AIMagazine
INDUSTRY 4.0 IN PRACTICE
35

Automation:

A thinking warehouse at your service

News, trends, analyses, interviews and case studies from Industry 4.0, automotive and IT

Digital Factory

Cloud

Automation

Automotive

Trends

SAP S/4HANA

aimtecglobal.com/**AIM**agazine/en

Contents

An interlinked world full of challenges

This year, Pilsen saw the 20th edition of the TAL (Trends in Automotive Logistics) international conference, which we organised together with IHK Regensburg. This anniversary event was really something – and you can partially re-experience it in this issue. My colleague Marie chose the almost magical date of 20. 2. 2020 for the event. Coincidence? I think not. Even though her motives for choosing this date were all about marketing, the conference's timing proved to be fantastic. Because TAL 2020 turned out to be one of the field's last conferences that could take place with no restrictions.

Globalisation has both upsides and downsides. We may be more interlinked than we've been willing to admit, and that raises new questions. For example: do you know your supplier's supplier? How healthy is your supply chain? Have you faced stock shortages in recent months? One can ask countless such questions, but here at AIMagazine, we prefer to bring you answers. So we're starting from the premise that your business faces new challenges. How can you overcome them?

The key to success is automation. Are you imagining assembly lines and robotic arms? Don't worry – most people will. But there is much more that automation can offer. In the latest issue of AIMagazine, we'll show you that tackling intralogistics automation head-on just might save your enterprise considerable sums and lift its productivity to the next level. But where do you start? Which automation technologies should you choose, and what should you prepare your internal team for? Don't worry. This issue should answer all these questions and more – and if not, we have a complete guide to intralogistics automation for you. Here's wishing you pleasant reading.

Daniel Dorňák

When transformation is not a trend, but a necessity:

The biggest changes faced by logistics and manufacturing in 2020

An automobile comprises about 20,000 parts. Some components are so unique you could count their suppliers on just one hand. If on top of that you're forced to speedily switch to a new supplier, the whole process can become a nightmare. We probably needn't quiz you on why this information is so interesting of late…

Likely the highest-buzz phrase in automotive as of spring 2020 was "supply chain." Or more precisely, its dependence on Asian countries. The trends currently shaping the global world of logistics and manufacturing are tied to precisely this region. Anyone caught sleeping may soon face major problems. Experts and the public agree – the road lies in digitalising and automating. Quickly. But is this kind of transformation actually possible?

"It's good to be aware that many attractive past proposals concerning digitalisation in manufacturing never even saw the start of their execution. And the reason often was not the actual size of the investment so much as it was laziness, unwillingness to learn something new, ignorance of trends and the feeling that 'we certainly don't need it'. Unless this approach changes, only a real optimist can expect fundamental changes within the manufacturing sphere in the 'New Normal'," IDC's Jan Burian has noted on Euro.cz. But it is in precisely this regard that the situation around us is quickly changing. Because companies are feeling how decisiveness can help them to survive.

We've prepared a list of changes found in predictions for the future of logistics. How many of them do you already have behind you?

Do you know your suppliers' supplier? Maybe you should!

The supply stoppage in Wuhan, capital of China's Hubei province – the province that is the centre of the automobile, electronics and pharmaceutical industries – disrupted supply chains on every continent. It thus revealed fairly painfully that companies often do not even have an inkling of where their suppliers' suppliers reside.

Most firms have always built up their global supply chains so as to maximise efficiency and profits. Especially in automotive, the Just in Time (JIT) supply mode has thus caught on. In calm periods, JIT can be the optimal way to manufacture an object as complex as automobiles are. Now, however, we can also see the downsides of this system, which demands that all its components run like clockwork.

Does this mean we will witness the end of JIT? Likely not. But our view of it may change considerably. The majority of firms are currently working on "What If" scenarios that include alternative solutions during crisis situations. These scenarios take on various forms. Besides automation, they also extend into areas like 3D printing or an option to reorient both manufacturing and logistics towards an entirely different product almost instantly.

Resilience and transparency – the supply chain's new mottos

The effort to reduce dependency on a single specific supplier or geographical region will likely lead to more supply chain diversification than we are used to today.

The importance of the whole chain's transparency may thus grow as well. It may not be enough for automakers and other manufacturers to monitor only their Tier 1 and Tier 2 suppliers; a comprehensive view of the whole supply chain will be a major advantage. For a robust and resistant supply chain, the identification of weak links is important, especially at Tier 3 and below. And even a single fifth-tier supplier can shut down many assembly plants of one or more OEM manufacturers if a supply stoppage or financial or operating problems occur.

The future commands us to re-evaluate and perhaps even fully revise benchmarks for the entire logistics sector. Instead of costs or speed, resilience, flexibility and the ability to respond immediately are coming to the fore.

Precisely these characteristics enable firms to minimise their losses in times of crisis. How? Thanks to supply chain mapping and flexible measurement systems, they can access data on every movement almost immediately after the disruption of any process. They know precisely which products, parts or suppliers are problematic and why. This enables easy prioritisation and optimisation, on the order of minutes. Shortly and simply – mapping of the supply chain and processes sounds like a large and financially demanding bite to chew. But it can save not only money, but also time that would otherwise fall to rescuing a collapsing system.

Can we expect acquisition reshuffles?

However, supply chains can't change overnight. For one thing, a change like this is challenging; for another, companies will need to work with a

concept when tackling it. ZF CEO Wolf-Henning Scheider has stated that a regional supplier structure brings only limited benefits. Furthermore, automotive is among the most complex industries, with a tightly interconnected structure. Decisions on supply chains' future will thus largely depend on the entire industry's behaviour. It is nearly impossible to localise suppliers into a single region with the aim of ensuring operational security. This is one reason why – compared to other industries such as pharmacy – automotive must lean lightly on state stimuli. The effort to increase supply-chain resilience may also result in the buying up of smaller suppliers. These often find themselves in a difficult situation, forcing them to minimise their manufacturing costs so as to stay afloat longer than their competitors.

Companies that have sufficient spare funds even in our present times – be they purely financial investors, technology firms or automakers who wish to preserve their supply chains – may leverage this situation for acquisitions. These new owners may also help to preserve jobs and smaller companies. However, in certain discussions, fears have surfaced regarding the buying up of national firms by foreign owners – and countries' policies may have a role to play here as well.

Data overload? Supplier overload? An automated supply chain can be the solution.

We can expect that internal digitalisation and automation will be mirrored externally. Companies will likely demand greater integration of their supply chain, precisely in connection with its transparency, or more precisely, visibility. For production to flexibly react to supplier-side stoppages, you need to have integrated even the lower tiers of the supply chain and have a real-time overview of deliveries. Data from suppliers once again needs to be in all internal enterprise systems, so that all departments involved – from production planning to delivery – can react to it. But how can you achieve this?

Aimtec's Cloud & Integration Solutions Director Jan Stočes believes that EDI will also play an important role: "*EDI has long meant more than just receiving call-offs and sending ASNs. It's a tool for supply chain integration, digitalisation and automation. EDI has grown from mere exchange of documents in electronic form into a solution that increases efficiency and productivity thanks to more precise information for the warehouse, the purchasing room and the production hall. As the supply chain becomes ever more tightly integrated, and the pressure grows for it to become ever more transparent and visible, EDI is turning into a key element for maintaining smooth flows during the production of a growing quantity of goods. As the data exchanged constantly grows, further parts of the supply chain are digitalised and traceability becomes more detailed, it is more than likely that electronic data interchange will play a principal role.*

Especially during the COVID-19 pandemic, EDI was one of the few solutions to be used practically uninterrupted, precisely so that firms could respond flexibly to market events."

So the map is clear, but what is the best road to automation? The AIMagazine you're reading right now explores this question in further detail. You'll find the answers on the pages to come!

Tereza Drahoňovská & Zdeňka Linková

Digitalisation and automation as tools to soften the impact of the crisis

"There are quite a few firms that are investing into automation and digitalisation even in these times, because they realise that this will help them to traverse future similar crises faster, and they can also replace people wherever they are unneeded. The solution lies in reducing meetings and shifting employees from manual labour into more creative work with higher added value, which they may even be able to perform from home. Precisely these employees are often, for example, ideal key users for the systems they previously operated. A major shift in thinking is certainly happening here; in many companies, the real confirmation of this trend is yet to come."

Roman Žák, Aimtec's Chairman of the Board

Five questions about EDI and integrations

Why should people in manufacturing, IT or logistics take an interest in integration tools? Because they're a simple road to supply chain integration, which is quickly gaining in importance today. The greater the pressure on its transparency, the more important EDI and integrations become.

1 What role do integrations play in manufacturing and logistics?

Just a few years ago, each company had a single ERP system, which was expected to cover everything from logistics to production planning to e.g. sales or HR. But as the market grows more demanding, they are all forced to implement ever more complicated company processes. To support them, alongside ERP, they deploy smaller specialised systems, focused on a single area alone. If such systems are to bring their expected benefit, they must all work with the same "version of the truth," i.e. the same data. These systems must thus be mutually integrated.

2 What is the use of integration platforms?

Once having decided to integrate its individual systems, a company's initial approach is generally "all-with-all." As the number of systems grows, supervision of how integrations operate and how to develop them further becomes more complex. Therefore it's wise to consider deploying appropriate integration platforms. These help to monitor what was transferred when, and whether each transfer succeeded. It also shows what was linked and how, which significantly eases further development and the addition of new systems. And all this usually comes without a need to intervene in already connected systems.

3 What is the difference between EDI and integration platforms?

EDI handles the transfer of business documents between companies and translation of data structures among EDI formats and those supported by individual information systems. Thus an information system can produce and accept only one message format, even though different partners demand different formats.

Integration platforms work similarly. They sit among the individual systems in a company and can adjust data to fit a different structure so that all of the target system's requirements are satisfied.

4 Is there also room for integrations in companies that use SAP?

The need for a single version of the truth is just as present for SAP ERP and its surrounding specialised systems as it is for other ERP systems. Additionally, SAP itself is supporting these trends in S4/HANA by shaping its API so as to make integration with surrounding systems stable even across multiple versions of SAP ERP.

The existence of the S4/HANA API is also key for the running of SAP ERP in the cloud, where older integration methods cannot always be used.

SAP uses the S4/HANA API for developing integrations with its other products (e.g. SuccessFactors) as well; SAP ERP users thus have a major advantage over users of other systems. SAP assumes that, as we all move to the cloud, it will need to enable the integration of every application.

5 Which brings more benefits for SAP users: internal or external EDI?

The era when everything lay within a single data centre is long gone. Most companies also outsource their EDI. The benefits are clear: there's nothing to look after, except perhaps for ensuring SAP availability. Today, 24/7 support is standard, and the external supplier resolves the problems of hard-to-transfer know-how and a market short on specialists.

The best route is to find a supplier that's an expert in both SAP and EDI. This kind of partner makes the whole project and the migration markedly easier, and as a bonus, it removes the most common pain points: convoluted team coordination, and grey zones that are "nobody's responsibility."

Lukáš Rampa

Logistics automation step by step:

Which way is for you?

Automation. It's so tied to industrial manufacturing that just about everyone thinks of robots when they think of assembly lines. But what do you think of when you hear the phrase "internal logistics automation"? Self-driving forklifts? Conveyor belts? Warehousing and logistics was a back-burner field until recently, but now it's time to change that. After all, inefficient intralogistics processes generate considerable financial losses. Thanks to the latest technologies, we can free workers' hands and take productivity to a new level. But how does one approach automation? What are its possibilities? What can it lead to? We have some answers for you.

Consider your needs and goal before you invest

Automation is above all here to serve people – whom it replaces for demanding and/or repetitive tasks. In internal logistics, wherein materials enter the company at the warehouse and exit it e.g. at the assembly line, the goal is to transport goods, materials, or works in progress to the right place, on time, and at the required quality, with minimal human intervention. This fact is the foundation of the most common motivations and benefits for automation of intralogistics processes.

All these benefits are hard facts that aren't hard to state in figures. Yet there are important feelings behind automation as well – ensuring that your competitors and customers feel the courage and financial stability that have enabled your company to embark on a change as far-reaching as logistics automation is. Only true industry leaders have the vision and boldness to dive into a project that addresses not only short-term problems but above all the long-term ones – a solution that will still be of service a decade from now. But the first step must be taken today. For the successful realisation, besides capital, a great deal of patience and élan must be invested as well, along with the right partners for the project.

Motivations

- A lack of qualified personnel
- Error rates
- Inefficiency and slowness in internal logistics
- Limited warehouse capacities
- Employee safety

Benefits

- Optimisation of labour and of personnel routes; transfers to activities with higher added value
- Error elimination
- Standardisation of processes; transport-time savings
- Maximisation of space utilisation
- Lowering/elimination of accident risks

Automation path no. 1: introducing technologies gradually

There are two main ways to approach automation: a gradual path of introducing individual technologies one by one, or a big bang. Most companies go for the first option, but despite this, fully automated warehouses that work without human intervention are becoming more and more common. We'll be covering these later. What are the basic technologies involved in the gradual automation of internal logistics?

Warehouse Management System (WMS)

A WMS actually amounts to the automation of a warehouse's data entry. This system replaces pen and paper, which remain very common helpers in warehouses even in the 21st century. Even just introducing a WMS saves on the time needed to compose work queues, do stocktaking and track down goods. Picking without a warehouse IT system is highly dependent on operators' knowledge of where goods are stored; with a WMS it becomes possible to show a specific picking position in the warehouse and to optimise the work queue to prevent forcing an operator to walk across the warehouse. Thus, together with the use of barcodes, a warehouse system is a clear first choice of all logistics experts. And the result? Faster and more efficient warehouse operations, fewer kilometres walked, compliance with the rules for FIFO and other methods, traceability for materials used and more. And all this happens

Warehouse Management System (WMS)

- Data entry is automated
- Stocktaking takes less time and picking is quicker

"Goods-to-person" order fulfilment

- Handling units travel to the operator – not vice versa
- Picking takes up to 50% less time

Smart handling technologies

- Adding a terminal to your current forklifts
- Semi-automated forklifts
- Automated forklifts

automatically, without any hand-copying or mistakes – and also quickly and simply.

The "goods-to-person" concept

As the name implies, this is a method wherein each handling unit comes to the operator rather than vice-versa. Some sources state that operators' movements around a warehouse can take up to 50% of their picking time. A combination of conveyors and vertical storage systems makes it possible to move needed materials straight to the required location. That represents a significant saving – faster put-away and retrieval and fewer warehouse operators needed, enabling you to shift operators to work with higher added value. And since we all know it's essential to retain capable and talented people, automation is a win-win situation on all sides.

Smart handling equipment

From enhancing the current fleet with a terminal at which operators can see the work queue and items' storage locations, all the way to semi- and fully-automated vehicles, handling equipment is an integral part of automating logistics processes. In a future article, we'll take a more detailed look at what such a fleet's possibilities are and what it means to acquire and integrate it.

All three of these logistics automation elements can function separately, and they often do. Smart handling equipment such as semi- and/or fully-automated VNA (Very Narrow Aisle) forklifts and sorting systems are usually integrated into the remaining processes at a basic level. Much greater synergy and efficiency, however, can be achieved by fully interconnecting and integrating the individual technologies, processes and people into a single functional whole. This brings us towards the second approach, warehouse automation.

Automation path no. 2: the big bang

When complete and comprehensive intralogistics process automation is required, a company needs to let go of their current state and individual improvements. The management of a manufacturing company that stands before an automation decision must consider what its internal logistics demands will be in ten years – or where it wishes its logistics to be at that time. And that above all demands a clear vision and the courage to introduce changes that people will often fear. With a project this enormous, prepare yourself for many questions, internal justification, and even initial rejections. An implementation team must be created and motivated as well, and its members must defend the benefits of automation before management, their colleagues, and their subordinates. And of course, there is the financial aspect as well. Because automation is a project that affects every level of a company and must be approached accordingly. But how do you convince everyone and – perhaps – dispel doubts of your own as well? Two techniques are the best in our experience:

- Take a reference visit to a company where automation has already been introduced and where they can tell you about its upsides and downsides.
- Choose partners that have experience with similar projects and that "fit" into your internal team. After all, you will all be in close contact for several months.

Complete automation uses all technologies that gradual automation does, but it can also involve further ones:

A fully automated warehouse

An Automated Storage and Retrieval System (AS/RS) works fully autonomously, and in fact, for safety reasons, humans are not even allowed to enter its storage zone. Even though it is demanding to deploy, we are seeing ever-broader use of the AS/RS, not only in automotive but in other fields as well.

Autonomous mobile robots, trains and more

The above-mentioned technologies may be joined by Autonomous Mobile Robots (AMRs), trains, Autonomous Intelligent Vehicles (AIVs) and other machines that pick up materials or components at transfer points and take them where needed, replacing people in this role. The pioneers here are certain e-commerce companies, at which robots serve entire halls, from put-away to shipping. Even so, these are exceptions, and we will still have to wait a bit before this becomes a standard.

Automation does have its pitfalls

Besides the implementation process, automation has other pitfalls and stumbling blocks that must also be factored in. These are very human factors. Do you want to know which? You can find the full list together with possible solution in our Guidebook: How to automate intralogistics at a manufacturing company!

Rostislav Schwob

More reading:

- How to Automate Warehouse Processes with VNA: The General Prerequisites
- Automation: Keeping Your Control System in Great Shape
- Warehouse Automation Achievement: Sellier & Bellot
- Automation and Jobs: The Skills Revolution Is a Necessity

aimtecglobal.com/aimagazine/en

The TAL 2020 conference:

Digitalisation strictly with people and for people

Paul Norford, Zebra Technologies

The 20th Trends in Automotive Logistics (TAL) conference brought in almost 300 participants, as well as domestic and international speakers that included Marco Prüglmeier from the BMW Group and Jiří Cee from Škoda Auto. Aimtec organised this conference in cooperation with IHK Regensburg. Everyone agreed that people are the answer to TAL 2020's key question – "Who is the driver in digitalisation?" Machines and robots will never fully replace us, although we do need to keep pace with constantly advancing technologies, and thus we must know how to fully use their potential.

Case studies: A focus on efficiency and critical thinking

A large portion of the program was dedicated to case studies and technologies. Attendees heard the digitalisation and automation experiences of a variety of firms, such as Hella Innenleuchten-Systeme Bratislava, Webasto Roof & Components Czech Republic, Autoneum CZ and Fehrer Bohemia. Most of these cases illustrated how technologies must be accompanied by critical thinking and enormous willpower among implementation teams. This was yet another confirmation of the need for humans' role in the automation of logistics and manufacturing processes. Faouzi Grebici from the robotisation manufacturer OMRON spoke about the future of automation technology. His presentation's attendees could also see an OMRON autonomous intelligent vehicle live in action.

Celebrating 20 years and cross-border cooperation

The TAL 2020 conference was also exceptional in that this was the 20th conference in this series – a great reason to celebrate during the evening get-together. Aimtec representatives, along with IHK Regensburg and Beratungsbüro Oberpfalz, emphasised the importance and helpfulness of cross-border regional cooperation and showed appreciation for the role of TAL, which provides important support for the transfer of experience. Aimtec's chairman of the board Roman Žák has this to say about his overall impression from the conference: *"This year's TAL conference bested all the ones before it: in everything from the charged atmosphere to the attendance levels to the quality of the speakers. These speakers came from several countries, and we received a superb response from everyone on the event's principal idea – "Who is the driver?" – and the conference's organisation and professionalism. We are confident that, in part thanks to TAL, managers will begin to find the courage to launch new digitalisation projects – and that they will take home inspiration and shared experience regarding how to bring these projects to their successful conclusions."*

Filip Dřímalka, Digiskills.cz

Anyone can be an innovator – just surround yourself with the right people

In his introductory presentation, corporate digitalisation expert Filip Dřímalka emphasised the importance of digital skills, as well as the ongoing shift in the perception of demands on employees. Work with information and the ability to cooperate, communicate and solve problems are key in his opinion. It's no longer enough to just be a great professional; innovation and leadership skills are needed as well. Dřímalka says that anyone can be an innovator if they surround themselves with other innovators.

Jiří Cee, ŠKODA AUTO

Logistics is a simple field where team cooperation is the key

Another main speaker, Jiří Cee from Škoda Auto, echoed the need for a team approach in digitalisation. He stated that people are the most important link in the logistics chain, no matter how advanced and digitalised it becomes. He also touched on the subject of green logistics. Škoda Auto uses a tool named KALOGEMIS within its environmental protection activities. This is a logistics emissions calculator that makes it easy to calculate CO2 emissions and thus to compare transport concepts in terms of their environmental impacts. Cee also unofficially parted ways here with his career as Škoda's Head of Logistics and announced his successor: David Strnad.

Marco Prüglmeier, BMW Group

The goal is to give people helpful machines

Marco Prüglmeier from BMW Group spoke about the BMW Logistics Next strategy. He emphasised the necessity of cooperation as well. An automaker's goal is not – in his words – to have people-free factories, but rather factories where people will have access to every possible tool to make them faster, more effective, and more efficient. Prüglmeier also emphasised the need for rules for autonomous vehicles, and the rise of the VDA 5050 standard that addresses precisely this topic.

talconference.com

Ivana Klubalová, HELLA Innenleuchten-Systeme Bratislava

Look back at the conference and watch selected lectures

Trends in Automotive Logistics 2020

General partners

Deloitte. ZEBRA

Partners

bayern innovativ · Bezirk Oberpfalz · ZF OPENMATICS · SAP · Plzeňský kraj – Nejlepší místo pro inovace · OMRON · DESEQ · LINTECH · Jhk.cz

Media partners

AUTOMA · Automobil Industrie · IT Systems · AIMagazine · Logistika · SL · Svět průmyslu

Organisers

aimtec · IHK Regensburg für Oberpfalz / Kelheim

What makes smart logistics smart?

Interview with Marco Prüglmeier from the BMW Group

When it comes to digitalisation in logistics and manufacturing, the question most often asked is what will happen to the human workers. Will they be made redundant? The very clear answer is "no". Digitalisation is nothing without human workers. It is there to support them, not to replace them.

This is, in a nutshell, what Marco Prüglmeier, Project Leader Innovation and Industry 4.0 Logistics at BMW Group, explained in a Q&A after his keynote at our Trends in Automotive Logistics 2020 conference, which took place in February.

Marco Prüglmeier can speak with some authority on this topic. He and his team were awarded the German Logistics Prize 2019 for their project Logistics Next. Their objective was to build agile and smart inbound and transport logistics to be able to react quickly and smoothly to evolving logistics processes.

One very popular output of Logistics Next are the Smart Transport Robots (STRs). Can you tell us more about these robots?

We developed this vehicle, the Smart Transport Robots, ourselves. There was nothing else on the market that met our requirements. The robots have built-in technology that you can find in actual BMW cars. One of our objectives was to use our own technology within our logistics vehicles.

We also had some further specifications that could not be met by any vendor. One of them is the height: the vehicle needs to be 22 cm high so it can fit underneath our roller stillages.

We worked for over four years on industrialising these robots and have an overall equipment efficiency of 97%. So, our system is very robust from an engineering point of view. These robots feed the main line, so they really have to work flawlessly. In a worst-case scenario, we would have a main line standstill, which we of course cannot afford.

Do these robots interact with Machine Learning? How are they driven?

No, they do not. However, we designed them so they can maneuver within a plant without infrastructure like laser markers or magnets on the floor – we wanted more flexibility.

Instead, we use an algorithm called SLAM (Simultaneous Localization And Mapping) and the vehicles' Lidar scanner, which is also the safety scanner. We use that information to back-calculate the vehicles' positions. If a vehicle encounters a layout change, it recognises that there has been an alteration. The second vehicle knows that there has been a change reported, and all following vehicles will get the updated map with the information on the identified obstacle. So, they do learn; however, it is not AI.

Where are you using AI?

We are using Artificial Intelligence to recognise the dollies. We have marked out areas in every plant where the human workers place the stillages. However, they are not all put in the exact same position. So, we are using machine vision and AI to make sure the vehicle not only knows how to get to this area of interest but recognises any slightly misplaced stillages and knows how to drive underneath them to pick them up.

What other potential is there for integration of AI in logistics processes?

In every setting with cameras. However, it is all narrow AI, with trained deep neural networks for specific tasks. Our STRs get equipped with more and more AI to recognise humans or forklifts. We also see more and more AI coming in the planning field, like for example in the bin selection for parts. This is a tedious manual process that you can automate with AI and Machine Learning.

How do the robots first learn about their environment? How is the map created?

We drive them around manually once, with a joystick. Through that, you get the initial map that all the vehicles receive. From there, they start learning by themselves.

What is the return on investment on the STRs so far?

If you look at the STRs, the ROI ranges from 30% to 130%. It depends a lot on the labour cost in the country and on the shift model. In a three shift model, the ROI is higher.

Why are you immersing so strongly into robots and automation? What are the reasons?

In fact, there are three reasons. First, the technology is available, and we want to use it. The second reason is efficiency. As I said, we have quite a high ROI. And the third reason is the lack of people, like forklift and truck drivers. Many workers are retiring and to respond to this fluctuation, we need to automate.

You want to connect the work of people and machines. Is this already the outcome, or do you want to achieve 100% automation, say in ten years?

Our fundamental belief in all our automation projects at BMW is that man and machine have to work together. We are not building automated factories for new plants. I don't even think that a complete lights-out factory is possible. Machines are smart, but humans are smarter. Even though machines are also getting smarter gradually, humans are still better equipped to deal with situations occurring on the shop floor. Full automation would not be cost-efficient, either.

How does standardisation work at BMW? How do you make sure you can roll out a project from one plant at other manufacturing sites?

We work with a lead plant concept. Leipzig, for example, is the lead plant for robotics. We have an automation bot that fulfills a certain task. While we are implementing this in the lead plant in Leipzig, we are always in touch with other sites to see if what we are doing makes sense to them. If the other sites suggest changes, we refer them to the lead plant to see what could be done.

What is the situation with your suppliers? Are you trying to persuade them to adopt new technologies?

No, we would never do that. We offer it to them, but we do not want to influence them. However, many suppliers are interested in our technologies and processes, so we show it to them. The interest is definitely there. They are free to either use it or not.

How about standardisation? Are you working with standardisation bodies and industry associations like VDA?

Certainly. We earned the first standard with VDA within only two years. We also work with VDMA. We need data standardisation for all different machines and types of machines. For example, we need to tell an STR to wait for a moving obstacle to pass by. We need the basic intelligence in the vehicles to make them resilient, and we need to give all these machines some central information.

Zdeňka Linková

The digital transformation:

Are you a driver or a follower?

If you were there in the audience at TAL 2020, Filip Dřímalka may have piqued your curiosity right as it began. If you weren't there, here's a summary of all his key points, as well as some tips on what to do to stay a true driver of the digital transformation.

With technologies becoming cheaper, faster, and smaller, they are also becoming more accessible. But does that mean they're making us more efficient? Filip Dřímalka says that quite the opposite is true – at least until we learn to use them right. *"What we're experiencing today is not a digital revolution; we're actually experiencing the slowest productivity growth in the last 120 years."* But why is that so?

Generally the fault for digitalisation's failure lies with us

Why do digitalisation projects so often fail, going over their budgets and deadlines and giving less real benefit than we imagined? To find the common denominator for the reasons Dřímalka mentioned, we will have to bitterly admit that they lie in us – in people. Judge for yourself:

- We never have time – and even less so in logistics.
- We don't see eye to eye with technology.
- We don't see IT's burdens if we're not in IT.
- Decisions come from the "HIPPO in the room" – the Highest Paid Person's Opinion. If they don't trust technologies, don't want to invest in them or don't want to experiment and would rather see everything supported down to the last detail, you won't be launching many new projects.
- The average age for the members of boards of directors in the S&P 500 is 63.5 years old. And these are precisely the people who decide how our companies' technologies will look in five or ten years.

How can you make your digitalisation a success story?

"The key is to develop and educate people, that is, competent people, at every level," Dřímalka states. In his view, the drivers of a digital transformation are people and what they can do with technologies – not the technologies themselves. However, three lanes of development need to be merged:

- digital skills,
- innovation skills,
- leadership.

Merging these areas produces a "T-Shaped Worker" who possesses both a specialisation in their field (hard skills) and soft skills; one able to handle technologies and come up with ideas and innovations; one also able to lead a project and bring things to the finish line.

Digital skills as defined by the EU (The DigComp 2.0 Framework):

- Information and data literacy
- Communication and collaboration
- Digital content creation
- Safety
- Problem solving

So to turn your digitalisation into a true success, ask yourself the right questions:

- How can you inspire and educate your team and yourself?
- Do you have the time and space to experiment? If not, how will you create them?
- How can you support innovation?

Filip Dřímalka gave TAL 2020's audience one piece of advice on how to start: *"Try changing how you think. The way things work today is that you can't just wait for technology companies to come to you; you have to invite them over, talk to them, cooperate with them. I believe the digital transformation is about partnership. You just have to be around innovators, and soon you'll be innovators too."*

And what about you? Are you more of a follower, last in line for new technologies, or are you a driver who's pushing your company's digital transformation ahead?

Zdeňka Linková

Filip Dřímalka

Filip Dřímalka is the CEO of Digiskills.cz and is an author and expert on organisations' digital transformations. He teaches people and organisations how to work with the latest technologies and inspires them to integrate these into everyday life. In 2020, he plans to publish a book called HOT Pirpraveni na budoucnost ("HOT Ready for the Future"), and you can hear him regularly on the HOTCAST podcast. For more info on Filip Dřímalka, visit drimalka.com.

Take an automation shortcut

through innovative project tools and an internal team on the right track

Automation's benefits are clear – saved costs, reduced human error, and faster, more efficient processes. But how much time will it take your team to grasp this Holy Grail? How can you prepare your key people for what awaits them and empower them to enable a smooth course for the entire project? Success is not just about suppliers and technologies, although they do play an important role. An often forgotten, but fundamental pillar lies elsewhere. In your people's time.

Automation concerns middle management staff such as IT managers and heads of logistics, quality and manufacturing, and precisely these people need to have capacity earmarked so that they can work on the project, and you can thus fully harness the new workings of your internal logistics. But precisely this fact also tends to be a bugbear that scares many firms away from automation projects. Companies that are struggling with a lack of staffing see automation as a possible solution – after all, it's there to "save" them people. But where should we seek the solution?

In order to approach it, we must first review possible risks that could complicate project delivery.

The five most common risks:

1. No precise task is defined for the supplier.
2. The target concept fails to flesh out a number of situations; very often only the "all goes well" route is described – there is no identification of error states and their correction processes.
3. There is not enough time for prototyping, testing and unit tests, i.e. the system is not properly debugged during the preparations.
4. After the system has been brought into production, there is no time set aside for debugging its processes and optimising its operation.
5. The system's key users go away, taking their know-how on the project and its task definition with them.

We wish to avert precisely these scenarios. Once we become aware of them, we can prepare for them and choose both a suitable supplier and a method of cooperation and ongoing consultations. A question remains on the table all the same: What should be included into a project so that your team will be able to handle it?

Prepare your team for the project's size and be a step ahead

Take the typical example of a project for a fully automated warehouse with automated cranes, handling robots and conveyor belts. The delivery of the whole solution, including software integration, can amount to 300 man-days from the supplier. To ensure your project succeeds and you can avoid the above-mentioned most frequent "errors", you should spend the same time on the project on your side as well. Even though the overall amount of time may sound frightening, recalculating in real terms brings us to very reasonable bounds.

With a 300-day delivery and a 6-member internal team, a project will take each team member 4 days a month.

Precisely the complexity and company-wide impact of a project can bring one pause, but at the same time, these are its largest added value, which you'll appreciate the moment its implementation succeeds. Yes, there is a catch. You can't underestimate preparations. After all, automation isn't just about redesigning processes at your warehouse. To approach the project strategically, you should also ensure and monitor specifications for other areas:

- changes to its processes in logistics and manufacturing,
- changes and expansions to support within information systems,
- changes to work centres' physical layout – sometimes even extensive construction.

You might object that this will make the project take almost exponentially longer. That doesn't have to be the case if you choose the right tools and approach. Over the course of dozens and even hundreds of automation projects, we have learned how to handle complex projects well. Our solution has three pillars.

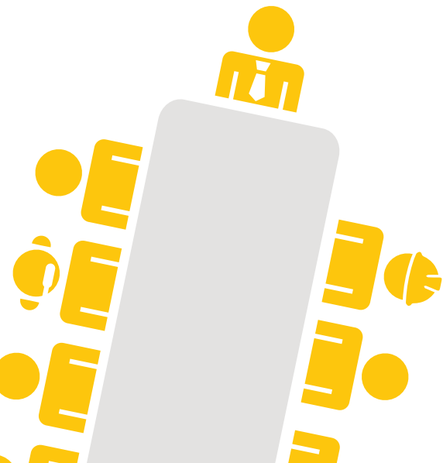
- Digital delivery increases flexibility and enables quick return on investment.
- A configurable solution makes it easier to tweak the system both during and after the project.
- A "self-maintaining" information system saves time, money, and training for new people.

Today we are looking at digital delivery; we will go through the other two pillars of automation projects in a future article.

Digital delivery – patently beneficial even during deployment

Digital delivery makes it possible to deploy a project that grows from simple to complex. At the same time, it harnesses the flexibility of digitalisation and applies it to project deployment. What does that mean in practice?

"The goal is the quickest possible delivery of the simplest possible sensible solution, which the customer can begin using so that it can immediately start providing benefits, and their investment can start to pay off. It simultaneously lets them adapt the solution to specific needs that crop up over the course of productive operation based on the daily needs of logistics and manufacturing," says Aimtec's Supply Chain Solutions Director Rostislav Schwob.



Project flow and finding space for digitalisation

1. Target concept

Within the target concept, the supplier should provide documentation – a sort of digital guide that can lead the customer through the system solution/application, so that they will better understand its possibilities and can better imagine its tangible benefits. The target concept is actually a vehicle for the integrated know-how and best practices in the given area.

2. Prototyping, the unit test and the integration test

Experience has shown that most misunderstandings have their origins in the start of a project, during verbal and oral definitions. To prevent these, a testable solution prototype must be presented as soon as possible. The most suitable variant for the customer's specific needs is then picked out based on this practical experience.

At the same time, digital delivery resolves several of the problems we've mentioned. Logistics is a dynamic field, and it is fairly complicated to envision all the possible paths and solutions before commencing a project. The possibility of gradually adding functionality to the system that was not in the task description when defining the project or that had a low priority within the project is thus a welcome enhancement.

Digital delivery means more than just delivering a project that ends in the digitalisation and automation of processes at a company. It also means digitalising and automating the delivery process itself. The greatest benefit can be seen for relatively standardised activities such as testing, training and documentation.

The digital simulator is another vital tool when designing complex solutions; it helps to identify inappropriately defined processes and blind alleys. The goal is to shorten verification of the proposed concept as much as possible. This simulator can shorten a project by as much as 30 percent, and its prototype phase by even 50 percent. It helps to save time on both the customer and supplier sides – especially in the phase where the technologies have not yet been delivered and the unit tests to verify technical fitness have not yet been performed.

The graphical configuration tool is another key point – it helps with designing the overall shapes of processes and integrating various processing equipment in an easily grasped environment with no programming needed. It lets the user define a large number of variants while keeping things clear and well organised. It also supports automatic documentation: the processes set up within the tool are documented automatically, with no need for manual entry. The documentation is available from the application online from anywhere at any time.

3. Digitalising training

Even when applications are user-friendly and easy to use, there is a need to train the internal team in how they work and how to use them. In situations where the supplier and customer are sitting at opposite ends of the nation or the world, training in-person and on-site is often unsuitable in terms of finances and time. Because of this, Aimtec has a number of training resources available online in digital form. This also lets the customer team renew their knowledge repeatedly and provides an easy way to train new staff. The video training sessions additionally serve as a tool through which the customer can get to know the application before the actual start of project definition, so that they can try out the possibilities and suitable paths to taking advantage of the application.

Vít Glasl

"Above all, communicate your automation internally,"

advises Jiří Ovesný, founder of the logistics consulting firm INTRALOG SERVICES. He has been working in logistics and industry for thirteen years, and he currently provides consulting focused on automation, improving process effectiveness and putting Industry 4.0 into practice. We asked him for his opinions on how to approach automation and what to focus on right away in the project planning phase.

When do companies approach you, and with what kinds of requests?

Especially in recent years, our first contact with the client will be initiated due to their need for automation or a transition to Industry 4.0, without their having a clear goal. That's the kind of premise we start with. One key moment after that is an open, general discussion on what automation means, what can and can't be automated, etc.

Why is it a better variant for the customer to have an advisor even before they approach other suppliers?

When we step into an ongoing tender, an idea already exists for what the result should be, and to a large extent that shuts the door on alternative solutions and technologies for the given assignment. Automation offers a vast range of available technologies, from autonomous forklifts to conveyor technologies to robots and cobots. There truly are a lot. When we step into an ongoing selection process, the borders and the main direction have essentially been set. That can lead to us closing off the path for other technologies, even though they could potentially be better. For this reason I prefer a greenfield, an "empty playing field", where the ball is in the middle and we can kick it in any direction. That way, we can present lots of proposals and alternatives.

Who is generally in charge of automation at a company?

Either a company has someone who wants to execute such a project and wants to head out in a new direction, or it's about a person who's been tasked with such a project from above. Naturally it's faster when there's someone at the company who has both enthusiasm and decision-making powers. Ideally they will personally know that their logistics processes have to change, want to change them and be able to convince their team and the other key people of this. Then it's easy to move the project forward. We have had excellent experiences with people like this from middle management.

People gather information in other places long before a project starts. How prepared are they? And what are the expectations with which customers begin their work on automation?

People generally gather information that leads them to believe that automation would be useful at their company: from trade fairs, seminars and case studies where they see the results. Then they say to themselves: "I'd like that." However, none of these events or case studies describes the process that led to that in detail, that is, the part of the iceberg that's underwater. The customer then arrives with their great expectations, and here we start running into problems. That's also what shapes our corrections to the task description, where we inform the customer on what information they need in order for automation to work.

So what should people focus on at the start of a project besides the already-mentioned process mapping?

It's definitely communication inside the company. Not even today is the message resonating that automation

isn't here to take people's jobs, but rather because there aren't enough people or human labour is valuable. People are too valuable to do the given activity. They either have to be far more efficient than a machine could be, or they have to work on activities with a higher degree of added value.

Because of this, many companies don't want communication when we're doing an analysis. They don't want us to tell people that they're thinking about automation, because we would terrify them, which in my opinion is wrong. A company that has core employees that it's serious about should constantly inform them that it wants to keep them, and that through automation it wants to increase their qualification. Because the routine activities that people are doing manually today will be done for them by machines. They will however have 5–6 machines to operate thanks to the fact that they have abilities that a machine will never have. They will be more qualified than the machine, which is able to do certain tasks, but it remains just a machine. I think that this is very important in the preparation phase, because when this information does not make it through, lots of people dig in their heels.

Unfortunately calculations of profitability are still to this day built on savings of human labour. Companies present it as saving a certain number of people who will no longer be needed. But what they don't state is that people will receive new tasks, that they will increase their qualifications so that they can do different work or so that they can work with automated technology. They communicate it as if the person won't be there, and ultimately that means: that they'll lose their job. And that damages these projects terribly.

The second part of the preparation phase is to become aware of the labour intensity of gathering information – performing analyses, microanalyses, audits, etc. The client has to have a clear idea of what all they need to know in order to move the project ahead, automate, simply: to change something from the ground up. The reason is clear – when I cut into something (into a project, application or activity), the threads that I cut through can go very deep, down to consequences that the client did not at all suspect could be impacted.

So far we haven't matured to the point – at least not in the Czech Republic – where the customer in such a fundamental project is aware of the fact that there's a need to set aside extra human resources. That investments are about putting resources into the project and having them work on it. We try over and over to explain to them that there's a need to build a project team right in the primary phase. For there to be someone who will work on the project systematically and for two counter-parties who will discuss things together as equals to be created. No matter whether that means an internal team member or a hired-out firm.

Zdeňka Linková

INTRALOG SERVICES

INTRALOG SERVICES is an innovative supplier and provider of comprehensive solutions for internal logistics. The company's core idea is to provide everything from one place – from logistical analyses to solution proposals all the way to bespoke deployments. All with the aim of saving clients' time and money.

Zebra Technologies' HD4000:

The latest smart glasses for industrial augmented reality

The potential of industrial augmented reality (AR) is growing, so talk about it has grown too. And we too wrote last year about the possibilities for using it, for example in tablet-assisted quality control. The latest AR tool we've had a chance to try out is the HD4000: a pair of glasses from Zebra Technologies. Made especially for the demanding industrial environment and user, it literally gives manufacturing and logistics a new dimension. You could first encounter it at February's TAL 2020 conference, and now you can be among the first to try it live and with your own eyes. Why is it worth a look?

More practical thanks to mobile terminal integration

They say simplicity is strength, and that's precisely the case for the HD4000. Because Zebra Technologies has decided to go its own way with its own take on smart glasses. The HD4000 beats out competitors primarily in its practicality and usability.

Most manufacturers today try for compact glasses containing a computer with an operating system and a battery, while still needing connectivity and, of course, a projector. Fitting all this into something so small as a pair of glasses is nearly impossible and brings many limitations. And so Zebra Technologies simply fitted its glasses with a projector in the form of a glass prism placed in front of one eye. This unit connects to a Zebra Technologies' mobile terminal over a USB cable – and precisely this provides its hidden strength. Because the computing performance gained from the terminal vastly exceeds that of competitors.

Unrivalled computing performance

Today, Zebra Technologies' mobile terminals most often utilise Android 8.1 or newer and an 8-core Snapdragon 660 processor running at 2.2 GHz with 4 GB of RAM. Naturally, a terminal will also provide plenty of power from its battery, plus WLAN or WWAN connectivity. The HD4000 is most often paired with the TC52 or TC20 and can be worn on the wrist

using a bracelet mount. But the HD4000 will soon be able to connect to the WT6000 as well and can support essentially every Zebra Technologies' device with USB C. The overall set can also be supplemented with an RS5100 ring scanner.

The only downside of the whole solution is the USB cable connecting the glasses to the terminal. But after mounting and proper fastening it can barely be felt and is mainly just something to get used to.

Its use in practice – the right information always in view

The HD4000 will find uses in both production and the warehouse. When workers are assembling products and completing shipments, it can help them check positioning, and during picking, it can guide them into position and confirm removal from storage. This eliminates extra scanning or manual on-screen confirmation, both freeing up workers' hands and speeding up the whole process.

Assembly / Final Assembly

These glasses are great for displaying simple schematics, videos or animations that can lead a worker through assembly step-by-step. This lets you speed up the training process and assign even complex final assembly jobs to less experienced workers.

Picking goods

In WMS solutions, it's common for a mobile-terminal app to inform the operator on which article they should take and where they should relocate it. But this means the worker must constantly monitor the display, their own position, and the warehoused goods. Putting the needed information right before their eyes makes the process more efficient.

Quality control features still limited to certain cases

These glasses contain a 5Mpx camera. For now, it doesn't offer detailed resolution, but all the same, certain kinds of quality control can still be performed with it. This mainly depends on whether we're talking about taking pictures during the check itself, or using simple image recognition to double-check, for example, whether a product has been fitted with certain components correctly.

Uses

Assembly | Final assembly | Picking | Quality control | Remote support

Technical specifications:

- **Display:** OLED 640 x 400 px
- **Camera:** 5 Mpx
- **Weight:** < 30 g
- **Waterproof**, dust resistant
- **Operating temperatures from -20 °C to +50 °C**
- **IP67**
- **Drop-resistant** 1.5 m to concrete
- **Compatible with Android 5 and up and Windows 10**
- **Connectivity** over USB 2.0

Remote support

Another area where you can harness this camera (but could use a terminal with a GSM module too) is remote support. If needed, it lets you provide field support for a customer or a technician. It's easy to see what their glasses are seeing, so you can handle the situation faster. No matter if that means fixing a defect, doing maintenance, or aiding project implementation.

Where can you try the HD4000?

You have an exclusive chance to try out these new AR glasses from Zebra Technologies right at Aimtec – or you can call to arrange a presentation at your company. Our developers have readied several demos that show off the HD4000's potential, so now all that's left is to join up and envision where AR will make sense and save labour for you and your workforce. Our take? We clearly recommend the new HD4000. It's the right choice if you want to try the latest technologies and keep pace with new trends.

Antonín Steinberger

Efficient planning with the Asprova APS system at Autoneum CZ

Autoneum has the vision and goal of digitalising all of its logistics processes. In 2019, digitalisation made its way to production planning, with the new solution aiming mainly to increase the efficiency of manufacturing and of plan creation. At TAL 2020, Jan Stejskal, Logistics Manager at Autoneum CZ's Choceň plant – to which the group's other plants are now turning for inspiration – revealed how it all worked out. But is this change in production planning "just" about a tool, or is it a much more comprehensive process?

Before: plant know-how largely bound to planner knowledge

"Never in my life had I seen such sophisticated Excel planning tables," was Jan Stejskal's perhaps-surprising praise of the state before the APS deployment. But he immediately noted that the tables were also very disorganised. The planners had to keep lots of data "in their heads"; parameters for moulds, tools etc. were unstated. Naturally this placed large demands upon planners, and there was no way one planner could stand in for another. Another limitation lay in the fact that orders had to end simultaneously with shifts, and thus the planners had to manually calculate when a batch could be produced and in what quantity.

The shift to advanced planning was intended to change not only what tool Autoneum used, but also how efficiently it planned all its manufacturing resources, including needed operators and their work queues. This mattered because major resources are involved in the manufacturing of chassis covers, insulation materials and noise insulation covers in passenger and freight vehicles, and lengthy manual labour had been needed for planning and manufacturing.

Watchwords: digitalisation and standardisation for plan creation

It was eminently clear that the whole plan creation process needed to be not just digitalised, but also standardised, to help make planners' work faster, more efficient and – when needed – easier to delegate. Autoneum had broad requirements for its new Advanced Planning and Scheduling (APS) system. The Asprova system provided by Aimtec could meet them all.

Autoneum CZ required an APS system that would:

- increase productivity,
- make manufacturing processes more efficient,
- synchronise production batches,
- manage all resources and maximise the efficiency of their use,
- group production orders by recipe,
- reduce energy costs,
- make planners' work more efficient,
- standardise production planning, and
- speed up the creation of production plans.

After: Plans are drafted more efficiently and checked automatically

"This change isn't about how we're ceasing to use Excel for planning and starting to use a system. It's about a change in our approach. We have to have the right data, and have it every day, at every moment, or else the system will not plan correctly." Stejskal underlines this as the main change needed by not only the production planning department, but also the teams in manufacturing, engineering and, of course, IT. But if they ensure the right data is passed to the APS system, it can have great benefits for the firm.

At the start of 2020, Autoneum CZ was in a phase where they were using two data sources for APS. The first was ERP – the data source for manufacturing processes. The second was a file with information on tools – primarily the warming and transport tools. The use of

these shared resources needs planning that's all the more careful, and the right data at every moment of production.

By deploying the Asprova APS and changing their approach to planning, the Choceň plant has brought more efficiency to not only manufacturing, but plan creation as well. Work that once needed three planners is now handled by two; the production plan is drafted faster, and more precisely as well, because the system has built-in checks that warn the planners of any discrepancies, such as when they forget to incorporate a particular manufacturing operation or customer requirement. Data on shifts, work weeks, breaks, holidays and more can be entered in Asprova, and the system then uses it to plan production batches so that all materials are ready on time. Its outputs include a work queue for the operators of shared tools and machines, with the above-described configuration ensuring that everyone knows when they should arrive at a machine and which mould needs exchanging. This has increased the manufacturing halls' productivity, and at one of them, it has even increased by ten percent in a single year.

The future: greater optimisation and parallel planning

However, the digitalisation of Autoneum's production planning does not end just with deploying this new system. Further system optimisations and improvements are also upcoming. The first of these is the use of the system in calculations for essential manufacturing processes (product and mould cooling). The second is parallel planning. While today, each of the planners has to wait for other to finish their changes, upcoming enhancements will enable them to draft the plan in parallel. This change will make planning even more efficient and will also let them shift planners onto input data checking, where they will have even more added value than they do in data entry. The system provides them with precisely this data automatically. The aim is to minimise manual involvement in plan creation.

Zdeňka Linková

Watch the full video – including a description of the manufacturing technology!

Jan Stejskal

Jan Stejskal fills the role of Logistics Manager at Autoneum CZ in Choceň. He has been in charge of the APS system's deployment since its very start. He and a dedicated team produced a GAP analysis and then answered for the decision on which APS system would be introduced – including its correct and successful deployment. Today Asprova is the solution chosen for Autoneum's European plants as well.

In Brief

Pilsen's most modern offices

In January 2020, we moved to Pilsen's Hamburg Business Center. "These offices help us to increase the ease of cooperating on our complex projects. The spaces are more efficient and eco-friendly than before," says Chairman of the Board Roman Žák.

Sonographs for University Hospital Pilsen

Where we can help, we help! We're thrilled to have been able to help University Hospital Pilsen. We deeply appreciate the energy that doctors invest into overcoming the pandemic. Aimtec has strived to help in its own way – by purchasing two Philips Lumify L12–4 ultra-mobile sonographs.

Aimtec delivers projects remotely from A to Z

Cloud testing environments. Digital documentation. Online training. These tools enable us to deliver bespoke software solutions with no need for consultants to visit the customer. Digital delivery can thus offer a solution to travel limitations. Learn more at aimtecglobal.com/aimagazine/en.

#AimtecHackathon 2020 postponed

Originally planned for 20–22 March at Pilsen's Moving Station, the hacking marathon, accompanied by the TechTalk and the YoungHackers, will be held next spring. For more information, visit aimtechackathon.cz/en.

Behind the scenes at Aimtec

Lift the curtain on business communication and get to know our culture! On the Instagram account AimtecLife, you'll find snapshots from daily life at Aimtec. See the faces hidden behind our systems' code!

AIMagazine 35

The magazine about Industry 4.0, the automotive industry and information technologies

not intended for sale

publisher: AIMTEC a. s. I address: U Prazdroje 2807/8, 301 00 Pilsen
phone: +420 377 225 215 I e-mail: aimtec@aimtecglobal.com
web: www.aimtecglobal.com/aimagazine/en

editors: Zdeněk Eliáš, Tereza Drahoňovská, Marie Nováková and Zdeňka Linková
graphic design: Beneš & Michl
registration: MK ČR E 14979
ISSN 2464-5257
printing: TYPOS
graphics: Aimtec, Autoneum CZ, BMW Group, Shutterstock, Zebra Technologies
published: 7. 9. 2020

Effective use of your people's labour, savings of their time and lower error rates. Automating manufacturers' intralogistics brings all of these benefits.

Download the guidebook today and get tips based on many years of experience. Be inspired by real business examples of warehouse and intralogistics automation.

What will you learn?

- **The key advantages and benefits of automation.**
- **How to integrate the most modern technologies into fully automated operations.**
- **How to get your team on board when you decide to implement this type of project.**

aimtecglobal.com/**AIM**agazine/en