THE DATA IS DEAD, LONG LIVE THE TIC4.0!

"WITHOUT A COMMON UNDERSTANDING, DIGITALISATION, AND AUTOMATION OF THE BUSINESS PROCESSES IN THE CONTAINER SECTOR WILL REMAIN MOSTLY AN EXCEPTION"

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According to ChatGPT, boxing is a combat sport where two individuals, usually wearing protective gloves, throw punches at one another in a boxing ring with the aim to land blows on the opponent while avoiding being hit, with the goal of either knocking them out or scoring more points. Boxing requires a combination of speed, strength, agility, and endurance, and is widely regarded as one of the toughest and most physically demanding sports in the world. Probably the same skills and level of demand required by a container terminal which collaborates with a technological company to deploy, in live, a new service or a Killer app whose purpose is to boost the aforementioned enterprise to a different level of profitability and competitive advantage. No matter if the target solution is a huge platform built over hundreds of thousand lines of code or a lean and trendy Artificial Intelligence/ Machine Learning module, in order to be useful for the staff and add value to the core business of the organisation since the day after of the go live it will not be an isolated component but part of the whole ecosystem. Is that new service trying to predict the dwelling time of the import/export boxes you have allocated for an unknown time in the yard? As a responsible of the maintenance staff are you trying to support some mechanical scenarios to know, for instance, the tyre status of the machinery in real-time (for example, pressure, temperature, and distance) to perform any kind of preventive stoppages while raising awareness and compliance according to different levels of service agreement? Are you in charge of setting up a data acquisition system which will enable you to report, in almost near real-time, the operational manager with regards the latest movements of an specific bunch of STS because you have the feeling they are not performing as expected and the headquarters are considering an important investment in new equipment to increase productivity? Due to your long expertise carrying out a lot of fieldwork in the berth you are confident enough that the reason why a bottleneck always happens in such specific part of the yard is because there are Container Handling Equipment (CHE) in IDLE state even though they have a Work Instruction (WI) assigned from the TOS (Terminal Operating System)? Because of the strong competitiveness, challenging requirements and the need for continuous improvement of the maritime industry in general, and the container terminal in particular the number of services and applications oriented to achieve high operational efficiency, while ensuring that the assets are used effectively in order to maximise productivity rates (i.e., increase movements per hour) and minimise both IDLE times of the equipment and demurrages during the whole supply chain in a port call process are endless. And guess what? Enabling data integration between parties is no longer enough but ensuring the acceptance of a neutral language and vocabulary among market forces in the whole industry. Without a common understanding, digitalisation, and automation of the business processes in the container sector will remain mostly an exception and the deployment cost in resources, time, and money to put at the disposal of the staff of the terminal new technologies will be very high, if not prohibitive.

Nowadays, there is no doubt about the need to digitalise both equipment, tools and processes, which rests on three fundamental pillars: (1) technological enablers like the Internet of Things, the Edge Computing, Big Data, High Speed Wireless Communications Networks, Cloud Infrastructures, SaaS (Software as a Service), High-Performance PLCs and Data Converters, and so on, (2) the challenge to develop and adopt a global standard which univocally defines realities (meaning processes, equipment, signals, actions, events, data aggregations, key performance indicators, and more) for using a commonly agreed vocabulary, grammar, and protocols for enabling

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a digital transformation and facilitate the interconnectivity between assets and software solutions and (3) the lack of reluctance for the operators, managers and the rest of the staff in order to accept that the use of structured, normalised and well-known data could assist them, on a daily basis, into the decision-making processes for increasing the efficiency of cargo operations as well as to admin that new personal skills are required in order to stress and evolve the actual status quo of the terminal to make it globally competitive and more performant. Specifically, in short, technology, standards, and people are means to an end: embracing the 4th Industrial Revolution in the Port Industry.

Generating a single broadly accepted process' definitions ontology which enables a straightforward communication between the equipment provided by different manufacturers and the digital solutions used at ports and terminals is the challenge carried out by the TIC4.0 Association[1]. The outcome: an open and technology-agnostic language ready to represent any reality in a digital format in every time instance from any point of view (i.e., past: performed, present: actual and future: scheduled, planned, requested, proposed, estimated) with a specific grammar[2] which combines six basic elements to represent a unique reality: header, subject, concept, observed property, point of measurement and value. Besides that, the semantic is compatible with multiple industrial protocols (including MQTT, OPC-UA, OPC-DA, CanBUS, ModBus, and Profinet) and the information is structured by default in JSON format (but a human readable format like Flat is also supported). In theory, theory and practice are the same while in practice they are not. For that reason, before TIC4.0 standards and semantics could be broadly adopted without risks for the business, it is important to test, validate and fix (if proceed) them in real operational environments. One of the first proof of concept (PoC) carried out was iTerminals 4.0. iTerminals 4.0 (i.e., Application of Industry 4.0 Technologies Towards Digital Port Container Terminals) has been an EU funding project, coordinated by the Fundación Valenciaport, awarded in mid-2018 by the Connecting Europe Facility Programme that has validated, in real conditions at strategic container terminals based on Core Network Ports of the Trans-European Transport Network, the TIC4.0 semantics, the data model (for both CHEs and TOS) and the data set through several pilots focussed on the improvement of the efficiency, safety, sustainability and maintenance.

Experiments and PoCs have been recently finalised, and results achieved on this innovation (but pragmatical) action based on the digital transformation of port terminal operations were presented[4] to the international port community on 13 December 2022, whose most important lessons learned, and insights were:

- Better connectivity between assets and software modules from multiple suppliers, which means less problem solving carrying out integrations (and deployment costs which alleviates the burden for the staff).
- Consistent and reliable information since definitions and terminology are aligned amongst all stakeholders.
- Improved transparency, allowing better connectivity between terminals and other port stakeholders, including shipping lines and hinterland.
- Elimination of ambiguous and confusing messages in the terminal operation environment (creating common language, which is globally accepted by the whole Industry, not only the container terminal staff).
- Projects can be executed more efficiently, and terminal operators and their suppliers can put the focus on operational improvements instead of dealing with technical interfaces and integration issues.
- Possibility to easily replicate solutions and software modules among terminals which are part of the same group.
- Data is owned by the terminal and persisted in a common language (i.e., well-known data models) which provides freedom to the company to choose the best provider and boost collaboration among the different stakeholders.
- Technological solutions and platform could easily scale up since there is an important community behind the TIC4.0 toolset which increases code reutilisation and quick quality checks.

Last but not least, like professional boxers could become friends outside the ring and progress together, the TIC 4.0 Association can boost the

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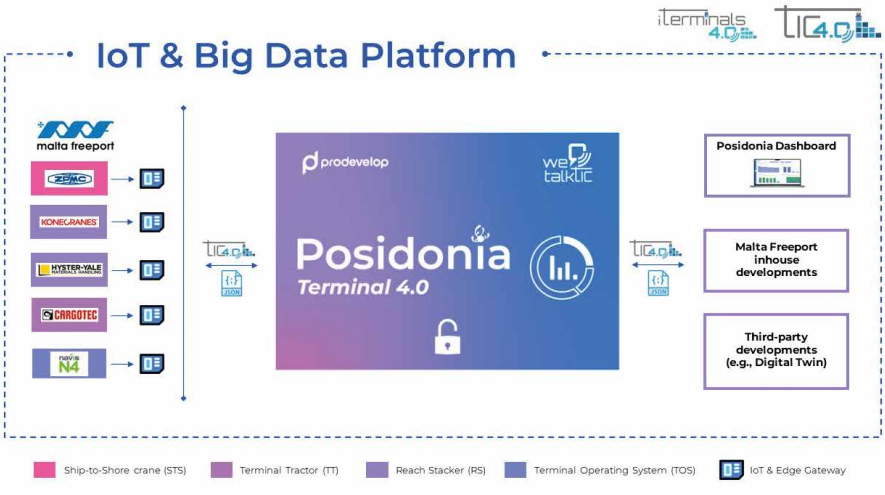

industry forward thanks to the honest collaboration among the different stakeholders who can find room for collaboration even being market competitors. This field of collaboration can be sustained by establishing long-term partnerships which lead to strong and more efficient solutions for the industry. (As a result, the final client perceived more value than it would get individually).

So, in conclusion, unstructured data per se which comes from different sources of information does not mean anything because digitalisation requires as a first step, the need to agree on standards, terminology, and vocabulary as a mandatory prerequisite to be able to tell a story with context enough to improve business processes. In the past, there was no need to have these aforementioned agreements since companies were working isolated and they had their internal concepts of cargo operations and strategy. Besides that, in the old days there were no technological enablers like Internet and no need to connect the equipment in real-time neither carry out complex data fusion algorithms to merge job instructions and telemetry. Nevertheless, today even for manual container terminals, the operators and managers need certain exchange of information with their assets as a disruptive way to improve performance while reducing IDLE times and risks for the staff. To be able to connect the equipment in a reasonable fashion under a strict control of costs the manufactures, service providers, and others need to agree first in a common terminology and talk the same language, words and definitions which enables them to carry out fair and reasonable comparisons. This challenge was fulfilled with the foundation of the TIC4.0 association with the aim to properly define and put at the disposal of the whole industry a bunch of resources for speeding up the digital transformation in the container industry. This common outcomes will not only apply to the machine and software level, but also to all the people that are going to work within this business sector.

FOOTNOTES

1. https://tic40.org
2. https://tic40.atlassian.net/wiki/spaces/TIC40Definitions/pages/8618041/TIC4.0+Semantic
3. https://iterminalsproject.eu
4. https://iterminalsproject.eu/events/iterminals4-0-final-project-conference

ABOUT THE AUTHORS

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ABOUT THE ORGANISATIONS

Prodevelop is a highly specialised ICT company with a growing product portfolio to digitalise and optimise the maritime industry. Prodevelop prides itself on its ability to also offer customised, flexible, and innovative solutions that are designed to meet the specific requirements of port authorities and terminals.

CMA CGM is a container shipping company which transports goods internationally inside standardised containers onboard containerships. With a presence in 160 countries through 400 offices, 750 warehouses, 150,000 employees and a wide fleet of 584 vessels, CMA CGM serves 420 of the world's 521 commercial ports and operates 257 shipping lines.

Fundación Valenciaport, as part of the Port Authority of Valencia, is an Applied Research, Innovation & Training centre providing services to the port and logistics cluster which has developed projects in more than 60 countries, primarily Mediterranean nations, as well as from the rest of Europe, Asia and Latin America.