Aiming for Industry 4.0: The Case of the Czech Republic

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1 Introduction

The production of base metals is a global industry and in that sense its situation is largely defined by global political, economic and environmental trends. This is a segment that significantly transfers the consequences of world development to local economies and local labour markets. It is, moreover, an energy-intensive industry and therefore dependent on the development of the global energy market. Raw materials processed by the industry are geographically unequally available and are subject to global trade, hence also dependent on non-locally influenced factors. As such, there are significant and varied implications at national and regional levels for metals production, including with the Czech Republic.

The metallurgical industry in the Czech Republic is mostly located in the Ostrava region and its vicinity. Coal, which was discovered under Ostrava and Karviná, started the creation of the lower Vítkovice area—today a national cultural monument—and the establishment of the Vítkovice Ironworks, Nová huť (recently Liberty Steel), Třinec Ironworks (Třinecké železárny), steelworks and tracks production company Bohumín and other firms related to steel production, such as those related to the engineering industry and others similar sectors. Hence, in this chapter, we focus discussion on the Ostrava region, which is called the Steel Heart of the Republic.

Beyond this, the principal focus of the chapter is on the process of automation in the Czech Republic's steel industry, and its very gradual transition to Industry 4.0

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technologies. It represents a case of how the transition is taking place in a much-changed industry since the communist era and accession to the European Union (EU). First, we begin by situating the steel industry in the Republic with a discussion of the emergence of the Ostrava region as the heart of the Czech Republic's steel producing region, and its subsequent decline but also its place as the centre of post-industrial and industrial transformation, and in this sense presenting a case for technological transition, i.e. Industry 4.0.

2 Ostrava: The Steel Heart of the Czech Republic

As usual, those who want to understand today must know the past. In the case of Ostrava, this is doubly true. Its fate was lined up for many decades in the second half of the eighteenth century, when rich coal deposits were found in the Ostrava region. The rapid growth of the agglomeration started in 1828 with the establishment of ironworks in the village of Vítkovice. By the second half of the nineteenth century, Ostrava had already become one of the most important industrial centres of the Austro-Hungarian monarchy thanks to coal mining and ironworks.

However, the greatest expansion of Ostrava did not begin until the communist coup in 1948 and the subsequent orientation of the Czechoslovak economy to the development of mining, steel and other branches of heavy industry. Its massive support led to the rapid swelling of the city. While in 1950 Ostrava had a population of about 215,000, twenty years later there were already 300,000 people living in this city. To illustrate the situation: during the 1980s, the Ostrava industrial area accounted for 86% of hard coal mining, 82.5% of coke production, 66.8% of pig iron production and 60.3% of steel production nationwide. Half of the economically active people were employed in the industry here. The socialist planners anticipated that the North Moravian metropolis should accommodate half a million people and conceived the city accordingly. As the economic geographer Ondřej Slach from the Faculty of Science of the University of Ostrava says, the fundamental problem of Ostrava is encoded in its history, in that "*for some 150 years it was built not for people but for industry*" (Faculty of Science, 2023).

The economic downturn that followed the fall of the communist regimes in Central and Eastern Europe hurt Ostrava in particular. The disintegration of the Council for Mutual Economic Assistance in 1991, and thus the collapse of the market in which these countries traded, led to a drastic decline in the economic output of the post-communist countries. Of course, industrial centres such as Ostrava suffered the most. Workers were laid off in large numbers. If in 1989 OKD mining company employed 112,000 people, six years later the number of employees decreased to 42,000 and by 2003 it had fallen to only 17,500. Today, OKD employs just about 1,200 employees. A similar reduction in the number of employees also affected the company Nova Hut. In 1989 it had 23,000 employees, in 2003 only 12,000 were left and the company currently employs only about 7,500 people. Třinec ironworks underwent similar

developments as it reduced employment from 24,000 employees in the late 1980s to currently only about 6,800 employees.

The transformation of the industry to one that was much smaller in terms of workforce became fully apparent after the fall of the communist regimes in Central and Eastern Europe. Gone are the days when miners and steelworkers were a coveted group. It is not for nothing that during the industrial heydays, it was said: "I am a miner, who is more?" The average monthly wage of the miner in 1988 was just under 7,200 Czechoslovak crowns, which corresponded to two and a half times the then country-wide average income. Experienced front-line miners could even earn around 10,000 crowns, which was a lot of money for that time, given that the directors of industrial companies earned an average of just above 7,000 crowns a month at that time. Today the situation is completely different. The miners earn about 30,000 crowns gross a month, but if their wages had grown at the same rate as the average salary in the Czech Republic after 1989, they would be earning more than twice that amount.

3 The Black Lungs of the Republic

After 1989, Ostrava faced a situation for which it was not built. It became an industrial city in post-industrial times, and people started to leave. In 1990, it had about 331,000 inhabitants while today, only 289,000 people live in it. The process of population decline has not slowed down. On the contrary some 27,000 people have left just in the last decade.

This is a big problem for Ostrava in the future. The city was planned for half a million people, and the transport network and the entire infrastructure were designed accordingly: 'The city must learn to manage more efficiently. Although the city's population is shrinking, the infrastructure costs are still the same', says sociologist Lubor Hruška (cited in Kain 2018) head of the scientific team who created a multi-volume monograph on the development of Ostrava called The Industrial City in a Post-Industrial Society.

The most common explanation for the decline in the population in Ostrava is that economic development has stopped and the city has been economically left behind. But according to Slach (cited in Kain 2018), it is more complicated:

> *It is often said that people leave Ostrava for economic reasons, due to deindustrialization. But if you look at the hard data, Ostrava, from an economic point of view, when it measures the unemployment rate, added value per employee, R&D expenditure and several other indicators, it is one of the most successful regions in the Czech Republic. Economic development is not as bad as it is sometimes presented, and the economy is not the only reason why people are disappearing from Ostrava,*

According to Slach, the aging of the population also plays a big role. Like almost anywhere else in the country, birth rates have fallen in Ostrava after 1989 and while the number of pensioners is increasing. If in 1990 Ostrava was by far the 'youngest'

of the large cities in the Czech Republic, today it is the 'oldest'. If nothing changes, according to Slach, an average of 2.4 pensioners per child will live in Ostrava in 2045.

The fact that economic reasons may not have a major impact on the depopulation of Ostrava can also be seen in where people go to when they leave Ostrava. If the reasons for their departure were only economic, they would be completely outside the region, but this is not the case. According to a new analysis of the migration of Ostrava residents, which was prepared by Lexxus Norton for J&T Bank (cited in Kain, 2018) a total of 66.5% of 'leavers' remain in the region. This is also confirmed by the data available to Ondřej Slach. Of the total of 42,000 people who have left Ostrava since 1990, about 70% have settled (and remain) in its immediate vicinity.

4 'Post-Industrial' and Industrial Transformation: New Opportunities?

In an effort to find an answer to the question about its future, Ostrava has one advantage. The situation in which Ostrava finds itself is nothing new in the international context. Ostrava thus can learn from other places who have experienced similar developments. The German city Dortmund, for example, which for many decades was one of the country's largest industrial centres, has experienced heavy industry downturns. In the 1980s, coal mining and steel production became less profitable and 70,000 people lost their jobs due to closure of mines and industrial plants. At that time, the city bet on education, science and research. And it did well. The Technical University, already founded in 1968, flourished and has currently more than 30,000 students. A technology centre for companies focused on biomedicine or nanotechnologies has also been set up nearby, employing almost ten thousand people, many of them highly qualified.

Dortmund tried hard to change its image and get rid of the reputation of a dirty industrial city. A lake (Phoenixsee) was created on the site of the former steelworks, on the shores of which luxury housing has grown. The listed building of a former brewery was renovated for 50 million euros and reopened as a centre for artists. In 2010, Dortmund was even awarded the Capital of Culture of the EU.

Ostrava also has a chance to have a good future if it invests in education and bets on research and development, information and communication technologies, but it should certainly not turn its back on its industrial tradition, as Hruška notes (in Kain 2018): "*Ostrava will probably never just be a city of services, industry will always play a big role here. It will not only be a heavy industry, but it will be a light engineering industry, automated production*". Slach agrees: "*I am sensitive when someone says that Ostrava is a post-industrial city, because that is not true. The industry still employs around thirty% of the people here. Even reindustrialisation took place here between 2004 and 2008. Industry grew throughout the region.*" According to Hruška, Ostrava would flourish even if Mittal ceased to exist. "*It would lead to a*

further outflow of population, but in general, Ostrava has already taken a different path, the key is for Ostrava to become a modern city with a quality environment based on people who want to achieve something."

As far as the steel industry in the region is concerned it experienced a significant decline in production in the context of the global economic crisis of 2008–2009. Since then, there has been some gradual improvement in the situation in both the Czech Republic and Europe, but production is around 90% of 2007 levels and production volumes are not expected to return to 2007 levels or higher levels (Steel Union, nda). As in the whole of Europe, the Czech steel industry is characterized by some degree of overcapacity and the situation leads to relatively high pressure to maintain competitiveness, especially in the context of the inflow of cheap steel from China and India. Despite these facts, the recent annual performances, for example, in 2017 and 2018 of the Czech steel industry, are evaluated to be successful (Steel Union, nda). The Czech and European economies showed positive development as demand for and price of steel increased.

A successful strategy seems to be to try not to compete with Chinese and Indian cheap steel production, but to increase the added value of the product in terms of the introduction of modern technologies position (e.g. special wires and heat-treated high-quality bar steel in the case of Třinecké železárny, which thanks to this approach is able to maintain a good market position). This direction requires companies to invest heavily in equipment upgrades, technology development and production greening. In this regard, the role of research and development is irreplaceable, investment in research and development is one of the main global trends in the field of metal production in recent years.

Technological innovation will be key for the industry and those looking to stay ahead will invest in developing these capabilities. This is especially true for industries facing very challenging market conditions. Metal fabrication is a very competitive environment, and research and development is key to keeping businesses abreast. Manufacturers are increasingly aware of the importance of continuous development and innovation, and understanding which new technologies open up new production possibilities and new capacities. Cooperation between metal producers and the metalworking industry is also of particular importance to the success of research and development.

Iron metallurgy is a separate field of intelligent strategy. In this area, research and development is seen as a key element of the path to achieving and maintaining competitiveness. The research activity here should be aimed mainly at new sophisticated products in response to the requirements of the customer industries, especially in the form of higher quality standards, flexible response to the demand for new products and innovation (e.g. offering a lighter material while maintaining the mechanical properties of the original). Other research topics are light alloys, cellular materials and composites, extreme alloys and composites, new and improved steels, advanced superconductors, development of combination alloys, biocompatible metallurgy, metal structures and technological units, metallurgical semi-finished products of

copper and alloys, development of new and increasing parameters of existing auxiliary materials (chemicals, oils, etc.), new types of refractory materials, incl. their coatings for casting new types of alloys.

Research and development of new technologies in metallurgy are also supported, which enable an increase in productivity, a reduction in production costs including reduction of energy and material consumption. These new technologies will lead not only to improved product properties but also to cost savings, increased productivity, speed and flexibility, reduced environmental impact and improved workplace environment, including higher work safety. The key to all technologies is a combination of skills in materials science and a deep understanding of the manufacturing process and the technical equipment used. There is a fairly strong awareness among European metallurgical industry leaders that without major investment in innovation, the competitive position of European metal production will continue to deteriorate.

Among other things, this leads to pan-European and national subsidy initiatives to support the development of the sector, especially in terms of research, development and innovation (e.g. the 'Metallurgy Europe' program for the years 2012–2022 or at the national level the inclusion of metallurgy in the areas of intelligent specialization of the Czech Republic within research and development support programs). On the other hand, however, the ever-increasing emphasis on ecological production within the EU (Green deal) creates significant pressure on the industry and worsens its relative competitive position on the world market, and some protectionist measures on the international trade scene, specifically, for example, the introduction of import duties in USA. We need more investment, action and support from the European Union, Member States and companies to make this just transition effective. The transition to a low-carbon economy depends on sustainable and resilient industries.

In short, the industry provides 30 million high-quality jobs across Europe and delivers solutions to decarbonise our economy. However, it requires a supportive policy at EU, national (Czech Republic) and regional levels (Ostrava). A just transition is not free, but the costs of bad transitions are much higher for individuals, regions and society in general. Achieving climate goals in a fair and inclusive way requires higher public spending, but potentially brings long-term savings to society. An important aspect in achieving the transition is the second of the twin challenges (decarbonisation being one): Industry 4.0 and the development and insertion of digital technologies.

5 Industry 4.0

For many years, many developed countries have been engaged in the advent of the Fourth Industrial Revolution or Industry 4.0 (see Fig. 1 below), which is fundamentally changing the nature of industry, energy, trade, logistics and other parts of the economy and society as a whole. The Czech Republic aims to be part of this transition:

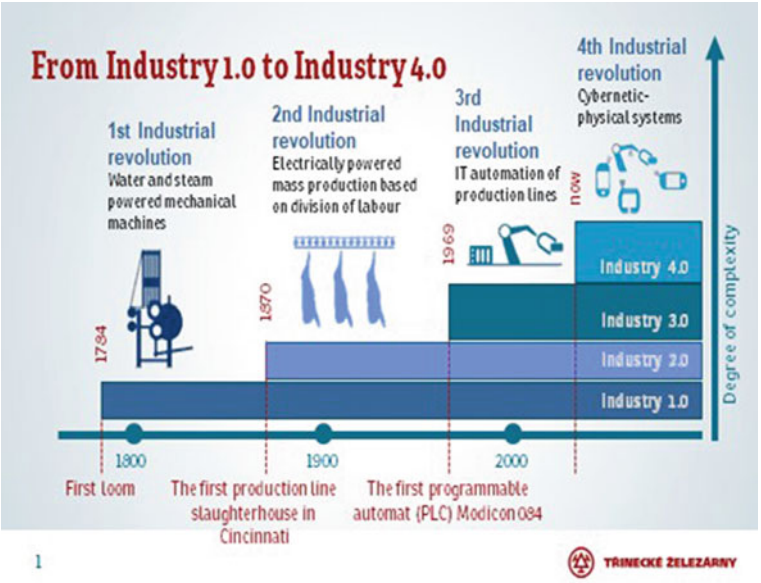

Fig. 1 From industry 1.0 to industry 4.0 [study of Třinec steelworks nda]

> *For Czech Republic and its high dependence on manufacturing industry there is nothing more important than not to let pass the train in something what the Germans called Industry 4.0. We need to develop this comparative advantage as much as possible. In reality we are not missing the money to develop further. But we need to put the money into areas that feed us, where we can do something, and to present it as perishable result".*
>
> (Zámečník 2015).

The aim in this section of the chapter is to provide key information related to the topic of the fourth industrial revolution, show possible directions of development and outline proposals for measures that could not only support the economy and the industrial base of the Czech Republic, but also help prepare the entire society to absorb this technological change. This is the only way to ensure the long-term economic attractiveness and competitiveness of the Czech Republic.

The digitalisation of the economy takes place in a wide range of sectors. These include sectors such as electronics, electrical engineering, machinery and equipment construction, tool manufacturing, automotive, energy, chemical and pharmaceutical production, metallurgy and steel, information technology and telecommunications, industrial automation, radiocommunications, but also maintenance, banking, financial and marketing services, business activity, consulting services, advertising activity, software development, agriculture, environment, health, nutrition and others. Thus, Industry 4.0's goal is to bring a complete digital interconnection of all levels of value-added creation-from product development to logistics. This means radical change and forward-looking investment planning in large and small businesses. Innovation, flexibility and productivity should all be redefined in Industry 4.0.

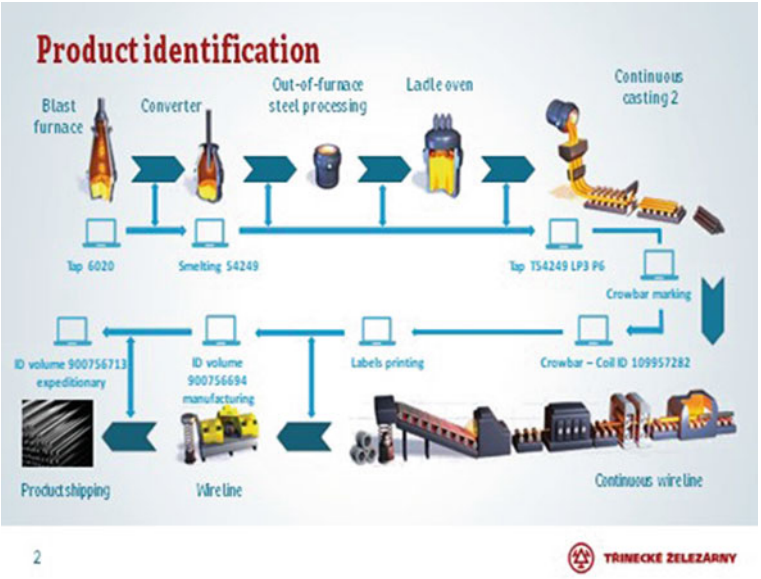

Fig. 2 Product identification-simplified production flow at Třinec steelworks a.s. from primary production to the final product [study of Třinec steelworks, nda]

Industry 4.0 is a term for a set of specific technological trends, which are the result of intensive development in the field of ICT, increasing computing capacity and higher possibilities of interconnection of ICT with physical systems. According to many experts, these trends will completely transform the face of industrial production and this change will also affect the production of metals and metal products (see Fig. 2).

Businesses will be strongly forced to introduce and implement Industry 4.0 technologies due to global megatrends, two of which are a lack of skilled labour and increasing global competition, particularly in terms of prices. These trends will lead the sector to further implement automation, including automation of assembly and setup of machines and parameters and their automatic adjustment in real time, monitoring of product lifetime, etc.

The introduction of Industry 4.0 requires large investments by companies, intensive use of R&D results, investment in state-of-the-art technologies, radical innovation solutions, quality and portfolio optimization of production. As for the future of the monitored industries, it is *expected* that they will move towards higher value-added products and sophisticated products. As such, Industry 4.0 makes claims to bring huge productivity gains and increased flexibility of series size (from individualized 1-piece production to huge series where interconnection allows flexible logistics and communication) [Naujok and Stam, 2017]. In so-called smart factories, which will continuously monitor and regulate the production process using digital technologies, production costs will be reduced (higher work efficiency), waste will be

reduced and decision-making processes will be speeded up. One of the key resources in the future will be the know-how for smart factories.

In addition to a direct impact on production processes and technologies, the 4th Industrial Revolution can be expected to affect the production of metals and metal products indirectly through an impact on the demand for metals in terms of certain new features or new use in new segments. The major developments that can be observed at a global level in the metal industry today include automation, introduction of systems using big data, robotics, the Internet of Things, connected factories, collaborative centres, remote monitoring and control and streamlining of complicated processes through data analysis (see Fig. 3).

Data-driven technologies enable higher production accuracy and higher repeatability. Automation, which is already present to some extent in metal production (CNC machines, programmable presses), will continue to gain importance in the form of the Internet of Things. The use of sensors and large data sets allows the implementation of predictive maintenance. All available machine status information will be available at all times and used automatically. Sensors and smart chips are getting smaller and easier to install, which applies to all kinds of products, not just machines. Intelligent tools provide feedback on state and processes, such as vibration, to IT staff who adjust the process. All equipment and tools in the factories will have to be equipped with such features in the future. Together, these technologies will completely map production from start to end. The introduction of real-time process monitoring (sensors and continuous calculations) will allow to regulate parameters (e.g. temperature) in individual phases. To put it simply, it will be enough to insert a piece of metal, program

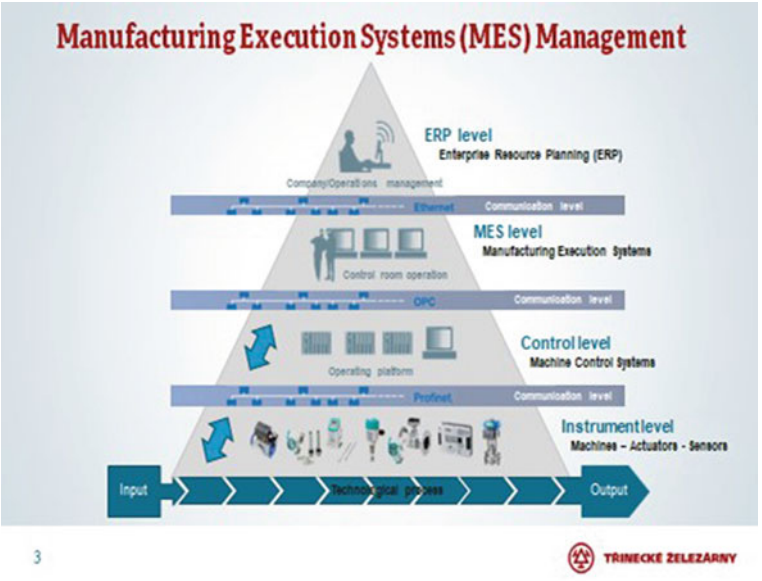

Fig. 3 Manufacturing execution systems management [study of Třinec steelworks, nda]

the device, and at the end the completely finished product falls out according to the specified parameters without the need of manual entry. Automated storage systems for material storage will also play a role—higher storage capacity, density of access and process transparency. Storage systems can be linked to production, where the material is fed automatically. As a result, it is a continuous automatic process from raw material to final product.

The combined effects of Industry 4.0 technology will generally reduce the price of production, reduce material consumption and increase production capacity. In the US, material consumption has already decreased by 4% (waste reduction) in this way, while production capacity has increased by up to 20% in some companies. After-sales services and pre-sales management have also improved with algorithms that better predict customer behaviour. Investing in these areas will enable companies to reduce spare parts costs, increase yield and increase accuracy (part size consistency). It is a realistic precondition for both the production of more advanced products in many ways and a higher adjustment according to customer requirements and customer support.

It is anticipated that such developments will bring more jobs for highly qualified technicians and data analysts and higher wages, but existing employees must also be retrained. However, it is also assumed that the development of digitalisation will to some extent reduce the number of employees (or help to solve labour shortage) in companies thanks to automation, integration of multiple machines, robotics, analytics and the possibility of remote control. The main driver will not be the effort to reduce costs through layoffs or low wages, but the effort to increase reliability, efficiency and productivity that can be achieved with digital technologies.

Trade unions not only in the Czech Republic, but also in the whole Europe should closely follow all these trends and their impacts on employment. New jobs will be for sure created but we should follow where are they created. We do not want to reach the situation that new jobs are concentrated only in some countries or regions while those where original jobs were disappearing are confronted with deindustrialisation, which can lead to poverty or another unbalanced situation within the EU. We fully support the European slogan: "*Nobody should be left behind*". This slogan concerns people/workers; companies, industries/sectors but also EU countries.

6 Industry 4.0 and the Czech Republic

The extent to which businesses in the Czech Republic currently consider the trends in Industry 4.0 to be relevant for them from their point of view is very diverse. It depends on the nature of production, the size of the company and the context of its supplier-customer relations. Large-scale manufacturers usually already have some degree of automation and robotics in place. For producers of small series, for single-piece and custom-made production, the trends have been slow to emerge. Further, a significant part of metallurgical enterprises of the Moravian-Silesian region indicate

that a significant proportion of manual labour is irreplaceable in their production also in the future (Association of Industry and Transport of the Czech Republic, nda)

The reality of the vast majority of Czech companies in industry is far from this vision, but these are real concepts that are being discussed extensively in the professional field, especially abroad. Even when they will not be fully developed in the next few years, it is a direction whose timely capture can determine the future competitiveness of the industry as a whole, especially if other competitive advantages (e.g., labour costs) weaken. Some sources mention that for metal production is the connectivity a key for the future, or that the 4th Industrial Revolution may bring a "renaissance" of metal production. Last but not least, digitization has the potential to make the metal and metalworking industry more attractive to younger generations.

The full development of some technologies of Industry 4.0 in production (not only in the Czech Republic) is hampered by the hesitation of companies due to the lack of robust evidence and procedures on how to use the amount of data collected. The whole area is under investigation. Some companies are interested in installing sensors on older equipment they own. Producers of production technologies are therefore hesitant to install sensors. However, as soon as there is solid evidence of benefits and data utilization practices, it is likely that the mainstream will begin to move more strongly in this direction.

The Czech Republic is one of the countries with the longest industrial tradition and our ambition is for its future to remain connected with industry. As example you will find concrete projects implemented in Třinec Steelworks in 2017–2018 (See Fig. 4). The Fourth Industrial Revolution brings a number of challenges, but especially a unique opportunity to ensure the long-term competitiveness of the Czech Republic in a global competitive environment. We live in exceptional times and our ability to seize this opportunity will have an impact on the quality of life of generations.

In what follows we identify a range of issues to be addressed in the context of Industry 4.0 and the future of the Czech Republic steel industry:

- **Readiness of companies to implement robotic technologies is currently weaker in older companies**: Where it is necessary to invest in the renewal of older technologies, little support from the state through funds and guarantees from banks (harsh conditions). New companies are mostly based on new technologies. One of the important conditions for the use of all possibilities of technological development is a sufficiently strong ICT infrastructure, which is evidenced for example, by the speed of the Internet connection available to the company.
- **Research, development and innovation / new materials and technologies**: Investment in research and development is one of the main global trends in metal production in recent years. Technological innovation will be key for the industry and those who want to stay ahead will invest in developing these capacities. This is especially true for the steel sector, which is facing very challenging market conditions. Metal production is a very competitive environment and research and development are the key to keeping companies from falling behind. Manufacturers are increasingly aware of the importance of continuous development and innovation, that new technologies open up new production possibilities and new

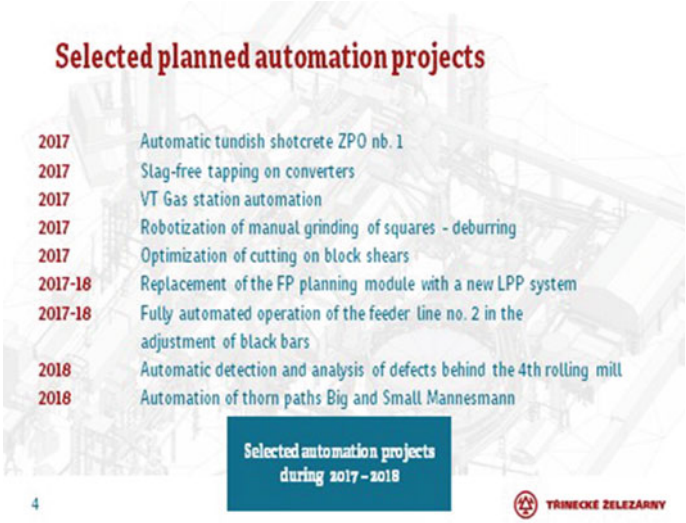

Fig. 4 Selected planned automation projects [study of Třinec steelworks, nda]

capacities. Cooperation between metal producers and the metalworking industry is also of particular importance for the success of research and development.

- **Employment in industry, age structure of employment**: It is a well-known fact that the Czech economy, like almost the whole of Europe, is facing an aging workforce. Industries are even worse off in this respect, as the physical demands of work tend to lead to early retirement and especially heavy industry is failing to attract young workers despite rising wages and the transition to new modern technologies. Demographic development is one of the most frequently mentioned topics in the context of the labour market. The metal industry is one of the first to lose labour due to lower numbers of young people. Many operations have a higher average age and risk leaving outgoing generations of experienced workers with no one to replace. The demographic trend has been compounded in recent years by a record high employment rate, with fewer jobseekers in the labour market than reported vacancies, and the fact that younger generations prefer career choices other than heavy industry or metalworking.
- **Educational structure of employment, education of employees in digital technologies**: Unskilled employees are entering, who need to be retrained for existing professions, and it is also necessary to provide training for existing employees in new technologies, low subsidy programs for training and retraining for companies.
- **Estimation of impacts on professions and skills**: There is a realistic assumption that some professions will disappear during the transformation of the industry, but new professions will also emerge, but with higher qualifications and higher wages.

- **Machine Learning/Artificial Intelligence**: Machine learning and artificial intelligence provide better insight into processes and data for their optimization. Analytical procedures are shifting from more reactive (analysing previous events) in the past to predictive and prescriptive analytics in the future. This allows for higher sophistication of artificial intelligence technologies along with a decrease in the price of sensors and computing power. Based on this data, it will also be possible to make qualified decisions concerning, for example, the strategic position in the value chain. By enabling machine learning to identify the internal processes and activities that contribute most to the achievement of production goals, machine learning will also affect the quality of products and services provided. Artificial intelligence is still in its infancy in metal production and is only being accepted very slowly. However, this type of production is characterized by a number of repetitive tasks that artificial intelligence in combination with robotics can easily take over.
- **E-mobility**: The projected transition to e-mobility is also causing some uncertainty in the sectors under review, which will significantly affect demand of the main consumers of metal industries. Electric motors are simpler than internal combustion engines and contain fewer parts. In general, efforts for lighter cars with lower fuel consumption result in demand for lighter parts and new progressive materials, reducing the need of steel.
- **Environment**: Environmental issues, climate change and efforts to mitigate environmental pollution affect the metal industry in several ways (Green deal and Fit for 55). Climate protection policy in Europe is being transformed into a practical form, for example through emissions trading. The development of their prices is a variable that significantly affects the situation in the steel segment and its competitiveness. If the prices of allowances continue to rise, there is a risk that steel production in the Czech Republic will no longer be profitable and will be moved to third countries outside the EU, where environmentally friendly technologies are used and CO2 production is not limited in this way. Current trends in targeted environmental regulations are described as potentially liquidating for the Czech and European steel industry.

7 Conclusions

The production of basic metals and steel is crucial for Europe and its member states. Today it is defined by global trends and geopolitical developments. Industry 4.0, digitization, the transformation of the entire sector towards greater sustainability and greening is also affecting the steel industry in the Czech Republic. Due to the concentration of steel industry especially in the North Moravian region, i.e. in Ostrava, these global trends have an impact not only on the steel companies themselves, but especially on the employees and their families. The transformation of the steel industry in the Czech Republic and its preservation in a given locality means providing a future perspective to the entire region and its inhabitants, as well as to related sectors.

The steel industry is one of the sectors that has been dealing with issues of its sustainability for many years. Considerable sums are invested in innovation, in research and development, and at the same time, it is and will be necessary to invest in people, in the employees of the future who will have to master new technologies. Considering that it will be a considerable investment, it will be necessary to involve in future educational activities not only steel companies, but also individual states, training and education providers, so that these correspond to the current requirements for an educated workforce of steel and metallurgical companies. At the same time, it will be necessary to introduce concepts of lifelong learning on the part of employees, who will have to continuously respond to new concepts and production changes that are constantly coming.

Even in the future, the steel industry will probably have to deal with unequal conditions on the global market, unfair competition, overcapacity, protectionism, problems with the supply of raw materials, however, thanks to an educated workforce and investments in research and development, which will ultimately lead to the production of green steel in the EU was to maintain a competitive position on world markets. The transformation of the steel industry and our future will therefore depend on a sustainable, stable and resilient EU industry and a skilled workforce.

References

Association of Industry and Transport of the Czech Republic (nda) Survey of Czech firms and industry 4.0 Homepage (sst.cz)

Faculty of Science (2023) University of Ostrava department of human geography and regional development. http://ceskapozice.lidovky.cz/

http://ceskapozice.lidovky.cz/tema/ostrava-chradne-pukne-srdce-mesta-zrozeneho-z-uhli-a-oceli.A180605_100221_pozice-tema_houd

Kain P (2018) Ostrava chřadne. Pukne srdce města zrozeného z uhlí a oceli?

Naujok N, Stamm H (2017) Industry 4.0 in steel: status, strategy, roadmap and capabilities. https://futuresteelforum.com/content-images/speakers/Dr-Nils-Naujok-Holger-Stamm-Industry-4.0-in-steel.pdf

Steel Union (nda) Prediction of Czech steel industry development 2017–2022

Study of Třinec Steelworks (nda) Planning, management and control of production from the study of Třinec steelworks a.s industry 4.0 in the conditions of a metallurgical company

Zámečník M (2015) Euro 47. https://www.tydenikeuro.cz/euro-47-2022/

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