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The impact of sectors on agriculture based on artificial intelligence data: a case study on G7 countries and Turkiye

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Abstract
The growing development of technology has had an impact on many sectors particularly business, communication, education and agriculture. In addition to its popularity, technology has brought many new concepts to the use of sectors, most of the important of which are cloud computing, artificial intelligence and cryptocurrencies. While the opportunities and concepts provided by technology have destroyed the existing job opportunities, they also introduced many positive opportunities like artificial intelligence, which can be considered as one of such positive innovations. The OECD artificial intelligence data of G7 countries and Turkey were used within the scope of this study. This study analyses the investment opportunities in agriculture and other sectors based on the artificial intelligence data. In addition to this study, both country-based and sectoral comparisons were made respectively. As a result, AI investments in the agricultural sector are generally at a lower level than other sectors. According to the analysis results, countries such as Türkiye and Canada are the countries that invest the most in the agricultural sector. This may reflect these countries' interest in agricultural potential and agricultural technology.

Keywords: Agriculture, G7 countries, artificial intelligence, venture capital investments, OECD.ai

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INTRODUCTION

The growing development and popularity of technology in time is a process that deeply affects human life (George and George, 2023). With the invention of the first computers, technology started to advance rapidly. Over time, computers have become smaller, more powerful and more accessible (Van Veldhoven and Vanthienen, 2022). With the widespread use of the Internet, access to information and communication has become easier accordingly (Khan et. al. 2020). The popularity of mobile technology has allowed people to stay connected anytime and anywhere. Smartphones, tablets and other portable devices have made people's daily lives more efficient and practical (Mayer, 2020). Moreover, the growth of social media platforms has changed the way people connect and share with each other (Alaimo et. al. 2020). On the other hand, the development of e-commerce and digital payment systems has radically changed shopping habits (Santos et. al. 2023). The spread of cloud computing technology has made data storage and processing processes more flexible and efficient (Atieh, 2021). New technologies such as artificial intelligence and machine learning have revolutionized business and industry (Bharadiya, 2023). Innovative products such as 3D printers, autonomous vehicles, smart home technologies are shaping the lifestyle of the future (Haktanır et. al., 2022). Overall, the development and popularity of technology has transformed the lives of humanity and drawn a promising roadmap for the future.

The impact of technology associated with its development has a vital importance in the modern world. Primarily, the advancement of technology in the healthcare sector has improved medical diagnosis and treatment methods, providing more effective care to patients (Paul et. al., 2023). With regard to the education sector, digital learning platforms and online resources have raised educational standards by providing students with access to a wider range of information (Akour and Alenezi, 2022). In the trade and retail sector, e-commerce and digital marketing techniques have transformed the shopping experience and increased customer satisfaction (Purnomo, 2023). The fintech innovations, payment systems and digital banking services emerged in the finance sector have

made financial transactions faster and more secure (Pazarbasioglu et. al., 2020). Automation and robotics technologies in the industry and manufacturing sector have turned production processes more efficient and cost-effective (Al Bashar et. al., 2024; Kahya and Özdüven, 2023). In the transport sector, autonomous vehicles and intelligent transport systems have provided safe and efficient transport while renewable energy technologies have increased energy efficiency by reducing environmental impacts (Iyer, 2021; Suman, 2021). Smart agricultural technologies emerged in the agriculture sector have supported the sustainability of agriculture by increasing productivity (Çağlar, 2024; Dhanya et. al., 2022). Furthermore, Figure 1 shows some of the benefits of artificial intelligence in the sectors.

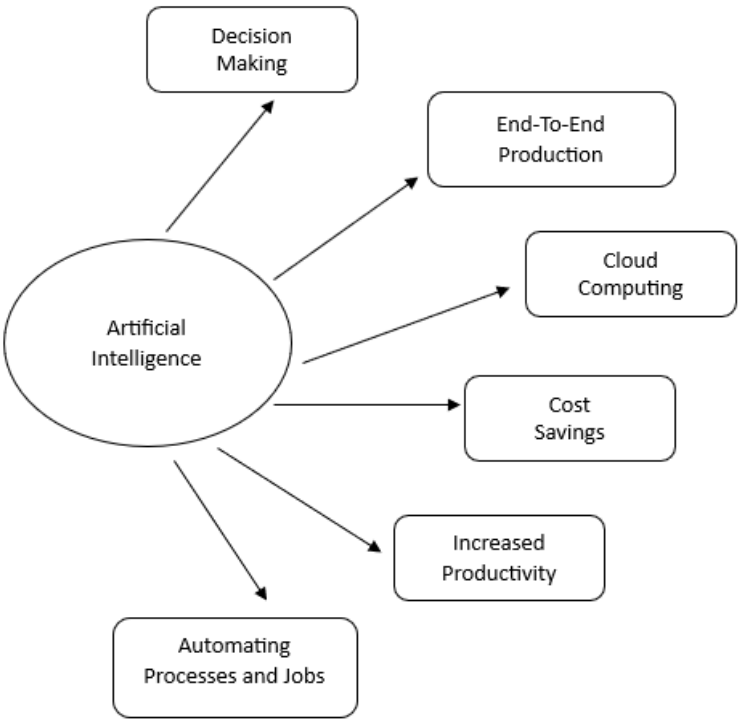

Figure 1. AI Benefits of Artificial İntelligence in Sectors

The agricultural sector experiences significant transformations with the impact of technological developments. Firstly, agricultural robots and automation systems have increased labor productivity by automating agricultural tasks (Mahmud et. al.,2020). Similarly, sensor technologies and smart farming applications monitor soil moisture, temperature and other important factors to improve the productivity of agricultural fields. In this way, water and fertilizer use is optimized and resources are used more efficiently (Ullo and Sinha, 2021). Climate forecasting and weather monitoring systems also provide farmers with important data to make the right decisions at the right time (Özbilge et. al.2020; Ceglar and Toreti, 2021). Advanced agricultural machinery and equipment also increase productivity, reduce workload and lower costs (Durai and Shamili, 2022; Atlı, 2023). Agricultural data analytics and artificial intelligence-based systems provide comprehensive data analysis for agri-businesses in making better decisions (Zhai et. al., 2020). Hence, it is possible to respond to market demands more quickly and flexibly. On the other hand, digital marketing and e-commerce platforms offer new opportunities in the marketing and sales of agricultural products (Ma and Zhang, 2022). Consequently, technological developments in the agricultural sector contribute to the development of more sustainable, efficient and competitive agricultural practices.

Among these innovative technologies, the opportunities provided by artificial intelligence are numerous. Artificial intelligence has offered so many possibilities that it has become revolutionary. Artificial intelligence has greatly facilitated the work of farmers by increasing efficiency and optimizing resource usage. In addition, it helps farmers in the early diagnosis of diseases and pests by monitoring plant health and growth processes thanks to precision agriculture practices. Data obtained using sensors or drones are analyzed with artificial intelligence algorithms and provide instant information about critical factors such as soil moisture, nutrient level and weather (Kamilaris & Prenafeta-Boldú, 2018). Prediction models are developed using artificial intelligence in data analysis. Analyzing many variables such as climate changes, market demands and crop cycles makes it easier for farmers to make strategic decisions (Wolfert et al., 2017). In addition, artificial intelligence-supported robots reduce labor costs by automating routine tasks such as weeding and harvesting in the fields (Shaikh et. al., 2022). Due to these unlimited advantages provided by artificial intelligence, it is thought that the agricultural sector's investment in artificial intelligence will yield positive results.

Literature Review

Upon the progressive development of technology and the increase in its usage areas, there have been developments in every sector in connection with such developments (Hervas-Oliver et. al., 2021). Therefore, new job opportunities have replaced the existing job opportunities. Yet this significant impact had a positive effect on all sectors in general. There have been very major positive effects especially in terms of time and money (Hu et. al., 2021).

In the literature, there are many studies regarding technology and sectors. This section reflects a number of studies on agriculture which is the research subject of the study, and artificial intelligence studies, which is one of the most popular technological developments.

The study titled "Agriculture and Artificial Intelligence" by Buğra GÜZEL and Ersan OKATAN (2022) from 2022, analyses with the effects and application areas of the use of artificial intelligence technologies in the agricultural sector. The study provides a comprehensive assessment of how artificial intelligence-based solutions can be used in different areas of agriculture where the authors discuss how artificial intelligence technologies in agriculture can contribute to factors such as productivity, sustainability and profitability. The study also highlights the current technological developments in the agricultural sector and the future potential of AI applications.

The article titled R&D and Innovation in the Agricultural Sector discusses the importance and impact of R&D (Research and Development) and innovation activities in the agricultural sector. The paper elaborates on the benefits of R&D and innovation in the agricultural sector in various aspects such as productivity growth, sustainability, competitiveness and market share gains. The research addresses the required policies and strategies for the promotion R&D and innovation in the agricultural sector and assesses the current situation respectively. Furthermore, the study also presents the effects of R&D and innovation activities in the agricultural sector with regard to producers, suppliers and consumers. It emphasizes the future potential and importance of R&D and innovation in the sector and argues that the relevant investments and support should be increased (Özaydin and Çelik, 2019).

This paper analyses the impact of artificial intelligence (AI) technology on company growth and product innovation. It uses various methods to analyze the impact of AI technology on companies' growth performance and product innovation. It concluded that the use of AI can increase the growth rate of companies and promote product innovation. The paper also explores the potential of AI technology to increase the competitive advantage of companies. It also addresses the effects of artificial intelligence technology on companies' marketing strategies and product development processes through underlining the importance for businesses to adopt and integrate AI technology (Babina et. al., 2024).

The article titled "Artificial Intelligence Investments in Turkey: An Evaluation in the Context of Strategic Management" analyses artificial intelligence investments in Turkey from a strategic management perspective. It discusses the Turkey's current situation and future potential in the field of artificial intelligence and the impact of artificial intelligence investments on the competitiveness of the country. The research analyses Turkey's strengths and weaknesses in the field of artificial intelligence and emphasizes the significance of artificial intelligence investments in terms of strategic management. Additionally, the study argues the Turkey's national policies and strategies in the related field and discusses the contribution of artificial intelligence investments to the economic and social development of the country. The article concludes the steps and strategic planning, which are required to enhance the Turkey's competitiveness regarding AI (Ercan, 2022).

METHODOLOGY

Within the framework of this study, OECD (Organization for Economic Co-operation and Development) data are used accordingly. The main objective of OECD is to coordinate economic and social policies among member countries, promote economic growth, increase welfare and contribute to the development of international trade (Canton, 2021).

OECD has developed a data platform called "OECD.ai", which provides comprehensive data and analyses on AI. This allows researchers, policy makers and other stakeholders to access information and make policy decisions on artificial intelligence (Anna et. al. 2022; Tricot, 2021). This platform includes various data sets covering the economic, social and ethical aspects of AI where the data set called "investments in AI and data" designed to help users better understand and make decisions about investments in AI and data (OECD.AI, 2024) was used for this study which analyses investments in AI and data technologies and visualizes their global trends and distribution. With this dataset, users can explore, compare and analyze AI and data investments from different countries, sectors or institutions. Hence, it is possible to learn about the size, distribution, sectoral focus and other important characteristics of investments in AI and data.

Upon using OECD.ai "Investments in AI and data" datasets, artificial intelligence investments in G7 countries were analyzed per specific sectors. From the perspective of this study, G7 countries and Turkey were compared on a sectoral basis. G7 countries were used in this study because they provide a strong basis for understanding global economic, political, technological and environmental dynamics. The policies and practices of these

countries provide valuable insights for predicting global trends and future developments (Koca, 2022; Yürükoğlu, 2021; Demir, 2021). In this context, Turkey's position among the G7 countries was evaluated and compared. While evaluating each G7 country according to its artificial intelligence investments, important sectors in the world were discussed. Firstly, artificial intelligence data in each G7 country and Turkey were analyzed from the general dimension under two factors "Sum of Investments (USD in millions)" and "Number of Investments" both of which were determined through the related dataset. On the other hand, artificial intelligence data in 5 different sectors from OECD.ai dataset were compared on the basis of each country as "1-Agriculture, 2-Energy, Raw Materials And Utility, 3-Environmental Services, 4-Logistic, Wholesale And Retail, 5-Media, Social Platforms, Marketing".

SPSS version 20 was used to analyse the artificial intelligence data set. Tests such as Anova and Tukey tests were performed to determine the differences or similarities between countries and sectors.

RESULTS AND FINDINGS

The main objective of this study is to compare G7 countries and Turkey with major sectors, particularly agriculture, through artificial intelligence data.

Table 1. Venture Capital Investment in AI

Venture Capital (VC) Investments in AI (Sum of Investments USD in millions)						
Items	N	Minimum	Maximum	Sum	Mean	Std. Deviation
SumVCinUSD*	96	0	114320	509795	5310,36	15663,47
AgriVCinUSD*	96	0	1441	7326	76,31	214,010
EnergyVCinUSD*	96	0	586	3898	40,60	86,427
EnvVCinUSD*	96	0	454	2462	25,65	65,364
LogVCinUSD*	96	0	2732	16893	175,97	480,227
SocVCinUSD*	96	0	15772	60706	632,35	2114,865
Venture Capital (VC) Investments in AI (Number of Investments)						
Items	N	Minimum	Maximum	Sum	Mean	Std. Deviation
SumVCNumber	96	0	2602	26185	272,76	520,431
AgriVCNumber	96	0	31	374	3,90	7,235
EnergyVCNumber	96	0	29	283	2,95	4,891
EnvVCNumber	96	0	22	181	1,89	3,769
LogVCNumber	96	0	91	704	7,33	15,347
SocVCNumber	96	0	326	3955	41,20	73,978

*SumVCinUSD= Sum of Venture Capital investment in USD, *AgriVCinUSD=Agriculture Venture Capital investment in USD, *EnergyVCinUSD= Energy, Raw Materials And Utility Venture Capital investment in USD, *EnvVCinUSD= Environmental Services Venture Capital investment in USD, *LogVCinUSD= Logistic, Wholesale And Retail Venture Capital investment in USD, *SocVCinUSD= MEDIA, SOCIAL PLATFORM, MARKETING Venture Capital investment in USD.

Table 1 provides the statistics of venture capital (VC) investments in artificial intelligence (AI) based on 96 different samples. In the first part, statistics on the total amount of VC investments (in millions in USD) are given where the minimum value of total VC investments is 0 and the maximum value is 114320 million USD. The average investment amount is 5310,36 million USD and the standard deviation is 15663,47 million USD. The second part presents statistics on the number of VC investments. Pursuant to these statistics, the total number of VC investments is 96 with a minimum of 0 and a maximum of 2602. The average number of investments is 272.76 and the standard deviation is 520.431. Additionally to table 1, the social sector consistently receives the highest investment amounts and number of investments, indicating a strong focus on AI applications in social contexts. Conversely, the environmental sector sees the lowest investment and fewer projects, suggesting a potential area for growth. The logistics sector, while not as prominent as the social sector, still shows substantial investment, reflecting the importance of AI in optimizing logistics operations.

Table 2. AI Investments Between Countries

Venture Capital (VC) Investments in AI (Sum of Investments USD in millions)								
Items	Germany	USA	UK	Italy	France	Japan	Canada	Türkiye
SumVCinUSD*	16351	427126	29873	1136	11033	8578	14730	968
AgriVCinUSD*	0	5539	644	7	216	367	539	14
EnergyVCinUSD*	388	2127	358	13	236	242	502	32
EnvVCinUSD*	8	1654	325	53	187	69	166	0
LogVCinUSD*	832	13579	472	16	960	350	682	2
SocVCinUSD*	1800	51048	2415	314	1540	1261	1677	651
Venture Capital (VC) Investments in AI (Number of Investments)								
Items	Germany	USA	UK	Italy	France	Japan	Canada	Türkiye
SumVCNumber	1130	17768	2651	187	1014	2020	1351	64
AgriVCNumber	0	237	30	1	17	34	49	6
EnergyVCNumber	25	153	25	2	20	20	31	7
EnvVCNumber	4	108	46	1	10	1	11	0
LogVCNumber	39	491	53	1	38	46	34	2
SocVCNumber	135	2667	411	46	194	280	213	9

*SumVCinUSD= Sum of Venture Capital investment in USD, *AgriVCinUSD=Agriculture Venture Capital investment in USD, *EnergyVCinUSD= Energy, Raw Materials And Utility Venture Capital investment in USD, *EnvVCinUSD= Environmental Services Venture Capital investment in USD, *LogVCinUSD= Logistic, Wholesale And Retail Venture Capital investment in USD, *SocVCinUSD= MEDIA, SOCIAL PLATFORM, MARKETING Venture Capital investment in USD.

Table 2 presents data on the total amount of venture capital (VC) investments in artificial intelligence (AI) (in millions of USD) and the number of investments. In the first part, the total amounts of VC investments in different countries are given. The second part of table shows the number of VC investments in different countries. Likewise, the distribution of VC investments by agriculture, energy, environment, logistics and social areas is presented separately. These data show the investment extent of different countries on artificial intelligence and their particular focus areas. Besides of these, the data clearly indicates that the USA is the leader in VC investments in AI across all sectors both in terms of the total investment amounts and the number of investments. Countries like Germany, the UK, and Japan also show significant activity, particularly in specific sectors like logistics and social applications. In contrast, countries like Italy and Turkey have much lower figures, highlighting the disparity in AI investment levels globally.

The table with data on Venture Capital (VC) investments includes the total amount and number of investments by year. The first section shows the total amount of VC investments (in millions of USD) by year. The investment amount, which was 2909 million USD in 2012, increased to 65507 million USD in 2023. Details of VC investments in agriculture, energy, environment, logistics and social areas are also provided. In the second section, the number of VC investments by year is given. The number of investments increased from 507 in 2012 to 2849 in 2023. Moreover, the number of VC investments in agriculture, energy, environment, logistics and social areas are also elaborated. Addition to these comments, the data underscores the increasing importance of AI across various sectors, driven by the potential for innovation and efficiency. The peak in 2021 likely reflects a culmination of technological advancements, investor confidence, and perhaps pandemic-driven digital transformation. Despite a slight decline post-2021, the investment levels remain high, indicating a strong future for AI technologies in driving global innovation and economic growth.

In table 4, values followed by the same letter or letters in same columns do not significantly differ from each other according to the Tukey's HSD (Honesty Significant Difference) test at $p<0,05$. The analysis reveals a clear global hierarchy in AI investments, with the USA leading both in the total sum and number of investments. Other countries like Turkey, Italy, Japan, France, Canada, Germany, and the UK are actively participating in the AI investment landscape but with lower volumes. This categorization underscores the USA's pivotal role in driving AI advancements and the collective efforts of other nations to foster AI development, albeit on a smaller scale. The varied investment levels across different sectors also highlight the strategic focus areas for each country, shaping their AI innovation trajectories.

Table 3. AI Investments Between Years

Venture Capital (VC) Investments in AI (Sum of Investments USD in millions)						
Year/Items	SumVCinUSD	AgriVCinUSD	EnergyVCinUSD	EnvVCinUSD	LogVCinUSD	SocVCinUSD
2012	2909	42	1	28	22	634
2013	4206	30	79	91	17	823
2014	13693	73	140	31	389	1632
2015	21549	108	175	32	847	2153
2016	18710	228	161	72	910	1889
2017	25755	524	230	142	873	2212
2018	38939	758	424	110	1392	3774
2019	50598	645	404	222	2500	5821
2020	56600	1215	256	186	1801	4343
2021	136832	1959	807	572	3481	13566
2022	74497	1025	595	632	3042	7342
2023	65507	719	626	344	1619	16517
Venture Capital (VC) Investments in AI (Number of Investments)						
Year/Items	SumVCNumber	AgriVCNumber	EnergyVCNumber	EnvVCNumber	LogVCNumber	SocVCNumber
2012	507	3	2	4	7	112
2013	751	10	6	4	12	173
2014	1054	12	14	8	26	217
2015	1385	15	12	6	37	269
2016	1696	23	10	10	45	309
2017	2073	31	19	9	55	361
2018	2571	34	30	7	63	401
2019	3026	47	32	15	80	452
2020	3136	51	27	23	81	448
2021	3827	59	50	27	129	481
2022	3310	45	45	39	94	365
2023	2849	44	36	29	75	367

Table 4. Tukey HSD Test

Venture Capital (VC) Investments in AI (Sum of Investments USD in millions)						
Countries/Items	SumVCinUSD	AgriVCinUSD	EnergyVCinUSD	EnvVCinUSD	LogVCinUSD	SocVCinUSD
Turkiye	b	b	b	b	b	b
Italy	b	b	b	b	b	b
Japan	b	b	b	b	b	b
France	b	b	b	b	b	b
Canada	b	b	b	b	b	b
Germany	b	b	b	b	b	b
UK	b	b	b	b	b	b
USA	a	a	a	a	a	a
Venture Capital (VC) Investments in AI (Number of Investments)						
Countries/Items	SumVCNumber	AgriVCNumber	EnergyVCNumber	EnvVCNumber	LogVCNumber	SocVCNumber
Turkiye	b	b	b	c	b	c
Italy	b	b	b	c	b	bc
Japan	b	b	b	c	b	bc
France	b	b	b	bc	b	bc
Canada	b	b	b	bc	b	bc
Germany	b	b	b	c	b	bc
UK	b	b	b	b	b	b
USA	a	a	a	a	a	a

Table 5. Percentage share

Items / Countries	Germany	USA	UK	Italy	France	Japan	Canada	Türkiye
PercentShareAgri	0.00% b	1.04% ab	1.02% ab	0.02% b	0.37% b	0.69% b	2.64% a	0.93% b
PercentShareEnergy	1.59% a	0.43% a	0.32% a	0.07% a	1.18% a	1.37% a	1.82% a	4.13% a
PercentShareEnv	0.02% a	0.56% a	0.58% a	0.10% a	0.48% a	0.04% a	0.47% a	0.00% a
PercentShareLog	3.82% a	2.94% a	0.97% a	0.03% a	3.35% a	1.73% a	3.92% a	5.03% a
PercentShareSoc	13.27% b	12.39% b	16.07% ab	38.79% a	17.66% ab	21.13% ab	16.66% ab	25.93% ab

Table 5 shows the percentage shares of VC investments in the agriculture, energy, environment, logistics and social sectors of different countries. In the field of agriculture, Canada's share is the highest with 2.64 percent, followed by the USA's 1.04 percent and the UK's 1.02 percent. This distribution highlights the strategic priorities of different countries in artificial intelligence investments; While Türkiye focuses strongly on Agriculture, Energy and Logistics, Italy focuses on Social Artificial Intelligence investments. USA, UK, France, Germany, Japan and Canada exhibit different investment models in these sectors.

Investments in the agricultural sector are generally at a lower level than other sectors. In particular, it is seen that investments in the agricultural sector are quite limited in European countries such as Germany, England and Italy. While it was expected that the agricultural sector in these countries would be subject to VC investments compared to other sectors, this did not happen. Countries such as Türkiye and Canada invest more in the agricultural sector. This may reflect these countries' interest in agricultural potential and agricultural technology. However, in general, investments in the agricultural sector appear to be less than in other sectors.

CONCLUSION

The effect of technology on sectors has significantly improved user experience and quality of life while increasing efficiency by improving business processes. However, the rapid advancement of technology has led to the change of traditional business models in some sectors and the emergence of new competitive environments. For instance, the abundance of data that comes with digital transformation has allowed businesses to make better decisions and gain competitive advantage. Thus, the speed and complexity of technological innovations have led to a lack of competence and infrastructure challenges in some sectors. Therefore, a continuous investment in training and infrastructure is required to reduce the digital divide between sectors. In conclusion, the impact of technology on sectors is a necessary factor to gain competitive advantage in the ever-changing business world and this process needs to be managed and adapted.

It is seen that investments made in the agricultural sector are generally lower than other sectors. It is noteworthy that investments in the agricultural sector are quite limited, especially in European countries such as Germany, England and Italy. However, it appears that Canada has a significant share in investments in the agricultural sector. It can be said that Canada's agriculture-based economy and its predisposition to agricultural technology affect this situation. On the other hand, a significant increase is observed in investments in Turkey's agricultural sector. Turkey's agricultural potential and developments in agricultural technology may be effective in increasing these investments.

Consequently, these findings provide many important benefits for developing and investing in new technologies. First, it guides strategic investment decisions and determines which sectors countries and companies should focus on. Optimizing resource allocation helps use resources in the most efficient way. Determining areas of technology development shows in which areas countries are leaders and in which areas they need development. It can accelerate global technological progress by unlocking opportunities for international cooperation and partnerships. Additionally, identifying market opportunities creates new business opportunities for entrepreneurs and investors. Governments can encourage AI investments by using this data in policy and regulatory developments. Companies and research organizations can optimize their strategies by conducting competitive analysis. In terms of training and talent development, educational institutions can determine in which areas they need to train more experts. Developing technological infrastructure is necessary to support AI investments. Finally, by planning long-term, countries and companies can more effectively plan their future technology and investment strategies. These findings are critical for developing and investing in new technologies and increasing competitive advantage.

Compliance with Ethical Standards

Peer-review

Externally peer-reviewed.

Declaration of Interests

The author has no conflict of interest to declare.

Author contribution

The author read and approved the final manuscript. The author verifies that the Text, Figures, and Tables are original and that they have not been published before.

REFERENCES

Akour, M., & Alenezi, M. (2022). Higher education future in the era of digital transformation. Education Sciences, 12(11), 784.

Al Bashar, M., Taher, M. A., Islam, M. K., & Ahmed, H. (2024). The Impact Of Advanced Robotics And Automation On Supply Chain Efficiency In Industrial Manufacturing: A Comparative Analysis Between The Us And Bangladesh. Global Mainstream Journal of Business, Economics, Development & Project Management, 3(03), 28-41.

Alaimo, C., Kallinikos, J., & Valderrama, E. (2020). Platforms as service ecosystems: Lessons from social media. Journal of information technology, 35(1), 25-48.

Anna, S. (2022). Implementing the OECD AI Principles: Challenges and Best Practices.

Atieh, A. T. (2021). The next generation cloud technologies: a review on distributed cloud, fog and edge computing and their opportunities and challenges. ResearchBerg Review of Science and Technology, 1(1), 1-15.

Atlı, H. F. (2023). Safety of agricultural machinery and tractor maintenance planning with fuzzy logic and MCDM for agricultural productivity. International Journal of Agriculture Environment and Food Sciences, 8(1), 25-43.

Babina, T., Fedyk, A., He, A., & Hodson, J. (2024). Artificial intelligence, firm growth, and product innovation. Journal of Financial Economics, 151, 103745.

Bharadiya, J. P. (2023). Machine learning and AI in business intelligence: Trends and opportunities. International Journal of Computer (IJC), 48(1), 123-134.

Canton, H. (2021). Organisation for economic co-operation and development—OECD. In The Europa Directory of International Organizations 2021 (pp. 677-687). Routledge.

Ceglar, A., & Toreti, A. (2021). Seasonal climate forecast can inform the European agricultural sector well in advance of harvesting. Npj Climate and Atmospheric Science, 4(1), 42.

Çağlar, E. (2024) Integrating Innovative Technologies into Postharvest Fruit Storage Systems. In Postharvest Physiology and Handling of Horticultural Crops (pp. 234-244). CRC Press.

Demir, Y. (2021). G7 Ülkelerinde Ticari Dışa Açıklık, Finansal Açıklık ve Ekonomik Büyüme İlişkisi. Selçuk Üniversitesi Sosyal Bilimler Meslek Yüksekokulu Dergisi, 24(1), 274-287. (in Turkish)

Dhanya, V. G., Subeesh, A., Kushwaha, N. L., Vishwakarma, D. K., Kumar, T. N., Ritika, G., & Singh, A. N. (2022). Deep learning based computer vision approaches for smart agricultural applications. Artificial Intelligence in Agriculture, 6, 211-229.

Durai, S. K. S., & Shamili, M. D. (2022). Smart farming using machine learning and deep learning techniques. Decision Analytics Journal, 3, 100041.

Ercan, S. (2022). Türkiye'de Yapay Zekâ Yatirimlari: Stratejik Yönetim Bağlaminda Bir Değerlendirme, 127-142.

George, A. S., & George, A. H. (2023). A review of ChatGPT AI's impact on several business sectors. Partners Universal International Innovation Journal, 1(1), 9-23.

Güzel, B., & Okatan, E. (2022). Tarim Ve Yapay Zekâ. Yapay Zekânin Değiştirdiği Dinamikler, 199. (in Turkish)

Haktanır, E., Kahraman, C., Şeker, Ş., & Doğan, O. (2022). Future of digital transformation. In Intelligent systems in digital transformation: Theory and applications (pp. 611-638). Cham: Springer International Publishing.

Hervas-Oliver, J. L., Sempere-Ripoll, F., & Boronat-Moll, C. (2021). Technological innovation typologies and open innovation in SMEs: Beyond internal and external sources of knowledge. Technological Forecasting and Social Change, 162, 120338.

Hu, T., Chitnis, N., Monos, D., & Dinh, A. (2021). Next-generation sequencing technologies: An overview. Human Immunology, 82(11), 801-811.

Iyer, L. S. (2021). AI enabled applications towards intelligent transportation. Transportation Engineering, 5, 100083.

Kahya, E., & Özdüven, F. (2023). An example of lettuce (Lactuca Sativa) seedling selection using deep learning method for robotic seedling selection system. International Journal of Agriculture Environment and Food Sciences, 7(2), 349-356.

Kamilaris, A., & Prenafeta-Boldú, F. X. (2018). A review of the use of convolutional neural networks in agriculture. The Journal of Agricultural Science, 156(3), 312-322.

Khan, F. N., Sana, A., & Arif, U. (2020). Information and communication technology (ICT) and environmental sustainability: a panel data analysis. Environmental Science and Pollution Research, 27, 36718-36731.

Koca, D. (2022). 2000-2020 Yılları Arasında G7 Ülkeleri ve Türkiye'nin İşgücü Piyasası Yapısının ve Aktif İşgücü Piyasası Politikalarının Karşılaştırmalı Analizi. In Journal of Social Policy Conferences (No. 83, pp. 101-140). Istanbul University. (in Turkish)

Ma, H., & Zhang, X. (2022). Construction of smart marketing model of agricultural products E-commerce in the era of big data. Mobile Information Systems, 2022, 1-10.

Mahmud, M. S. A., Abidin, M. S. Z., Emmanuel, A. A., & Hasan, H. S. (2020). Robotics and automation in agriculture: present and future applications. Applications of Modelling and Simulation, 4, 130-140.

Mayer, R. E. (2020). Where is the learning in mobile technologies for learning?. Contemporary Educational Psychology, 60, 101824.

OECD.AI (2024), visualisations powered by JSI using data from Preqin, accessed on 21/4/2024, https://oecd.ai/en/data?selectedArea=investments-in-ai-and-data

Özaydin, G., & Çelik, Y. (2019). Tarım Sektöründe Arge ve İnovasyon. Tarım Ekonomisi Dergisi, 25(1), 1-13. (in Turkish)

Özbilge, E., Kırsal, Y., & Çaglar, E. (2020). Modelling and analysis of IoT technology using neural networks in agriculture environment. International Journal of Computers Communications & Control, 15(3).

Paul, M., Maglaras, L., Ferrag, M. A., & Almomani, I. (2023). Digitization of healthcare sector: A study on privacy and security concerns. ICT Express, 9(4), 571-588.

Pazarbasioglu, C., Mora, A. G., Uttamchandani, M., Natarajan, H., Feyen, E., & Saal, M. (2020). Digital financial services. World Bank, 54.

Purnomo, Y. J. (2023). Digital marketing strategy to increase sales conversion on e-commerce platforms. Journal of Contemporary Administration and Management (ADMAN), 1(2), 54-62.

Santos, V., Augusto, T., Vieira, J., Bacalhau, L., Sousa, B. M., & Pontes, D. (2023). E-commerce: issues, opportunities, challenges, and trends. Promoting organizational performance through 5G and agile marketing, 224-244.

Shaikh, T. A., Rasool, T., & Lone, F. R. (2022). Towards leveraging the role of machine learning and artificial intelligence in precision agriculture and smart farming. Computers and Electronics in Agriculture, 198, 107119.

Suman, A. (2021). Role of renewable energy technologies in climate change adaptation and mitigation: A brief review from Nepal. Renewable and Sustainable Energy Reviews, 151, 111524.

Tricot, R. (2021). Venture capital investments in artificial intelligence: Analysing trends in VC in AI companies from 2012 through 2020.

Ullo, S. L., & Sinha, G. R. (2021). Advances in IoT and smart sensors for remote sensing and agriculture applications. Remote Sensing, 13(13), 2585.

Van Veldhoven, Z., & Vanthienen, J. (2022). Digital transformation as an interaction-driven perspective between business, society, and technology. Electronic markets, 32(2), 629-644.

Wolfert, S., Ge, L., Verdouw, C., & Bogaardt, M. J. (2017). Big data in smart farming–a review. Agricultural systems, 153, 69-80.

Yürükoğlu, B. (2021). Yönetişim ve Ekonomik Performans: Türkiye ve G7 Ülkeleri İçin Bir Değerlendirme. Journal of Applied And Theoretical Social Sciences, 3(3), 244-262. (in Turkish)

Zhai, Z., Martínez, J. F., Beltran, V., & Martínez, N. L. (2020). Decision support systems for agriculture 4.0: Survey and challenges. Computers and Electronics in Agriculture, 170, 105256.