3.2. THE ROLE OF INFORMATION AND INNOVATIVE TECHNOLOGIES IN THE MODERN ECONOMY

In complex technical, economic, social systems, it is important to take into account many different factors and be able to assess the consequences of their change. It is important that these changes not only lead to a better result, but also give the most useful effect. Information technology – it's a system of interconnected methods and methods for collecting, storing, accumulating, searching, processing information based on the use of computer technology.

The term «information technology», according to UNESCO[1], is a combination of interrelated, scientific, technological and engineering disciplines that study the methods of effective organization of labor of people who are engaged in the processing and storage of information, as well as equipment and methods of organizing the interaction of people with equipment.

In general, information technologies in the economy are actions carried out on economic information using computers in order to obtain the optimal result. In economics, technologies are usually used for processing and storing data in order to organize the process of interaction between participants and equipment, satisfying information needs.

Any managerial decisions are made taking into account the feasibility of the economy. It is worth paying attention also to education in the application of technology in the economy. The optimality of technology will be implemented in the case of staff training and analysis of the latest developments in technology in the economy. The application of technology in the economy is a means of virtual economics.

Information and communication technology (ICT) permeates the business environment, it underpins the success ofmodern corporations, and it provides governments with an efficientinfrastructure. At the same time, ICT adds value to the processes oflearning, and in the organization and management of learning institu-tions. The Internet is a driving force for much development and innova-tion in both developed and developing countries.

Countries must be able to benefit from technological developments. To be able to do so, a cadre of professionals has to be educated with sound ICT backgrounds, independent of specific computer platforms or soft-ware environments.Technological developments lead to changes in work and changes inthe organization of work, and required competencies are thereforechanging. Gaining in importance are the following competencies: critical thinking, generalist (broad) competencies, ICT competencies enabling expert work, decision-making, handling of dynamic situations, working as a member of a team, and communicating effectively.

The concept of «innovation» – is currently considered as the final result of innovation, expressed as a new or improved product distributed on the market, a new or improved technological process used in practice. The purpose of innovation is to obtain an economic, environmental, social or other type of effect.

Technology («science of craf», from Greek τέχνη, techne, «art, skill, cunning of hand»; and – λογία, – logia) – a manner of accomplishing a task especially using technical processes, methods, or knowledge[2]

Innovative technologies are a set of methods and tools aimed at supporting the implementation stages of a specific innovation. The following types of innovative technologies exist: training, implementation, consulting, engineering and transfer. With the development of new technologies and as a result of the innovative activities of companies, innovative products are created that can be in a specific material or other form.

In the conditions of globalization changes and transformations, any sphere of human existence and activity undoubtedly connected with the information component. It is worth noting that information technology is simply not possible without an innovative component. There is a lot of software and development in the economy and management right now that can accurately,

[1] Evgueni Khvilon. Information and communication technology in education: a curriculum for schools and programme of teacher development, p.9

[2] "Technology | Definition of Technology by Merriam-Webster". Merriam-Webster.

quickly provide up-to-date data, make accurate forecasts.

For example, the use of information technologies and innovation in the modern economy is modeling of the agricultural sector of Ukraine based software AGMEMOD (Agriculture Member State Modelling). At its core, AGMEMOD is econometric, dynamic, partial equilibrium multi-country, multi-market model, first developed for the agricultural and food markets in the EU, covering the majority of EU member states at the national level. Based on a set of standard templates for specific products, the model developed by individual countries taking into account the agricultural components at Member State level and at the same time to a combination of the EU model. Later, this model was extended to seize other countries and stylized version of the rest of the world (ROW), which neglects any detailed understanding and policy. Careful passing patterns provides analytical consistency model of the country, necessary for the purpose of aggregation. Besides, joining the template model and the overall modeling approach also contributes to a better understanding of the effects of these policies in different countries. Models can help in conducting research, the study of future problems (eg, introduction of monitoring of land relations), political analysis at modeling basic relationships in these areas. Since 2001, AGMEMOD has been developed and sustained by a partnership comprising research institutes, government agencies and universities in European Union (EU) Member States, later extended to include partners in new Member States as well as other countries (such as the former Yugoslav Republic of Macedonia, Russia, Turkey and Ukraine). AGMEMOD has been funded under the European Commission fifth and sixth Framework Programmes and by contributions from partner institutes. The AGMEMOD model is managed in a flexible manner as, depending on the specific task in hand, different AGMEMOD partners build up a consortium around the main developers of the AGMEMOD model. Moreover, the academic network has been extended to include broader society; the result is the AGMEMOD network, involving market experts and stakeholders interested in the results of the AGMEMOD Outlook. The development of the AGMEMOD model and partnership has been continuously supported by the European Commission's Joint Research Centre (JRC) as the AGMEMOD model is an integral part of the Integrated Modelling Platform for Agro-economic Commodity and Policy Analysis (iMAP) hosted by the JRC .[1]

Tables 1 and 2 depict the state of art of commodities and countries that are involved in the current AGMEMOD system, in combination with its mnemonics or codes used.

Table 1. Commodity names and codes in AGMEMOD

Grains and Oilseeds		**Root crops, fruit, other**		**Livestock, Meats and Fish**		**Milk and Dairy**	
Soft wheat	WS	Potatoes	PT	Cattle	CC	Cow's milk	CM
Durum wheat	WD	Sugar beets	ST	Dairy cows	DC	Other milk	OM
Barley	BA	Sugar	SU	Suckler cows	BC	Whole milk	WM
Maize	CO	Isoglucose	IS	Bovine animals<1y	CV	Skim milk	NF
Oats	OA	Sweetener	SE	Beef and veal	BV	Butter	BU
Rice	RE	Molasse	MO	Pigs	HP	Cheese	CD
Rye	RY	Tobacco	TB	Sows	SW	Casein	KA
Triticale	TR	Cotton	ST	Pig meat	PK	Drinking milk	DM
Other grains	OG	Olive oil	OO	Sheep	LM	Cream	CE
Rapeseed	RS	Tomatoes	TO	Ewes	EW	Other fresh	FM
Sunflower	UF	Tomato paste	TP	Broiler	BR		
Soybeans	SB	Citrus fruit	CF	Other poultry	OP		
Rape meal	RL	Oranges	OR	Poultry	PO		
Sun meal	UM	Apples	AP	Eggs	EG		
Soya meal	SM						
Rape oil	RO	Cotton	CT	Fish	FH		
Sun oil	UO	Cotton lint	CL	Cephalopods	FH_c_		
Soya oil	SO	Tobacco	TB	Crustaceans	FH_r_		

[1] SUPPORT FOR AGMEMOD MODEL, BASELINE AND DATABASE UPDATES 2017/2018: AGMEMOD technical documentation, p.6

Grains and Oilseeds		Root crops, fruit, other		Livestock, Meats and Fish		Milk and Dairy	
		Table wine	WT	Demersal Fish	FH_d_		
Teff	TF	Coffee	CX	Freshwater Fish	FH_f_		
Quat	QQ	Tea	TE	Other Marine Fish	FH_m_		
Beans	BN	Sugarcane	SC	Other Molluscs	FH_o_		
Sorghum	SG	millet	MI	Pelagic Fish	FH_p_		
		Yam	YM	Plaice Fish	FH_I_		
		Plantain	PL	Flatfish	FH_t_		
				Whitefish	FH_w_		
				Salmonidae	FH_s_		
				Fish meal	FHml_		
				Fish oil	FHol_		

AGMEMOD has been extended with extra commodities, activities and countries. In the ideal case, the country models are updated, maintained and used by economic modellers in the relevant countries. This is a unique approach, as other agricultural sector models are maintained within one or a few institutions. The AGMEMOD Partnership also aims to establish an advisory circle of market experts in the agricultural sector in each country to review model projections. In total, the combined process intends to provide a core competency in the economic modelling of agricultural commodity markets and agricultural policy analysis, enhancing the quality of analytical results available for policymaking and decision-making at all levels.

Table 2. Country names and codes in AGMEMOD (2018)

EU countries		EU countries		EU countries		Non-EU countries	
Austria	AT	Finland	FI	Malta	MT	Macedonia	MK
Belgium	BE	France	FR	Poland	PL	Turkey	TR
Bulgaria	BG	Greece	GR	Portugal	PT	Russia	RU
Cyprus	CY	Croatia	HR	Romania	RO	Ukraine	UA
Czech R.	CZ	Hungary	HU	Sweden	SE	Rest of World	RW
Germany	DE	Ireland	IE	Slovenia	SI	Iceland	IC
Denmark	DK	Italy	IT	Slovakia	SK	Norway	NO
Estonia	EE	Lithuania	LT	United Kingdom	UK	Ethiopia	ET
Spain	ES	Latvia	LV	UE	EU28	Ghana	GH
						Kenia	KE
						Rwanda	RD
						Tanzania	TA

While policy reform remains a political process, policy makers increasingly use evidence based decision making in policy negotiations. Within the EU, Member States are free to adopt differing positions in respect of policy proposals, based on their assessment of the merits of the policy for their agriculture sector and wider economic and social interests. Those charged with developing policy proposals at EU level, need to have an appreciation for the likely impact of a particular policy in order to identify, at an early stage, any issues that would prevent a policy proposal's acceptance by the Member States. In this context, a model such as the AGMEMOD model, which can provide Member State level detail, will be highly useful for EU and Member State based policy makers.

The primary objective in developing and maintaining AGMEMOD is to have a partial equilibrium modelling system with the capacity to undertake model-based economic analysis of the impact of policy or other changes on the agri-food sector of each EU Member State and the EU as a whole. The AGMEMOD Partnership's approach is a bottom-up one based on country-level models, using a common country model template, and their subsequent combination in a composite EU model. The general structure of the AGMEMOD country and composite models is based on the so-called GOLD template that can be found in Hanrahan (2001). A more detailed model description can be found in Chantreuil, Hanrahan and Levert (2005). The form of the model template varies across four different groups of commodities, i.e. grains, oilseeds and root crops; permanent crops;

livestock; and dairy products.

Based on a set of commodity specific model templates, country specific models were developed to reflect the detail of agriculture at Member State level and at the same time to allow for their combination in an EU model. This approach allows the inherent heterogeneity of the agricultural systems existing across the EU to be captured within the model's parameterisation, while the analytical consistency across the country models is ensured through an adherence to the agreed commodity model templates. The maintenance of analytical consistency across the country models is essential for the successful aggregation of country models to the EU level. It also facilitates the meaningful comparison of the impact of a policy change across different Member States.

The European Union (EU) and Ukraine have developed an increasingly dynamic relationship since 1991, when Ukraine gained independence. Ukraine is a priority partner country within the European Neighbourhood Policy (ENP) and the Eastern Partnership. In March 2007 negotiations on a new EU-Ukraine Association Agreement were launched and have been finished in December 2011 (however, the agreement still has to be signed and ratified)[1].

Ukraine has huge agricultural potential due to its rich natural resources (soil, climate, and water) and a key geographical position, with access to the Black Sea and the key markets in the EU, CIS, the Middle East and North Africa. The role of agriculture in the Ukrainian economy is quite remarkable. Even though the share of agriculture in total GDP in Ukraine decreased considerably since 1991, agriculture still accounted for about 8.5% in 2010, 10.2 % in 2017, 2018. In addition, with a share of 15% (15.4% in 2010, 17.7% in 2017, 18% in 2018)[2] the Ukrainian agricultural sector still contributes significantly to national employment. Agriculture also has a core role in Ukrainian foreign trade, with agri-food exports accounting for about 20% of total Ukrainian exports in 2018.

The farm structure in Ukraine is characterized by corporate farms or so-called agricultural enterprises and individual farms, with the latter comprising peasant farms and household plots. In 2018, agricultural enterprises produced about 80% of total Grain and leguminous crops, 95,3% of sugar beets and 86% of sunflowers in Ukraine. On the other hand, Ukrainian household farms produced about 98,2% of total potatoes, 85,6% of vegetables and 78,4% of fruits and berries. The majority of all types of livestock (excluding only poultry) is kept by household farms, and regarding production output, households have produced 73% of total milk production in Ukraine, whereas 60% of all meat has been produced by agricultural enterprises.

About half of the 75,6 million hectares of agricultural land in Ukraine is cultivated with Grain, leguminous crops and sunflower. With respect to area, the most important grains are soft wheat, barley and maize. The main oilseed is sunflower, but rapeseed and soya are cultivated as well. During the transition period, Ukrainian agricultural production withered especially with regard to animal production, due to a drastic drop in demand which was driven by a decline in real per capita income. The lower meat production also caused a considerable drop in domestic feed demand. However, during the last decade in particular Ukraine's grain production recovered significantly and in 2018 Ukraine produced about 70 million tonnes of Grain and leguminous crops. Correspondingly, Ukraine's grain export shares also rose constantly between 2002 and 2009 and Ukraine became a big player on the world grains market. Furthermore, besides Russia and the EU, Ukraine became one of the biggest sunflower seeds producers and one of the major vegetable oils exporters. The increase in Ukrainian crops exports was supported by a significantly increase in export capacities due to the extension of the required infrastructure, such as the capacity of Ukraine's commercial seaports. In the agri-food sector, Ukraine's main trading partner is the EU, both in terms of imports and export. CIS and Middle East countries absorb an increasing share in Ukraine's exports as well, while Russia's role as the third main export destination for Ukrainian agri-food commodities is decreasing.

1 Myrna van Leeuwen, Petra Salamon,Thomas Fellmann, Martin Banse,Oliver von Ledebur, Guna Salputra and Olexandr Nekhay : The agri-food sector in Ukraine: Current situation and market Outlook until 2025, p.67

2 State Statistics Service of Ukraine. Agriculture of Ukraine. Statistical Yearbook. p. 26

Regarding Ukraine's agricultural policies, the main domestic policy measures comprise input subsidies through tax concession, credit availabilities for agricultural producers and direct payments based on animal numbers and agricultural areas. Domestic market price support mainly consists of minimum prices. Poultry, beef, pig, and sugar are the most protected sectors. The agricultural trade policy of Ukraine has changed significantly since the early 1990s. Exports, formerly processed by governmental agencies under largely barter-based bilateral agreements, are now conducted by private market transactions to an increasingly number of export destinations. Export quotas have been actually replaced by tariffs and indicative prices, while export taxes still restrict a few selected products. For some commodities and products (e.g. live cattle, mutton, sheep), Ukraine applies minimum prices below which products cannot be exported. In May 2008 Ukraine became a new member of the WTO, which led to considerable changes in agricultural support instruments and in Ukraine's use of trade policy measures. The majority of Ukraine's WTO commitments should have been reached by 2011, including substantial reductions in tariff protection for key agro-food products and downscaling of export restrictions. Due to WTO commitments customs duties have been capped at bound rates between 0% and 30% (with the exception of sugar where 50% are applicable for out of quota imports). As a consequence, import tariffs decreased, especially in the poultry, sunflower, and sugar sectors. In general, the WTO commitments should essentially determine the framework for future agricultural policies in Ukraine and help to make the policies more stable. In particular with regard to trade activities Ukraine should have fewer possibilities to intervene, involving the use of traditional approaches to resolve emerging problems of domestic market supplies. Nonetheless, after its grain production was hit by severe droughts in 2010, Ukraine introduced quotas for grain exports on the grounds of domestic food security. The measure was removed again in 2011.

Ukrainian agriculture is one of most attractive investment opportunities in the world. The Ukrainian government encourages foreign investors to invest into agricultural business in Ukraine. Referring to the statistics of the previous years, Ukrainian agriculture has been securing approximately 8-10% of national GDP within the last few years. Approximately 18% of working population is employed in agriculture.

Ukraine has 41,5 m ha of agricultural land, which comprises 68,7% of the country's total area. Among them: 78,3% - arable land (32,5 million hectares), 13% – pastures (5,4 million hectares), 5,8% – grasslands (2,4 million hectares), 2,2% – perennial plants (0,9 million hectares). Ukraine has favourable climate for large-scale agriculture, rich agricultural soils and access to abundant land and water resources.

The agricultural GDP (as of 2018) – was 40 billion USD. The basis of agriculture is crop production – 72% of the total agricultural production, animal production states 28%.

The main crops sowed in Ukraine (as of 2018) are wheat 6,6 million hectares (23,8% of arable land), sunflower – 6,1 million hectares (22,0% of arable land), corn – 4,4 million hectares (15,9% of arable land), barley – 2,5 million hectares (9% of arable land), soybean – 1,7 million hectares (6,1% of arable land), potatoes – 1,3 million hectares (4,7% of arable land), rape and colza – 1,0 million hectares (3,6% of arable land). These crops occupy 85% of arable land in Ukraine.

Now this process has already begun and is expected in the near future Ukrainian producers access to the markets of the European Union and the Middle East. On the other hand, the poultry sector demonstrates a positive tendency. Promoting of Ukrainian products on international markets and requirements to comply with the HACCP system since 2017 will help in reaching new markets.

Ukrainian farming business has to look for new business development locations, markets and instruments. Obviously, value adding niches of fruits, veggies and organics foods are most promising on the global food market. European Union, Middle East, Asia and Oceania are markets to consider for trade development. Processed and dried products with customized service for each local market is a high margin niche in mentioned regions for major number of Ukrainian farming businesses, which may contribute impressive results through strategic investments and steady quality improvement.

Ukraine has a strong position in practically all stages of the food supply chain, in particular,

with regard to raw material, production, processing, wholesale and retail trade, consumption, export. The export process is supported by the strong infrastructure.

Overall volume of agricultural export in 2018 amounted to 18,6 billion USD (live animals and livestock products – 1.2 billion USD, plant products – 9.9 billion USD, animal or plant fats and oils – 4,5 billion USD, finished food industry products – 3.0 billion USD).

In 2018, agricultural exports (increased by 5.1% (or 0,9 billion USD) comparing to 2017. Imports of agricultural products in 2018 rose by +16% compared to the 2017 and reached 5.1 billion USD (live animals and livestock products – 0,9 billion USD, plant products – 1,5 billion USD, animal or plant fats and oils – 0,3 billion USD, finished food industry products – 2,4 billion USD), representing 9% of total imports of Ukraine. The main products that are exported are sunflower oil (4,1 billion USD, 5,6 million t.) – 22,0% of agricultural export value, corn (3.5 billion USD, 21.4 million t.) – 18,8%, wheat (3 billion USD, 16.4 million t.) – 16.2%, sugar is white (0.2 billion USD, 0.6 million t.) – 1,1%, cigarettes containing tobacco (0.3 billion USD, 0.03 million t.) – 1,6%. In addition, soybeans, sunflower meal, barley and poultry meat. Imports –fish fresh, chilled or frozen (0,5 billion USD), tobacco raw materials (0,3 billion USD), sunflower seeds (0,3 billion USD) and citrus.

The balance of foreign trade in agricultural products has remained positive for many years, while the total value of all imported goods, in the vast majority of periods, exceeded their export volume. In particular, according to current data, in 2018, the overall balance of foreign trade in goods is negative (- $ 9.6 billion), while the agricultural balance is positive (+$ 13.6 billion).

Table 3 depict geographic structure of exports of certain agricultural products in 2018 (%).

Table 3. Geographic structure of exports of certain agricultural products in 2018, %

Name of goods	EU	Asia	Africa	America	CIS
Wheat	10	52	37	1	0
Corn	47	33	19	0	0
Barley	3	87	10	0	0
Sunflower oil	23	72	3	1	1
Meat of poultry	50	34	9	0	8
Butter butter	14	38	34	0	14
Sugar is white	8	12	14	0	66

The value structure of imports is dominated by the group «Finished food industry products» (47%), among which the largest share is alcoholic and nonalcoholic beverages,vinegar, tobacco and industrial substitutes of tobacco, other mixed foodstuffs, cocoa and cocoa preparations.

The second position of agricultural imports is products of vegetable origin, whose share is 30%. The most prominent representatives of imported products in this subgroup are citrus, bananas, coffee, corn and sunflower seeds.

Of animal origin, whose share in the structure of imports is about 18%, fish and seafood are the most imported, with a share of almost 70% in this segment. Imports of cheese, pork and poultry meat and poultry by-products are also active in Ukraine.

The geography of agricultural supply over the last decades has significantly expanded, and today Ukrainian food is, to one degree or another, represented on all continents of the planet. However, the main connoisseurs of products from Ukraine are the countries of Europe and Asia.

Positive transformations triggered by these reforms have been noticeable, as well as have been reflected in some major global rankings.

The most prominent ranking is the Doing Business[1], which is composed by the World Bank on a yearly basis. The Ukraine's score has been steadily increasing for the last years – from 48.87 points in 2013 up to 68,25 points in 2018. Now, Ukraine is ranked 71th among 190 economies. Doing Business is a sophisticated index that tries to evaluate a variety of different economic, financial and legal aspects.

In particular, in recent years Ukraine has improved its performance in categories like

[1] Doing Business 2019 Economy Profile of Ukraine Training for reform WORLD BANK GROUP 16TH EDITION, p.3

Starting a business, Registering property, Enforcing contracts, Getting electricity etc.

But not only economic and financial factors contribute to an attractive investment environment. Other factors, like e.g. political stability, or maturity of civil society institutions along with many other social aspects matter as well. Because of that it is particularly important that since the Revolution Ukraine has been gradually improving its position in the Corruption Perceptions Index, which is published by the Transparency International. Its score has been slowly increasing, starting at 25 in 2013, 29 in 2016 and reaching 32 in 2018 (120/180). Though corruption is still an issue in Ukraine, this positive trend indicates that Ukrainians are becoming less tolerant towards corruption.

Another international index, in which Ukraine has been showing positive dynamic, is the Index of Economic Freedom of the Heritage Foundation, an American think-tank. Ukraine's economic freedom score is 52.3, making its economy the 147th freest in the 2019 Index. Its overall score has increased by 0.4 point, with improvements in fiscal health, business freedom, and property rights outpacing declines in labor freedom and trade freedom. Ukraine is ranked 44th among 44 countries in the Europe region, and its overall score is below the regional and world averages. Progress has lagged on many much-needed but contentious structural reforms such as cutting subsidies and raising energy tariffs, fiscal consolidation, and the fight against corruption. As Ukraine's oligarch-dominated economy improved in 2018, partly because of greater inflows of remittances, Western institutions found that they had less leverage to press for further reforms to make the country more prosperous, democratic, and transparent. Ukraine also needs to develop its capital markets, privatize state-owned enterprises, and improve both its legal framework and the rule of law.

With the Fourth Industrial Revolution (4IR), humanity has entered a new phase. The 4IR has become the lived reality for millions of people around the world, and is creating new opportunities for business, government and individuals. Yet it also threatens a new divergence and polarization within and between economies and societies. This year also marks the tenth anniversary of the beginning of the global financial crisis, which has had social and economic consequences of a magnitude unprecedented in recent generations. Combined with a background of growing inequality and geopolitical flashpoints, this has fuelled citizens' concerns about globalization and polarized the political debate. Although global economic growth has been robust over the past two years, it remains fragile in this changing economic and political context.

These developments – the 4IR and the consequences of the Great Recession – are redefining the pathways to prosperity and, indeed, the very notion of prosperity, with profound implications for policy-making. Concerned leaders are grappling for answers and solutions, aiming to go beyond short-term, reactionary measures. Tables 4 depict Index of Economy Profiles of the 140 economies.

Table 4. The Global Competitiveness Index 4.0 2018[1]

Index Component	Ukraine (83)		Poland (37)		Best Performer	Worst Performer
	Score*	Rank/140	Score*	Rank/140		
1. Institutions	46,3	110	57,1	53	New Zealand	Venezuela
2. Infrastructure	70,1	57	79,3	27	Singapore	Haiti
3. ICT (information and communication technologies) adoption	51,0	77	54,4	68	Korea, Rep.	Chad
4. Macroeconomic stability	55,9	131	100	1	Multiple (31countries) (Australia, Botswana, Chile and etc.)	Venezuela
5. Health	72,0	94	86,2	49	Multiple (4	Lesotho

[1] Antoshchenkova V.V. (2019): Konkurentospromozhnist′, yak osnova efektyvnoyi natsional′noyi ekonomiky [Competitiveness as a basis for an effective national economy]. Visnyk KHNTUSG : ekonomichni nauky - Bulletin of KHNTUSG. Economic science, no 200, p.90.

Index Component	Ukraine (83)		Poland (37)		Best Performer	Worst Performer
	Score*	Rank/140	Score*	Rank/140		
					countries) (Japan, Spain, Singapore, Hong Kong SAR)	
6. Skills	68,9	46	72,9	32	Finland	Mozambique
7. Product market	55,3	73	61,2	38	Singapore	Angola
8. Labour market	59,5	68	59,8	62	United States	Yemen
9. Financial system	48,7	117	63,4	55	United States	Yemen
10. Market size	62,7	47	73,4	22	China	Gambia, The
11. Business dynamism	55,3	86	61,5	55	United States	Haiti
12. Innovation capability	39,0	58	48,7	38	Germany	Angola

* Scores are on a 0 to 100 scale, where 100 represents the optimal situation or «frontier». Arrows indicate the direction of the change in score from the previous edition, if available.

The United States is the closest economy to the frontier, the ideal state, where a country would obtain the perfect score on every component of the index. With a competitiveness score of 85,6, it is 14 points away from the frontier mark of 100, implying that even the top-ranked economy among the 140 has room for improvement. It is followed by Singapore (83,5) and Germany (82,8). Switzerland (82,6) comes in at 4th place, followed by Japan (82,5), Netherlands (82,4), Hong Kong SAR (82,3). The United Kingdom (82,0), Sweden (81,7) and Denmark (80,6) round out the top ten.[1]

In this context, the World Economic Forum is introducing the new Global Competitiveness Index 4.0, a much-needed economic compass, building on 40 years of experience in benchmarking the drivers of longterm competitiveness. After having conceptualized the Fourth Industrial Revolution, the World Economic Forum is contributing to global thinking and policy-making by integrating the notion of the 4IR into the definition of competitiveness.

The index integrates well-established aspects with new and emerging levers that drive productivity and growth. It emphasizes the role of human capital, innovation, resilience and agility, as not only drivers but also defining features of economic success in the 4IR. It calls for better use of tech as part of a holistic approach with other factors of competitiveness. Finally, it offers objective, data-driven analysis for dispassionate, future-oriented, and rational policy-making.

The results of the GCI 4.0 reveal the sobering conclusion that most economies are far from the competitiveness «frontier» – the aggregate ideal across all factors of competitiveness. In fact, the global average score of 60 suggests that many economies have yet to implement the measures that would enhance their longterm growth and resilience and broaden opportunities for their populations. In addition, we find that countries have a mixed performance across the twelve pillars of the index and that long-standing developmental issues – such as the lack of well-functioning institutions – continue to be a source of friction for competitiveness.

Yet there are bright spots – in the form of economies that outperform their peers and present valuable case studies for learning more about methods to implement the factors of competitiveness.

One of the realities of a modern market economy is fierce competition. Under these conditions, a business-oriented approach to management has an advantage over a functional approach, but management based on business processes cannot be effectively implemented without the use of information and innovative technologies.

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