actual shop floor environment can disrupt the operations. Tweaking the configuration for satisfactory performance before scaling it up can take significant time and the realities of manufacturing processes discourage extensive experimentation with layouts, process topology and other important performance factors. This is even bigger problem in multi-vendor solution acquisition scenarios.

A solution to this problem is Data Driven Process Design & Evaluation approach. Process/Operations managers can simulate multiple scenarios of the process in a virtual, software-based environment, using a realistic representation (models) of all essential process assets and parameters – machines, environment, infrastructure, material flows etc. After analyzing how different process configuration affect resulting KPIs, the optimum scenario can be selected for the actual implementation. Data Driven Process Transformation approach consists of the following steps:

- Investigate: for greenfield implementations use digital twins and simulation envi ronment to define and test candidate processes and rank them for price/performance.
- Design & Optimize: use the data generated by the selected process configuration to improve your models, and then use the simulation to identify process tweaks and improvement opportunities.
- Change: before introducing any significant changes in the process context (e.g. – changing the master manufacturing process supported by an automated warehouse operations) run simulations based on historic data to understand how these changes should be reflected in process configuration.

# DATA DRIVEN IMPLEMENTATION OF SMART INTRALOGISTICS SOLUTIONS

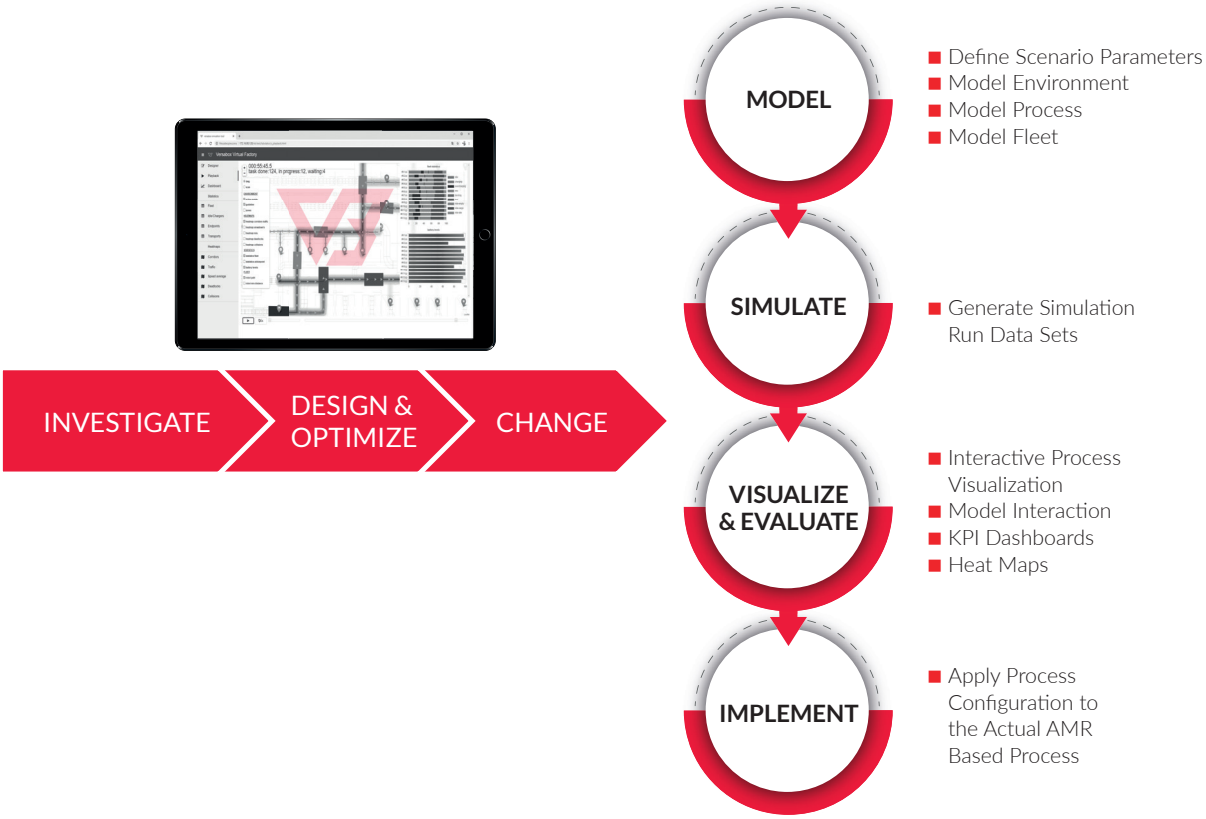
VERSABOX VIRTUAL FACTORY™ is an advanced analytical tool supporting data driven implementation of the AUTONOMY@WORK™ platform. It enables operation managers and intralogistic specialist to model, simulate, evaluate and optimise the configuration of AMR based intra-logistics process. While being an integrated component of the AUTONOMY@WORK™ platform, it may also be used as a standalone tool by organisations that are yet evaluating the business case for smart intralogistics.
The primary use cases of VERSABOX VIRTUAL FACTORY™ are also the key steps of data driven approach to the transformation of intralogistics:

**INVESTIGATION** - taking existing shop floor layouts as an input, managers can run virtual "run and rate" experiments defining the process topologies (endpoints, tracks, charging stations) for potential new implementations of AMR based intralogistics.

**PROCESS DESIGN AND OPTIMISATION** - while implementing AUTONOMY@WORK™, intralogistic specialist can use simulation to optimise the process that will actually be implemented on a given site to shorten the implementation process and avoid master process disruptions.

**PROCESS CHANGE MANAGEMENT** - while planning changes in master process or intralogistic process due to changing requirements, intralogistics specialists and operation managers can investigate optimum re-configuration of intralogistics, taking advantage of historic data concerning shop floor traffic.

For each of these use cases VERSABOX VIRTUAL FACTORY™ provides the tools that enable the fast definition of process scenario and evaluation of core process KPIs. The evaluation uses an interactive simulation engine, with realistic process visualisation rendering the AMR activities, evolution of traffic patterns and changes in KPIs.



## PROCESS ANALYTICS

VERSABOX VIRTUAL FACTORY™ provides operation managers and intralogistic specialists with insights in the form of interactive, visual simulation of intralogistic traffic. The interactive analytical capabilities include:

**REALTIME HEAT MAPS** visualising event intensity patterns for aspects such as corridor traffic, slowdowns, deadlocks and MRS interventions etc.

**CONFIGURABLE KPI DASHBOARDS** providing core KPI information on fleet utilisation, energy usage, endpoint traffic at every time-point of the simulated imtralogistics process.

**MODEL INTERACTION** - filtering and managing the level of details: zoom in and out to analyse global picture or a specific part of process layout, as well as including/excluding the building blocks of process model (endpoints, paths, zones, etc.).

## REALISTIC PROCESS MODELLING

VERSABOX VIRTUAL FACTORY™ can use as process "canvas" either existing factory layouts available in popular DWG format, supported by many CAD tools, or maps created on site by VERSABOTs auto-mapping functionality. Using available CAD based layouts enables customers which have not yet decided to implement AUTONOMY@WORK™ platform to investigate the process improvement opportunity and business case for smart intralogistics. The baseline model covering all aspects essential for process performance, can be created quickly with user friendly, visual modelling tools.

## ACCURATE RENDERING OF AMR NAVIGATION

The simulation engine accurately reflects the Navigational AI algorithms of individual simulated VERSABOTs as well as the functionality of Multi Robotic System component of AUTONOMY@WORK™ platform. This allows for detailed analysis of various aspects of VERSABOT utilisation: idle time, recharging time, coordination overheads and mission execution times. Simulation reflect as well as the behavior of charging stations, and energy consumption of AMR units over time.

Simulation engine of the VERSABOX VIRTUAL FACTORY™ can handle large, complex factory layouts and fleets of hundreds AMR units so it can serve as a mission critical element of the implementation process of AUTONOMY@WORK™ and VERSABOT fleet.

## INTEGRATED TOOLSET

VERSABOX VIRTUAL FACTORY™ models are fully compatible with the process models managed by AUTONOMY@WORK™ platform. For clients who have implemented the platform VIRTUAL FACTORY™ becomes just another component of the smart intralogistics toolset.

The models defined before the actual implementation of AUTONOMY@WORK™ platform (e.g. when VIRTUAL FACTORY™ has been used as business case investigation tool) can be used as starting point for implementation, protecting clients' investment in model development and evaluation.

# FOLLOWING UP ...

## FURTHER READING

Please stay in touch with VersaBox to access other educational and technical materials by subscribing to VersaBox newsletter at: https://versabox.eu/newsletter/

## CONTACT VERSABOX

VersaBox is a Smart Robotics company that brings together talents of new generation of innovators, software designers and engineers to develop world class, advanced technology solutions for the transforming global manufacturing and logistics.

We put autonomy to work for our clients by implementing Smart Intralogistics platform based on autonomous robotic units. VersaBox solutions fill out the growing human workforce deficits with efficient, intelligent devices and enable productivity improvements through new generation of agile intralogistics processes (Intralogistics 4.0). We achieve this by implementing systems of collaborative autonomous robotic units, orchestrated by an innovative process management platform.

Contact VersaBox when considering an investment in AMR-based, Smart Intralogistics.

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