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# Key technological choices & factors for successful industry & logistics 4.0 transformation

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## Right business decisions are based on accurate, reliable data

Industry & Logistics 4.0 are not just about technologies, but tech is a big part of it. After focusing over the last 5 years on the "Why" and "How"; most companies have now drawn up digital transformation programs, segmenting the data flow to be exploited in three clearly distinguished layers: the enabling technologies deployed on manufacturing floors (Traceability, robots, IoT), the secured aggregation layer often based on AWS, Azure or Spaces, and the upper process-focused application layers.

The choices boil down to which technologies and solutions to choose to optimise utilisation and maximise impact, while insuring adaptability to future technology changes. Large corporations seem to have completely abandoned vertically integrated solutions (prevalent in the past) for strategic and risk management reasons, as this implies limiting or impeding their future options or making them extremely costly.

To create value on data, the first question all data scientists ask is: "what is the quality of the underlying data?", "what is its precision?". The second question is usually: is this data relevant? what is its granularity? is this data telling me things about my core business?

Precise and reliable location is a key part of this choice. Indeed, trying to model and improve asset flow throughout a manufacturing or warehousing site, with most existing indoor location technologies, is like trying to drive around a city with a 100m GPS precision.

While great communications technologies such as LoRa, Bluetooth, Wi-Fi or active RFID have been around for over 10 years, none of them have ever been mass deployed for indoor asset tracking... If they were able to do the job and affordably scale, then mass deployment would have started a long time ago.

So, what are their limitations? Firstly, none of them were designed just for identification & precise location. They can have very rich functionalities, be used extensively for various communications and for outdoor tracking usages, but they offer poor indoor precision in harsh metallic environments or where machinery is producing significant amounts of EMI. This is what you naturally have in most factories or warehouses - accuracy levels of around 10 meters or more is the best that can usually be achieved, as they were not designed specifically for these applications. Hence the growing importance and acceptance worldwide of using UWB for indoor location in recent years, as it offers sub 1 meter precision in complex industrial and logistics environments, while offering high levels of security, scalability, and robustness. But why then has UWB not been more massively adopted and deployed?

We arrive at the second major limitation of existing indoor tracking & location solutions... their inherent need for batteries. Manufacturers core business focus is to improve the production process. To do so, they need to follow tens of thousands of parts, products or tools through the production line and conduct continuous inventory counts on boxes and pallets. With battery powered tags, the maths does not work with typical costs being in the tens to hundreds of dollar range, and bulky

cumbersome tags, it limits their potential usage to minor use cases which are usually associated to non-core business. In addition, customers investments around the use of tags are usually amortised over long time periods. The additional maintenance cost linked to the replacement of tens of thousands of batteries is just not feasible as it usually unmanageable. This makes scale in large deployments impractical as it returns an unacceptable ROI.

As a result, volumes of track & locate battery powered tags sold every year for indoor usage are deceptive. In 2020, an estimated 45 million units were sold worldwide, including all technologies. This number is in relation to the addressable market which is in excess of 100 billion tags / year.

The first steps of "digitalisation" have been successfully addressed by RFID and Bar Code players and there are lessons to learn from it. One has just to remember how painful the process used to be prior to the introduction of RFID to conduct I/O inventories with pen and paper or spreadsheets. Today, the passive RFID market continues to grow, particularly in the retail sector. In excess of 25 billion RFID tags are sold every year with an CAGR of about 15%. Saying all that and despite its perceived success, passive RFID cannot offer precise continuous location on a manufacturing floor or warehouse, hence its very limited deployment footprint for industry 4.0 where a key fundamental requirement is to locate assets continuously and precisely on the manufacturing floor.

Another lesson learned from leading RFID players by experience, is that in order to transform some operations, tags ideally need to be low cost (a few cents rather than dollars). They often need to have an extremely thin form factor (less than 1mm thick) because "who is going to deploy a 3cm thick tag on a cardboard box?"

If we look at the market players in both categories, the differences are staggering. On the one hand, the RFID system manufacturers market is controlled worldwide by 5-10 key players (inc. Avery Dennison, Zebra, etc.) worth a market cap in the range of \$10-\$20B. On the other hand, system manufacturers offering indoor location solutions are estimated to be around 3500 worldwide with turnovers rarely in excess of 1 Million dollars, forced to focus on high value-niche applications in and around their local market.

The conclusion, therefore is that the only track & locate solution which is scalable to hundreds of millions or even billions of units is passive and UWB based. This is the only association technology which meets the required cost/tag level, location precision, robustness in harsh environments and security levels required by manufacturers and logistics centers in their 4.0 transformation. This is the technology choice UWINLOC made 5 years ago and is the reason of our success and growth today. It has required a lot of effort and several million euros investment to develop UWINLOC's best of class, RF energy harvesting and ultra-low power UWB ICs. It was the only possible technical solution that would allow us to create an offer to our customers with a low-cost passive UWB tag. Today, with 22 patents assigned against the breakthrough technologies developed by UWINLOC and products deployed worldwide, all these efforts are finally starting to pay off. Saying that, we all realise it's just the beginning of an extremely exciting journey with our customers and partners, with considerable room for product improvements in coming years which will be driven by customer feedback and evolving requirements.

When looking at use cases and assets to localise, over 70% of use cases and 98% of assets to be tracked can only accommodate passive tags. What about the remainder? They are typically Forklifts (Fenwick's) or AGVs used in factories and warehouses, or categories of people (externals for example) that need to be followed. Most of the time they need real time location (due to continuous and fast movements) and identification. These can be covered by active UWB solutions but seem to be more and more covered by advanced digitised camera visualisation systems that offer a much better ROI and include advanced visual authentication of people on the sites.

The future of asset location & identification on such sites could result in a hybrid combination of passive UWB & computer visualisation systems to cover all core business use cases and to provide a double authentication or validation combined with localisation. When both technologies reach their limit (ex: object temporarily lost from tracking/not visible by computer vision) while keeping an attractive ROI. For other data transmissions such as sensing, existing Wi-Fi, IoT and 5G technologies will most likely be used. For secure voice or high bandwidth communications Wi-Fi, 5G and Ethernet should prevail.

## Environmental & Economic Challenges

What about RFID? The future of RFID should be bright in the short term, as the 6-9 cents paper tag won't be matched by UWB passive tags for another few years. We expect RFID to remain the technology of choice in sectors like retail where continuous location in shops is not always as critical in comparison with tags costs, which is crucial.

As mentioned earlier, enabling technologies are only part of the equation for successful transformations to take place. Process digitalisation and value creation also require a deep understanding of how to leverage the unique potential of Industry 4.0 technology.

It begins with recognising that seamless integration, real-time secure communication, and the ability to create manufacturing environments that are easily modifiable, more decentralised and more modular, has the potential to radically reshape the industry landscape.

With that big picture in mind, let's take a closer look at how those trends are playing out, and what kind of Industry 4.0 advances will shape the months and years ahead.

### Information is power & better margins

One of the game-changing elements of Industry 4.0 is its ability to unite IT with engineering and operations in ways that create valuable new synergies between two formerly separate operational spheres.

Which is why data gathering, data management and data analysis have proven to be pivotal when companies decide to take big leaps forward using Industry 4.0 solutions.

Growing numbers of businesses are investing in the infrastructure and expertise required to do just that. Using real-world metrics and measurables to understand where tech upgrades will have the biggest impact and how they can best be integrated into existing systems are some of the most important and impactful new Industry 4.0 trends.

The historic and unprecedented challenges businesses have had to grapple with as a result of the ongoing COVID-19 and the semiconductor world shortage, have led to two major needs, both contributing to a further acceleration of industry 4.0 programs.

- The urgent need to reduce or eliminate unnecessary manual showering operations required with bar code or RFID identification in manufacturing process to refocus operators on high added value operations.

- The need to re-think the 'just-in-time' model which has prevailed over the last 30 years to adopt a more supply-chain resilient model based on double sources and fully automated stocks management solutions. Some CEOs are realising that stocks are not a swear word anymore and that well managed sufficient stocks can save your business.

Unreliable supply chains and unavoidable operational interruptions have highlighted the value of top-to-bottom process visibility. Access to real-time business info isn't anymore a luxury, it's a necessity.

Over the last couple of years, CSR and environmental impact have become very important objectives for corporations. For information, the world consumes already around 100 B unit batteries/year. Half of them never get recycled and end in local dumps!! Consequently, battery powered solutions to track an addressable market of an additional 100 B units will just never happen... As a matter of fact, UWINLOC has been working over the last 18 months on a number of very promising projects beyond its normal solution offering scope, to energise low power electronics in the industry (for sensing for example) and in the consumer field at a distance, removing the need for batteries. UWINLOC's commercial offer on Ultra low power Energisation & Communication MCM will be rolled out from mid June 2021 onwards.

In a space that continues to evolve with impressive speed, in many cases traditional five - and 10-year corporate planning is simply obsolete. The best adopters of Industry 4.0 technology solutions are replacing long-term planning with long-term vision. They establish long-term goals and have a clear sense of the big picture, but also develop specific short-term plans and objectives as part of an attempt to become more agile and responsive to

customer changes, as well as reacting to emerging trends and technologies.

Finally, and perhaps most importantly, is to recognise that an optimised and impactful digital transformation is really about the people using it.

## Successful changes require buy in from all the people engaged

From project discovery and interface design to enterprise rollout, the best new Industry 4.0 tools and strategies are based on an approach that puts the user first and gets him involved right from the beginning of the project. The engagement of operation technicians, process engineers, IT managers, plant managers and health & safety departments as well as executive committee sponsorship, is a pre-requisite for success.

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## List of abbreviation

**AWS:** Amazon Web Services

**AGV:** Automatic Guided Vehicle

**CSR:** Corporate Social Responsibility

**EMI:** Electromagnetic Interference

**IC:** Integrated Circuit

**IoT:** Internet of Things

**IT:** Information Technology

**I/O:** Input/Output

**MCM:** Multi Chip Module

**RF:** Radio Frequency

**ROI:** Return on Investment

**UWB:** Ultra Wide Band

## References

Market data sources includes: ID Tech, Markets & Markets, ABI research, Gartner.