

# **Ipar 4.0**

## **Vállalkozói szellem és strukturális változások új digitális környezetben**

[Devezas, T., Leitao, J., Sarygulov, A.: Industry 4.0 Entrepreneurship and Structural Change in the New Digital Landscape (Ipar 4.0 Vállalkozói szellem és strukturális változások új digitális környezetben). Springer International Publishing AG, Switzerland, 2017]

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Industry 4.0 is a very important topic, as it transform not only production, but the whole business model of the companies. Information and communication technologies will merge with production. Products, machines and people will communicate with each other. This leads to much tighter vertical and horizontal integration. Cooperation between market participants will transform, macroeconomic environment will change and new political regulations will be necessary. The book contains 19 publications about structural changes, economic cycles, technological innovations and development of entrepreneurship regarding industry 4.0. It gives a good overview what a huge transformation process mean the implementation of the forth industrial revolution.

The book contains 426 pages divided into three parts:

- Part I — Structural Change & Cycles;
- Part II — Technological Change and
- Part III — Entrepreneurship Development.

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In the introduction the writers Devezas, T., Leitaó, J., Sarygulov, A describe the way from the first till the fourth industrial revolution. They highlight how the term industry 4.0 developed and become popular topic. They express, that we are witness now the birth of a completely new socioeconomic paradigm, where people and real objects are linked with virtual objects via information networks in cyber-physical systems.

**Part I** contains six studies about technological and economic cycles. They describe long-term tendencies and point out that cycles not just connected to macroeconomic conditions, but rather structural characteristics of different industries.

In chapter Economic potential of breakthrough technologies and its social consequences describe Akaev, A. and Rudskoi, A. the nano-, bio-, information- and cognitive technologies (NBIC-technologies) and their potential contributions to economic growth and social impacts. They present an empirical research about NBRIC technologies in the US and its contribution to economic growth. They also highlight the connection of industry 4.0 with Kondratiev cycles<sup>2</sup>.

In chapter Structural and technological stalemate in Eurozone: If this is the reality, what we can expect write Akaev, A., Ichkitidze, Y. and Sokolov, V about the slow economic growth in the last 10 years of the Eurozone, what is a result of structural and cyclical imbalances. The authors state, that since 2009 the Eurozone and the USA are facing with an unstable equilibrium under the influence of internal or external price shocks. They develop a nonlinear dynamics model to describe the development of this economic systems.

In chapter On the Asymmetry of Economic Cycles describe Sokolov, V., Devezas, T. and Rumyantseva, S the characteristics of asymmetric economic cycles of non-equilibrium processes. First they give a short overview of economic cycle theories. Than explain periodicity, amplitude and asymmetry of economic cycles basis empirical research of GDP dynamics of many countries. The authors state, that the causes of the financial instability are concentration of capital and lack of investment opportunities.

In part Modern trends in evaluation of macroeconomic structural changes

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<sup>1</sup> In the 1920s Kondratiev discovered long cycles of economic growth with a 50 years duration. He outlined the relationship between the rising stage of these cycles with technical innovations.

Yevsikov, I., Korovin, K. and Sarygulov, A. explain the connection between structural changes of economy and cycles. They highlight that there always exist certain states in economic system, in which the volume of production (GDP) exceeds their empirical value. They introduce attractor theory, namely the use of proportionality factor and World-Mensch's nonlinear model, what can be used for monitoring of structural shifts.

In chapter Distribution and Clusters of Basic innovations the authors Bolotin, M. and Devezas, T. highlight the temporal distribution of basic innovations, which is the main driver of economic growth. They present the theory of random process of basic innovations. The main finding of their research is, that long-term changes of appearance of basic innovations occur less frequently than expected by the theory of long waves.

Ichkitidze, Y. writes in chapter "Financial instability under innovation development: reasons and regulation within the model of evolutionary process" about financial market instability and its impact on the real sector. He shows how financial markets create a destructive impulse under the economic growth slowdown and therefore affect the process of innovations diffusion. Main finding is, that the causes of financial instability are the capital concentration and the lack of investment opportunities, whereas the symptoms are financial bubbles and crises.

**Part II** contains seven studies, where the authors highlight the broad topic of technological changes like renewable energy, new materials, eco-efficiency and sustainability.

In chapter The challenges in the transition from fossil fuel to renewable energy Nyambuu, U. and Semmler, W. analyze the changes in energy technology. They express, that new energy technologies are required to ensure climate stability They study the costs and prices of fossil and renewable energy and its effect on stock markets and make a proposal how industrial policies can support phase out of fossil and phase in of renewable energy.

In chapter Racing to a renewable transition Thompson, W. and Zakhirova, L. write, that technological and economic growth needs relatively inexpensive energy. In the history those countries had strong power, which owned the source of primary energy. They ask the question, what will be the big source of energy in the future and which countries will own them.

In part Metal matrix/nanocarbons composites based on copper and aluminum the authors Tolochko, O., Michailov, V. and Rudskoi, A. search for new raw materials for Industry 4.0. They developed a new multifunctional

composite material, what includes aluminum and cooper. This new material can be successfully developed for industrial applications.

In chapter Additive Technologies – The basis of digital Custom Manufacturing Popovich, A., Sufiiarov, V. and Grigoriev, A. highlight the future customized production possibilities of 3D printing, what gives rise to a higher rate of automation, design freedom and shorter time-to-market. 3D printing is a key technology of Industry 4.0, what significantly change traditional way of production in terms of industrial mechanical equipment, assembly process, supply chains and parts design. They also present a 3D bioprinting solution of a hip prosthesis.

In chapter Private Astronautics and its role in space exploration the authors Zheleznyakov, A. and Korablev, V. write about the increasing possibilities of private astronautics activities. They describe the increasing potential of non-state financing development of space capabilities.

Grinin, L., Grinin, A. and Korotayev, A. write in chapter The MANBRIC-Technologies in the forthcoming technological revolution about a new technological invention. They define MANBRIC – technologies as a combination of medical, additive, nano-, bio-, info- and cogno-technologies. They analyse the relationship between economic cycles and technological revolution and assume that the Cybernetic Revolution will be interpreted as the fourth industrial revolution and with the sixth Kondratieff wave.

In the next chapter Global pattern in material consumption: an empirical study the authors Devezas, T., Vaz, A. and Magee, Ch. look for an answer to the question if it is possible to keep the global economy growing while simultaneously reducing material resources. They name it dematerialization or decoupling theory. They express that making progress towards a more sustainable economy requires a reduction in resource use at global level. They also highlight the effect of China's modernization in the past three decade to material consumption.

**Part III** contains six studies dealing with entrepreneurship in industry 4.0. This part describe market entry, exit and mobility determinants, possibilities of co-innovation, entrepreneurial networks as well as future of family businesses.

In chapter Challenges in Technology Entrepreneurship: managing inter-professional conflicts in biopharmaceutical enterprises writes Gurau, C. about conflicts between professional sub-cultures in knowledge organizations with different professional teams. He describes the different values, interests, requirements and visions of various professional groups, what can cause intra-

organizational conflicts. Gurau, C. analyses possible conflict management procedures in such situations with the help of Conflict Management Matrix.

Brumana, M., Cassia, L., Gamba, D. and Minola, T. write in chapter Perception Gaps in international corporate entrepreneurship: the role of knowledge transfer tool about knowledge sharing in industry 4.0. They analyse the impact of knowledge sharing on performance and identify perception gap between head office and subsidiary and highlight how negatively this effect the performance of subsidiaries and introduce a knowledge transfer tool to close the gap.

In chapter Family business and entrepreneurship: competencies and organizational behaviour write Cubico, S. at all about which competencies are relevant to success of family owned business. They study how these competences influence organizational behaviour and family dynamics and introduce challenges and problems of a family owned business over time of several generations.

In chapter Metrics for innovation and entrepreneurial networks Farinha, L. and Ferreira, J. write about the regional dynamics of academia-firms-local governments and civil society (Quadruple Helixes) based on innovations and its impact on regional competitiveness. They research how regional networking can stimulate knowledge and technology transfer and highlight how government can facilitate the establishment of such regional networks. They develop in their study the Regional Helix Scoreboard model, what identifies key performance indicators, which helps to measure collaboration regarding innovation.

Baptista, R. and Karaöz, M. research market selection in chapter Determinants and interdependence of firm entry, exit and mobility. They demonstrate the effect of industrial and regional diversification, unemployment and unit cost on entry, exit and mobility of the market. In their empirical study they identify that growing industries experience significant more entry, exits and changes of market shares.

In chapter Coopetition and co-innovation: Do manufacturing and service providers behave differently? research Pereira, D., Leitao, J. and Devezas, T. the possibilities for cooperation between firms regarding R&D. They study the determinants of firms' innovative behaviour and explain how policies can increase the number of co-innovative products and services and suggest that public policies should be guided towards the creation and consolidation of open innovation flows and towards fostering patenting strategies.

The book explains through many studies, what means new technologies and higher vertical and horizontal integration in Industry 4.0. I recommend the book to entrepreneur, scientists and students to broaden their knowledge about economic growth, cycles and imbalances as well as about technological changes and innovations. I also recommend the book to policy maker as it can help them to develop new regulation of industry, what consider eco-efficiency and sustainability.