movement of machines via autonomous decisions based on observation of surroundings (autonomous robots, self-driving vehicles, autonomous drones) – 17.0%.

The distribution of the use of artificial intelligence by purposes: For marketing or sales – 24.4%, For production processes – 13.8%, For organisation of business administration processes – 6.8%, For management of enterprises – 15.6%, For logistics – 5.9%, For ICT security – 18.0%, For human resources management or recruiting – 15.4%.

Conclusion

As analyze shows Georgia has some experience to develop ICT as dominant role in management of enterprises. It is very important process and hope in next year's analyzing will be more detailed as nowadays.

References

Lia Charekishvili, Using ICT by Enterprises as Indicator of Higher Education in Georgia, International Scientific and Practical Conference, ORGANIZATION'S STRATEGY VS REALITIES OF THE VUCA-WORLD, Kiev, Ukraine, November 10, 2021

Lia Charekishvili, Higher education system in Georgia: Reforms and modern challenges, International Institute of Social and Economic Sciences, 2015

Dominici, G., and Gagnidze, I. (2021). 'Effectiveness of Entrepreneurial Universities: Experiences and Challenges in Digital Era (A Systemic Approach)', *Interdisciplinary Description of Complex Systems*, 19(1), pp. 13-30. https://doi.org/10.7906/indecs.19.1.2

Giga Kikoria, Sima Gachechiladze, Salome Pataridze, Distance Education and E-learning in Georgia, ECONOMICS AND BUSINESS, 2019, No2, pp. 209-220
https://www.bau.edu.lb/Research/Information-and-Communication-Technology-in-Business#:~:text=Therefore%2C%20ICT%20is%20concerned%20with,distribution%20and%20sales%20and%20feedback.
National Statistics Office of Georgia, https://www.geostat.ge/en/modules/categories/103/information-and-communication-technology-ict

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FROM INDUSTRY 4.0 TO INDUSTRY 5.0 -THE WAY FOR WELFARE OF SOCIETY 5.0

Abstract. *The concepts of Industrial Revolution 4.0 and Industrial Revolution 5.0 are discussed in the paper. As a result of Industry 5.0, the welfare of Society 5.0 is described by the model developed by the author. The model combines the approaches by H.R. Varian (2010) and by D. Begg, S. Fischer, and R. Dornbush (1991).*

Keywords*: Industry 4.0, Industry 5.0, Society 5.0*

The modern world faces many challenges. Among them are the Industrial Revolution 4.0 (Industry 4.0) and the Industrial Revolution 5.0 (Industry 5.0). The World Economic Forum has been publishing reports on the expected results of Industry 4.0 since 2016. These reports include predictable changes in the field of education (1), the future of jobs (2-3), the green economy (4), and other areas. Many publications have been devoted to the study of these issues by OECD, McKinsey Global Institute, and others (5-8). In addition to international organisations, many researchers discuss predictable changes in the world economy, and some countries, in the coming decades (9-14).

Many organisations and scholars anticipate these changes within the labour market, alongside the need to upgrade certain skills – the scale of which is quite impressive (15-20). For example, one study by McKinsey & Company suggests that by 2030, up to 375 million workers will need to switch occupational categories due to automation, and all workers will need to adapt in order to co-exist alongside increasingly capable machines. A 2017 McKinsey Global Institute survey reported that 62% of business executives

believe that more than a quarter of their staff will need to be retrained in part because of automation and digital technologies." (7, 2). According to another study, "14% of existing jobs could disappear as a result of automation in the next 15-20 years, and another 32% are likely to change radically as individual tasks are automated." (8,3).

The discussion about Industrial Revolution 5.0 has recently started and has already become an active debate. Muller (2020) argues that "several of the ideas of Industry 4.0 seem to be revitalised under a new terminology. The concept of Industry 5.0 could also be described as re-introducing the lost dimension of a "human/value-centered Industry 4.0", or as one participant put it, "Industry 4.1"... Industry 5.0 should not be understood as a replacement nor an alternative to, but an evolution and logical continuation of the existing Industry 4.0 paradigm" (21, 6-7).

According to the European Commission, in order to remain the engine of prosperity, industry must lead the digital and green transitions. Industry 5.0 provides a vision of industry that aims beyond efficiency and productivity as the sole goals, and reinforces the role and the contribution of industry to society.

Breque et al., (2021) argue that "Industry 5.0 will be defined by a re-found and widened purposefulness, going beyond producing goods and services for profit. This wider purpose constitutes three core elements: human-centricity, sustainability and resilience" (22, 13).

Dixson-Decleve et al. (2022) describe the differences between Industry 4.0 and Industry 5.0 (see Table 1) (23, 6-7). They argue that, rather than representing a technological leap forward, Industry 5.0 actually nests the Industry 4.0 approach in a broader context, providing regenerative purpose and directionality to the technological transformation of industrial production for people-planet-prosperity rather than simply value extraction to benefit shareholders.

Many authors indicate that Industry 5.0 will contribute to the formation of Society 5.0 (24-25). As it was mentioned above, the purpose of Industry 5.0 is to improve human living standards and welfare. We would like to offer our readers a graphic representation of the well-being of Society 5.0. The model developed by us combines the approach of the welfare model by H.R.Varian (27, 637-638) and the model of deriving PPF by D. Begg, S. Fischer and R. Dornbush (28, 333).

Table 1. Differences between Industry 4.0 and Industry 5.0

Industry 4.0	**Industry 5.0**
• Centred around enhanced efficiency through digital connectivity and artificial intelligence • Technology – centred around the emergence of cyber-physical objectives • Aligned with optimisation of business models within existing capital market dynamics and economic models – i.e. ultimately directed at minimisation of costs and maximisation of profit for shareholders • No focus on design and performance dimensions essential for systemic transformation and decoupling of resource and material use from negative environmental, climate and social impacts	• Ensures a framework for industry that combines competitiveness and sustainability, allowing industry to realise its potential as one of the pillars of transformation • Emphasises impact of alternative modes of (technology) governance for sustainability and resilience • Empowers workers through the use of digital devices, endorsing a human-centric approach to technology • Builds transition pathways towards environmentally sustainable uses of technology • Expands the remit of corporation's responsibility to their whole value chains • Introduces indicators that show, for each industrial ecosystem, the progress achieved on the path to well-being, resilience and overall sustainability.

Source: 23, 6-7.

This process can be presented in a two-dimensional plane (see Figure 1 and Figure 2). We placed Digitalisation on one axis, and Sustainable Development on the other. The reason for this being that for a policy to effectively achieve Industry 5.0 it must combine these two components.

We applied the model of deriving PPF from Begg et al. (1991). In this case, for the above-mentioned reason, we used the components of Digitalization and Sustainable Development instead of two resources. In this model, PPF is the maximum number of products produced by the combination of the two components in Industry 5.0 conditions.

According to the welfare model by H.R.Varian - the welfare maximisation for Society can be achieved at point A with Utility Maximisation (Figure 1, Isowelfare curves). As usual, the optimal point is characterised by a tangency condition (in our case PPF for Society 5.0 and Isowelfare curves and lines). Isowelfare curves, among others, represent utility level by investing in education, training and life-long learning; working conditions; healthcare and long-term care; social inclusion and minority rights; gender equality and rural development (29, 17;19).

The welfare maximisation for Society 5.0 with costs (represented by Iso-welfare lines) approach can be achieved at point A (Figure 2). The amount expressed by Iso-welfare lines are the costs that will be incurred for the transformation of the economy.

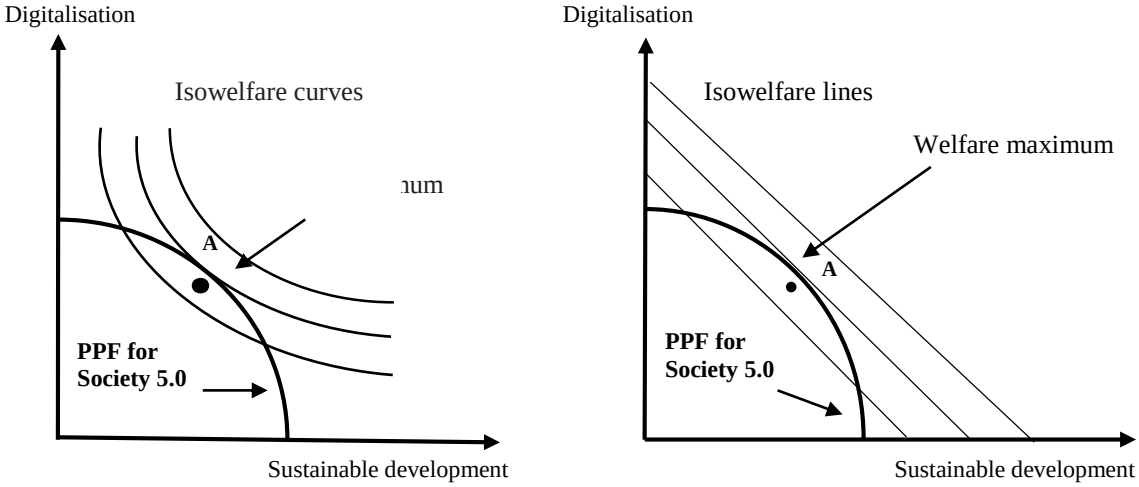

Figure 1. Welfare maximization model with Isowelfare curves (based on 27, 637)
Figure 2. Welfare maximization model with Isowelfare lines (based on 27, 638)

It is known that "the $10 trillion in stimulus measures that policy makers have allocated could be decisive for the world's low-carbon transition. Here's how organisations can bring economic and environmental priorities together" (30, 1). As the researchers indicate, with similar investments in the EU "a circular economy has the potential to generate a net economic benefit of €1.8 trillion in Europe by 2030; resulting in over 1 million new jobs across the EU by 2030; and be central to cutting greenhouse gas emissions. A global food and agriculture system could create a new economic value of over €1.8 trillion by 2030 and create 200 million jobs by 2050" (29, 25).

We can conclude that the World Economy will continue rapidly developing over the coming decades. It is important for the welfare of the population that this be done by taking into account the goals and principles of Sustainable Development.

References

1. *World Economic Forum.* Schools of the Future Defining New Models of Education for the Fourth Industrial Revolution, Platform for Shaping the Future of the New Economy and Society, (2020), available at: https://www3.weforum.org/docs/WEF_Schools_of_the_Future_Report_2019.pdf

2. *World Economic Forum.* Jobs of Tomorrow: The Triple Returns of Social Jobs in the Economic Recovery, White Paper, in collaboration with Accenture, (2022), available at: https://www3.weforum.org/docs/WEF_Jobs_of_Tomorrow_2022.pdf
3. *World Economic Forum*. The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution, (2016), available at: http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf
4. *World Economic Forum & JLL*. Green Building Principles: The Action Plan for Net-Zero Carbon Buildings, (2021), available at: https://www3.weforum.org/docs/WEF_Green_Building_Principles_2021.pdf
5. Organisation for Economic Co-operation and Development (2022), Assessing environmental impact of measures in the OECD Green Recovery Database, Tackling Coronvirus (COVID-19): Contributing to a Global Effort. OECD, 21 April, 2022, available at: https://read.oecd-ilibrary.org/view/?ref=1139_1139977-0fwdw1e0e8&title=Assessing-environmental-impact-of-measures-in-the-OECD-Green-Recovery-Database
6. *McKinsey Global Institute*. The net-zero transition. What it would cost, what it could bring. McKinsey Global Institute, McKinsey Sustainability, & McKinsey's Global Energy & Materials and Advanced Industries Practices, (2022), available at: https://www.mckinsey.com
7. *Desire2Learn.* The Future of Skills in the Age of 4th Industrial Revolution, (2019), available at: https://www.d2l.com
8. *Organisation for Economic Co-operation and Development.* The Future of Work, OECD Employment Outlook 2019, available at: https://www.oecd.org
9. *Dominici, G. and Gagnidze, I.* "Effectiveness of Entrepreneurial Universities: Experiences and Challenges in Digital Era (A Systemic Approach)", *Interdisciplinary Description of Complex Systems*, Vol. 19 No. 1, (2021), pp.13-30, DOI 10.7906/indecs.19.1.2
10. *Papachashvili, N., Mikaberidze, T., Tavartkiladze M. and Roblek, V.* "Industry 4.0 and the Challenges of Higher Education Programs in the Field of Business Administration", Nata, R. V. (Ed.), Progress in Education, Vol. 68 Chapter 7, Nova Science Publishers, Inc., New York, NY, (2021), pp. 171-202, **DOI:** https://doi.org/10.52305/WPPN2619
11. *Petrović, N., Roblek, V., Khokhobaia M. and Gagnidze, I.* AR-Enabled Mobile Apps to Support Post COVID-19 Tourism. *2021 15th International Conference on Advanced Technologies, Systems and Services in Telecommunications (TELSIKS)*, 2021, pp. 253-256, doi:10.1109/TELSIKS52058.2021.9606335
12. *Lekashvili, E. and Bitsadze, M.* "The Role of University Spin-Offs in the Success of Research Programs", Nata, R. V. (Ed.), Progress in Education, Vol. 68 Chapter 4, Nova Science Publishers, Inc., New York, NY, (2021), pp. 73-102, **DOI:** https://doi.org/10.52305/WPPN2619
13. *Sepashvili, E.* Supporting digitalization: Key goal for national competitiveness in digital global economy. Economia Aziendale Online, Vol. 11 No. 2, (2020), pp. 191-198, DOI: http://dx.doi.org/10.13132/2038-5498/11.2.191-198.
14. *Seturidze, R. and Topuria, N.* A way of developing collaboration between universities and businesses in a time of COVID-19, Kybernetes, Vol. 50 No. 5, pp. 1661-1678, (2021), https://doi.org/10.1108/K-08-2020-0518.
15. *Sobolieva, T. and Harashchenko, N.* Intellectual property indicators and renewable energy trends, Polityka Energetyczna – Energy Policy Journal, Vol. 23 No. 4, pp. 17-32, (2020), https://doi.org/10.33223/epj/127911.
16. *Vesperi, W. and Gagnidze, I.* The Impact of the 4th Industrial Revolution on the Higher Education System: Rethinking the Role of Universities, Nata, R. V. (Ed.), Progress in Education, Vol. 68 Chapter 6, Nova Science Publishers, Inc., New York, NY, (2021), pp. 143-169, **DOI:** https://doi.org/10.52305/WPPN2619.
17. *Gogorishvili I.* Small and Medium Enterprise Perspective in the Development of Digital Economy. E-Book of Abstract, Fifth Business Systems Laboratory International Symposium, Cocreating Responsible Futures in the Digital Age: Exploring new paths towards economic, social and environmental Sustainability, University "Federico II" of Naples, January 22-24, (2018), pp.255-257. ISBN 9788890824265 http://bslab-symposium.net/Napoli-2018/BOA-BSLAB-Symposium-2018.pdf
18. *Natsvlishvili, I., Kharaishvili, E. and Lazariashvili, T.* Impact of agro tourism on economic development of related sectors in the context of sustainable well-being (case of Georgia). International Journal of Markets and Business Systems, Vol.4 No.2, (2020). pp.120 – 139. DOI: 10.1504/IJMABS.2020.113122

19. *Charekishvili, L.* Lifelong Education and ICT in Georgia. IV International scientific and practical conference "Strategic Imperatives of Modern Management" (SIMM-2018), KNEY, Kyiv, 2018 pp.273-278. https://core.ac.uk/download/pdf/197267023.pdf
20. *Gagnidze, I.* The Numerous Challenges of the Post-COVID Economy, in Nedelko, Z. (Ed.), 6th FEB International Scientific Conference "Challenges in Economics and Business in the Post-COVID Times", University of Maribor, Slovenia, pp. 11-19, (2022), DOI https://doi.org/10.18690/um.epf.5.2022.2
21. *Muller, J.* Enabling Technologies for Industry 5.0. Results of a workshop with Europe's technology leaders. Independent Expert Report", European Commission Directorate-General for Research and Innovation, (2020), doi:10.2777/082634
22. *Breque, M., De Nul, L. and Petridis, A.* Industry 5.0. Towards a sustainable, human-centric and resilient European industry. European Commission. R&I paper series. Policy brief, (2021), https://op.europa.eu
23. *Dixson-Decleve, S., Balland, P-A., Bria, F., Charveriat, C., Dunlop, K., Giovannini, E., Tataj, D., Hidalgo, C., Huang, A., Isaksson, D., Martins, F., Mir Roca, M., Morlet, A., Renda, A. and Serger, S*. Industry 5.0: A Transformative Vision for Europe ESIR Policy Brief No. 3, European Commission, Directorate-General for Research and Innovation, Independent Expert Report, (2022), ISBN 978-92-76-43352-1; KI-BE-21-005-EN-N; doi:10.2777/17322
24. *Potočan, V., Mulej, M. and Nedelko, Z.* Society 5.0: balancing of Industry 4.0, economic advancement and social problems", Kybernetes, Vol. 50 No. 3, (2021), pp. 794-811. https://doi.org/10.1108/K-12-2019-0858
25. *Konno, N. and Schillaci, C.E.* Intellectual capital in Society 5.0 by the lens of the knowledge creation theory, *Journal of Intellectual Capital*, Vol. 22 No. 3, (2021), pp. 478-505. https://doi.org/10.1108/JIC-02-2020-0060
26. *Deguchi, A., Hirrai, Ch., Matsuoka, H., Nakano, T., Oshima, K., Tai, M. and Tani, Sh*. What Is Society 5.0?. In: Society 5.0. Springer, Singapore, (2020), https://doi.org/10.1007/978-981-15-2989-4_1
27. *Varian H. R.* Intermediate Microeconomics. A modern Approach. Eight Edition. W.W. Norton & Company, Inc., (2010), ISBN 978-0-393-93424-3
28. *Begg, D., Fischer, S. and Dornbusch, R.* Economics, 3rd Edition, McGraw-Hill, London, 1991
29. *Towards a Sustainable Europe by 2030*, Reflection Paper. COM (2019) 22 final. Brussels, 30.1.2019. https://eur-lex.europa.eu/resource.html?uri=cellar:21b348d0-261f-11e9-8d04-01aa75ed71a1.0001.02/DOC_1&format=PD
30. *McKinsey&Company.* How a post-pandemic stimulus can both create jobs and help the climate. Public & Social Sector and Sustainability Practices. McKinsey&Company, (2020), available at: https://www.mckinsey.com

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PROBLEMS HINDERING THE DEVELOPMENT OF RENEWABLE ENERGY IN GEORGIA

Abstract. *The paper provides a justification for the need to accelerate the introduction of technologies for the use of renewable energy sources. The main obstacles on this path are: the lack of a systematic approach and research in Georgia; The problem of maintaining the stability of the transmission network; and Net Accounting System Limitations.*
Keywords: *renewable energy, renewable energy policies, Georgia.*

According to the International Energy Agency, in 2019-2024. The installed capacity of renewable energy sources in the world in 2019-2024 will increase by 50%, in which the energy of solar photovoltaic converters (PV) will play the main role, and according to the International Renewable Energy Agency, solar photoconverter systems will cover electricity needs by 2050 a