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INDUSTRY 4.0 AND FUTURE OF INDUSTRIAL PETROCHEMISTRY

1. Introduction

The concept of smart sustainable development and inclusive growth are rapidly gaining in importance and relevance as they are seen as vital contributors to addressing the pervasive and challenging social-economic issues of the 21st Century [1]. A fully functioning smart territorial development is the most important factor to enhance the economy of countries in the European and other regions and promote long-term sustainable development and growth [2]. Growth involves numerous aspects that should be based on knowledge and innovation (smart growth) and must include a complex of others aspects: promoting a more resource efficient, greener and more competitive economy (sustainable growth), fostering a high-employment economy delivering social and territorial cohesion (inclusive growth). Industry 4.0 has the potential to improve productivity and competitiveness, increase energy and resource efficiency and effectiveness and hence to protect the environment and provide opportunities for developed and developing countries to achieve economic growth and sustainable development in line with the 2030 Agenda for Sustainable Development. [3]. This also include new innovative approaches to development of the circular economy; the role of strategic partnerships; the role of agreed standards for the exchange of data and components in the digital ecosystem; data security and privacy issues; loss of jobs; and digital gaps. The physical components of production and service systems are being transformed by smart, digital networking into cyber-physical systems (CPS), allowing for the management of processes in real time across great distances and customized products and services [4]. Major challenges for businesses in the Industry 4.0 environment are mass customization, effective and efficient supply chain, getting timely information of customer needs and wants, smart work environment, and the right combination of products. Industry 4.0 requires better management of products, just in time production, and a more efficient time to market [5]. No doubt, these are very challenging and real issues for Industry 4.0, but most studies only discuss the technological aspects and focus on only manufacturing firms, but ignore the petrochemistry. This study addresses these issues by considering the Industry 4.0 concept and its impact on the petrochemistry industry. The concept of Industry 4.0 is very useful for the petrochemistry industry, as personalized service, efficient supply and value chain, agility, smart work environment, use of big data for up to date information of customer preferences, highly customized services at lower cost, and digital enhancement can really affect the customer satisfaction, loyalty, and the perceived product quality.

2. Digital technologies in petrochemistry industry.

How exactly petrochemistry industry has been changing by innovative technologies? Here it is several examples bellow.

1. E-Government Technologies. These technologies have been currently considered as means of improving services and reducing costs of administrative procedures in different fields, levels of organizational processes by streamlining and re-organizing operating procedures saving time and increasing the transparency, effectiveness and efficiency in the public sector [6]. They make an essential change in the whole society structure, values, culture and the ways of conducting business by utilizing the potential of ICT as a tool in the daily work. Advantages and benefits of e-government implementation are the same for both developed and developing countries [7]. E-government applications allow people, businesses, and government sectors to access to available government information 24 hours a day, 7 days a week, which improves the quality of these services. Specialized platforms, receiving the name of the PPGIS-public participation GIS/PPSS-The Public Participation support system, have provided a lot of new optimization features the best decision-making the use of certain areas with the assistance of volunteers on the principles of crowdsourcing and even crowdfunding [8, 9].

2. Digital design technologies. Digital and innovative technologies in countries can be divided in several areas: Virtual reality and simulation technology, Enhanced design software, Project and cost management tools, Smart manufacturing platforms and artificial intelligence, workforce management solutions, material innovation, material sourcing platforms, project finance and investment platforms.

3. Search, Sale & Acquisition technologies. Companies in this category are focused on the tools, processes and business models for searching, marketing and acquiring new materials and products.

Blockchain offers an open source, universal protocol for property buying, conveyancing, recording, escrow, crowdfunding, and more. It can reduce costs, stamp out fraud, speed up transactions, increase financial privacy, internationalize markets. They have already been used to resolve disputes, reaching consensus without the involvement of any intermediary, implementing legal relations through the smart contracts.

4. Leasing & Management. Companies in this category are focused on the tools, processes and business models used for the leasing and manage-

ment in petrochemistry industry. Examples Include: Auto consulting Technologies, List and search services, Peer-to-peer leasing, Inspection management software, Transaction management software, Internet of things, Lease and revenue management software, Smart production platforms and artificial intelligence, In-venue marketing technologies, Broker back-office and infrastructure, CRM and lead management solutions, Product marketing and sales solutions including smart marketing and marketing automation.

Unlimited users auto consulting technologies for execution of business processes in petrochemistry industry. These transformation in-the-cloud technologies into mobile applications allow feel managers as a people without special education.

Internet of things Technologies IoT. Things, chatting with each other, make a decision and replace service managers [10]. For service management, IoT offers the possibility to understand in real-time what is happening throughout every aspect and component of a building and its operation, and can provide valuable contextualized data for analytics. The 'golden egg' for service management is the attainment of predictive instead of reactive maintenance to reduce downtime of equipment and aid efficient labour management, amongst other benefits. This allows a service management professional to identify and make informed decisions on how to ensure their equipment are operated and maintained to optimal efficiency. Acting on the knowledge gathered and analysed through IoT can help encourage a reduction in operational and maintenance costs, lower energy use leading to lower emissions, promote building user well-being and stimulate demand for further IoT technological advancements.

Across all of the categories above, Data & Analytics tools and Sustainability focused innovation are also having a signifcant impact. The following section expands upon both of these additional categories and lists examples of the technology solutions being developed in each category.

5. Data & Analytics. Companies in this category are focused on developing tools designed to identify, collate and analyse relevant data to enhance operational efciency, inform decision making and improve the experience of participants across the all stages of petrochemistry industry. Examples Include: 1. Big data aggregation and management tools 2. Information crowd sourcing tools 3. Content, data and information portals 4. Tenant and visitor in-venue experience and engagement solutions 5. Tenant and visitor in-venue loyalty, transaction and value add solutions 6. Automatic business valuation Technology.

6. Sustainability. Companies in this category are focused on developing tools and materials designed to: 1. Enhance building sustainability, 2. Enhance environmental sustainability, 3. Improve energy efciency outcomes.

Industry 4.0 aims at digitalization all the value chain, beyond 2030 the world will evolve towards a complete digital ecosystem that encompasses the integration of research, production, services, marketing, and sales in a fully integrated digital system.

Mackinsey Global Institute (MGI) employed a simple model for assessing digitalization of USA industry based on 3 broad categories namely Digital assets (Computers, servers, networks and software), Digital usage (Usage in the form of transactions, customer and suppliers interactions together with internal processes using digitization) and Digital workers (The degree to which digital tools are put in the hands of employees to ramp up productivity) with 27sub- indicators [11]. Digital usage and Digital workers were found to make the most crucial difference for increase of efficiency.

The most digitally advanced industry sectors were found to be in ICT, media, finance, and professional services—no surprises there, especially for the early-adopting technology sector, which more often than not acts as a digital pathfinder. Many industries are in the early stages of digitization with plenty of room for growth. The petrochemistry industry is in the early stages of digitizing and connecting their physical assets and a good example of an industry that could be at the forefront of future digital expansion.

Some sectors are highly digitized at one end of the scale, but have a large workforce that uses only basic—or sometimes no—digital technology, ultimately slowing the overall pace of digital adoption.

Industries that are both local and labor-intensive (construction, leisure, hospitality) tend to have low digital usage, especially in their customer transactions.

Government, while having the greatest share of GDP and the highest share of employment, rated poorly across all three digitization categories. This should not come as a great surprise given the bureaucratic, regulated, and non-competitive environment in which our administrators all too often operate.

3. Digital transformation and workforce.

Companies in leading sectors have workforces that are 13 times more digitally engaged than the rest of the economy. In lagging sectors, the digital engagement of the workforce can be erratic; some organizations have made progress in certain areas but have not yet addressed foundational tasks their workers perform.

These and many other technologies of the “digital economy of the petrochemistry industry” entail the reduction of traditional jobs, and therefore they often encounter resistance from citizens.

It seems to the authors that in this area, under the conditions of the fourth industrial revolution, there are certain prospects for solving this problem of job cuts. All of them are associated with the creation of new jobs, but with different approaches.

The first approach is connected with the training of specialists of a wide specialization (universalism). The practice of training universal specialists emerged: simultaneously in the field of petrochemistry industry management, and in the field of economics, and in the field of physics. Graduates work in the field of petrochemistry industry management, and in the field of environmental management.

The second approach is connected with the expansion of the field of activity of traditional specialties but on the basis of innovative and digital technologies. Another approach is related to the transition of petrochemistry industry professionals to the IT sphere and business analysts, specialists in designing artificial intelligence systems with training, and developers of optimal business processes models.

It is obvious that a wide profile of petrochemistry industry specialists using an interdisciplinary, problem-oriented approach. This approach ensures the connection of academic programs with a wide range of functions and tasks in petrochemistry with numerous modern challenges. Different disciplines should be taught on the principle of "learning-through-performance of work." The art of problem-solving should be taught through a project-oriented approach to education with an emphasis on the development of self-education skills "learning-learning". This approach even allows you to teach what is not yet but will appear in the future. Undoubtedly, the main challenge of the future is constant change. To cope with this constant change, the educational base must be more flexible.

Conclusion.

The new battle – ground in petrochemistry, is technology, digital transformation and education.

Global technology entrepreneurs and investors have already begun turning their attention to reinventing the petrochemistry industry, through business model innovation and product innovation. Going digital is an opportunity to reinvent core processes, create new business models, and put the customer at the center of everything. Companies are using digital tools to raise the bar in operational effciency, customer engagement, innovation, and workforce productivity. Consumer expectations of petrochemistry digitalization and their experience with the built environment have been elevated. As innovation in other industries continues to power ahead, consumer expectations will continue to put pressure on the petrochemistry industry to innovate.

The volume and depth of innovation will increase, with more specialized technological solutions for nuanced petrochemistry challenges as well as growing competition for more generalized solutions. Large petrochemistry corporates will need to understand the latest in innovation and implement strategies to integrate those advancements into their projects and businesses in order to stay ahead of the pack. However, introducing a cost effective and impactful corporate innovation and venturing strategy into traditional petrochemistry organizations comes with a number of material challenges.

The impact on the labor market is mixed with widespread dislocation of workers but a proliferation of digital tools that offer new ways of working, matching skills, and acquiring skills.

University graduates must have the skills to adapt to a rapidly changing labor market; they must have the skills to solve the still unknown problems of the future. The fact is that professional and technical skills can be acquired and updated at a later stage of their career, while theoretical problem- solving skills, self-development skills can be achieved only through the process of academic preparation at universities. To cope with this constant change, the educational base must be more flexible, universal and digital technologies oriented.

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