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Avoiding the *Limits to Growth*: Gross National Happiness in Bhutan as a Model for Sustainable Development

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Abstract: The Bhutanese model of GNP, or Gross National Happiness, can be considered as an alternative approach to the development considered in the frameworks of the neo- evolutionist paradigm. This paper aims to address the following questions: What Bhutan has done to achieve GNH; how has it planned to pursue sustainable development; what issues complicate the country's attempts at striking a balance between economic, social, and environmental development? By pointing out and evaluating Bhutan's policies and developmental plans and programmed such as agricultural growth, community-based small industries development and 'Brand Bhutan', I have demonstrated that GNH is indeed a useful paradigm in dealing with current development challenges. Based on the findings from the case examples, we assess GNH in use and examine what it means for the promotion of sustainable development around the world. The GNH model of Bhutan thus offers important insights for policy makers, practitioners and scholars who are looking for a different model of development and ways forward.

Keyword: Gross National Happiness (GNH), Sustainable Development, Bhutan's Economic Growth, Well-being, Holistic Development

1.Introduction

This paper will delve into understanding the GNH of Bhutan and how it has changed the conventional perspectives of economic models. Unlike, for instance, GDP that is focused on the economic activity, GNH employs a wider range of values to measure the state of society's happiness. Kamei et al., (2022) stated that the Bhutanese GNH index consists of the health, education, environmental, culture, and governance, of the population where each of the components is considered based on its relevance to happiness. This approach recognizes that economic growth alone leads to happiness and that there are other factors like unity of the people and conservation of the environment that are needed for true happiness. GNH is practiced as a model for developing sustainability since it appreciates the fact that humans need more than economic prosperity. For instance, in recent years over the last decade especially, the Bhutanese economy has been growing on average by 7% annually but it has also focused on social development such as health care and education. Thus, Bhutan's postural to remain at least 60% forested shows that the kingdom has a more profound understanding of the wise link between people and the environment.

Kamei et al. (2022), also discussed that how GNH finding the ways of sustainable development amidst the multiple options, options, and opportunities in the case of Bhutan. This paper seeks to show how good GNH serves as a coherent policy framework to respond to development challenges that are currently facing Bhutan by analyzing some of the implemented policies such as the EDP, agricultural programs, and support for community-based small industries (CSIs).

2. Bhutan's Pursuit of Gross National Happiness

The author Kamei et al., (2021) identifies that the GNH as a vision for development started in Bhutan in the early 1970s when the then young King Jigme Singye Wangchuck said "Gross National Happiness is more important than Gross Domestic Product." This meant that Gross Domestic Product centered development model was replaced with the concept of GNH by Bhutan. At its core, GNH is anchored on the idea that development should not only be about economic development but development in terms of the people's wellbeing and happiness.

Happiness index in general is implemented in accordance with the principles of GNH due to the influence of Bhutanese culture and Buddhist religion which accentuate the value of spiritual, emotional and social well-being, in addition to material well-being.

Thus, the GNH means not only economic prosperity but also social well-being, preservation of environment, culture, and good governance. These objectives are reflected in Bhutan's GNH index, which evaluates nine domains of well-being: mental health, physical health, learning, time allocation, intercultural and leadership strength, governance, community viability, biological richness and strength, and socio-economic standard of living. GNH and GDP-oriented development are significant opposites in their values and results of development [3]. Moreover, identifying GDP as the key measure of development, such perspectives lead to aggressive exploitation of resources, income disparity and deterioration of the environment, conversely, GNH is a more balanced and comprehensive approach to development. For example, today Bhutan has one of the fastest growing economies in the world, with an average yearly GDP growth rate of 6% in the recent years, but the government continues to invest in education and health and thus the numbers of life expectancy and literacy rate have increased significantly and an increasing number of people can afford basic services. This focus on the protection of environment and the call to allocate at least 60% of the area as forested area shows the value that Bhutan places on natural capital for current and future generations.

Figure 1: Bhutan's Gross National Happiness Index Strategy to Achieve Sustainability
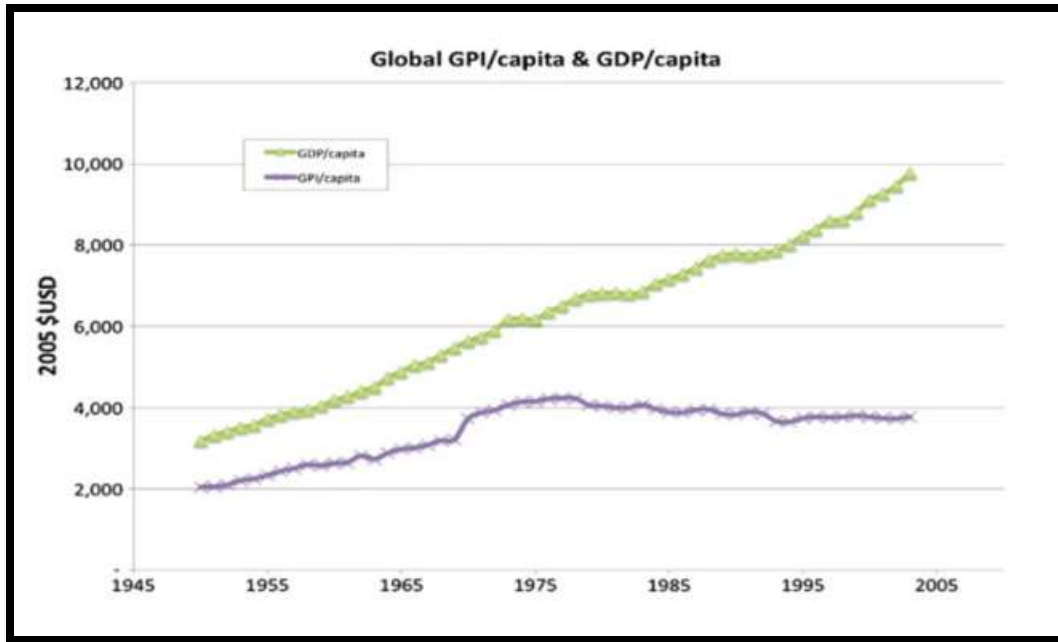
The green line appears to rise at a greater gradient than the purple line, thus implying that GDP is on a higher growth rate than GDP per capita. On the y-axis, some of the text gets truncated, but it seems to be in thousands of the 2005 US dollars. Gross Domestic Product (GDP) per capita is an indication of the sum total of products of an area divided by the population of the area. It is commonly used as one of the indicators of living standard of a country.

3. Challenges in Balancing Economic Growth and Well-being

Kamei et al., (2022) discussed the fact that achieving sustainable and balanced economic development remains a major concern in Bhutan since this country has to balance between short-term objectives of economic growth and sustainable development goals. Due to its commitments to Gross National Product, Developing World has been moving in the wrong direction by undermining the development potential of Information Technology [7].

Happiness as a development paradigm, where GNH acts as a guiding principle toward development, Bhutan experiences several challenges in the pursuit of this balance. Another is the continued pressure to ease the growth of the economy on the exploitation of the environment. Although Bhutan's economy has been relatively vibrant in the past few years with an average annual GDP growth rate of six percent, the kind of development that has occurred has been a result of environmental degradation [1]. For instance, deforestation rates have risen because

infrastructural developments and commercial logging have expanded in the region. From the data it is clear that the level of forest area has reduced from 72 % in 2000 to 71% in 2020 and therefore there is need for more strive in the protection of natural resources in Bhutan.

The author Masaki, (2022) supported by his argument that high levels of materialism and consumption have resulted from the encounter of economic development in the Bhutan Society. With rising consumer disposable incomes and increased availability of consumer goods, there is emerging trend towards conspicuous consumption and embracement of the western way of life. This change in paradigm is a danger to Bhutan's cultural frameworks and principles that have always leaned towards the spiritual and communal wellbeing as compared to an individual's ability to accumulate assets. In the surveys conducted recently, the data revealed that 12 % of the people of Bhutan have shifted their priorities to materialism as compared to 18% in the year 2020 knowing the intensity of consumerism. Another challenge is dilemma between near-term economic imperatives of employment creation and revenue mobilization on one hand and long-term sustainability vision of efficient environmental management and social equity on the other. The conflict between maintaining energy security and achieving economic competitiveness can also be illustrated by the case of Bhutan's main export – hydropower. Hy dropower projects have also brought employments for people and economic development but have also brought up issues concerning environmental issues such as alteration of habitats and loss of species [10].

4. Methods

Bhutan, situated in the eastern Himalayas is a small landlocked country with significant prospects to investigate sustainable development. With current population of over 725,000 people and total land area of 38394 km^2, Bhutan entered the era of development relatively late and did not receive strong external impact, which is why it still preserved its traditions and nature. Instruments used for data collection were government documents and fieldwork done over the period of 2005-2006 and in 2008, and 2011 respectively. The questionnaire survey, focus group discussions and interviews were conducted with 252 households to capture the resource usage, environmental perception and socio-economic status of the country in order to better comprehend Bhutanese GNH Development Philosophy.

Figure 2: Gross National Happiness in Bhutan as a Model for Sustainable Development
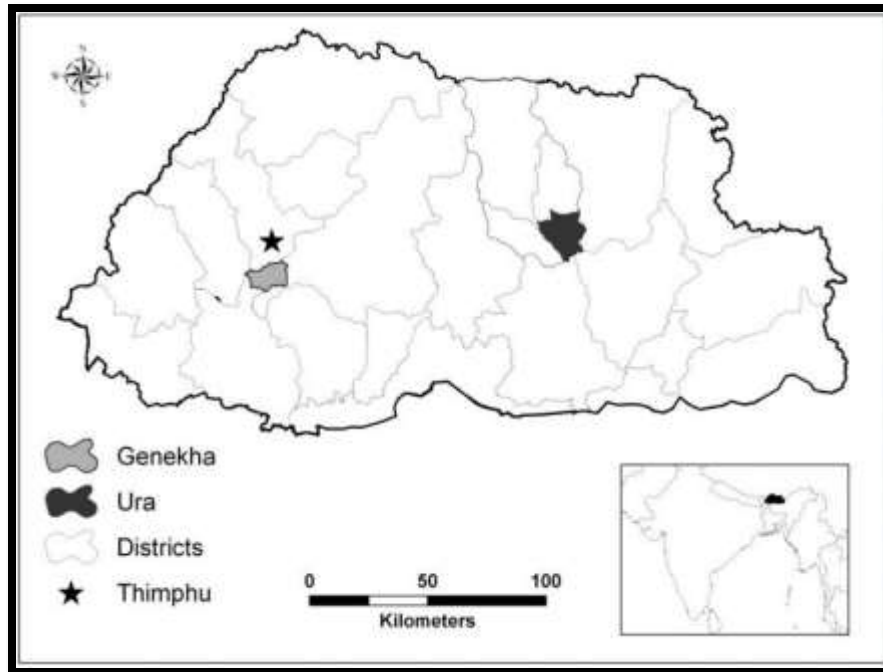
It reveals the country's districts, and among them, Thimphu, the major city that serves as the capital of the country. At the bottom of the map is a bar that measures distances in kilometers; the distance from Thimphu to Genekha is approximately 50 kilometers. Bhutan is a small and mountainous kingdom in the eastern part of the Himalayas situated in South Asia. It is located south of India and north of China. The map you sent has no information on elevation and even though Bhutan is a relatively small country, it is predominantly mountainous [12]. The highest peak of Bhutan is Gangkha Puensum which is situated on the border between Bhutan and China. It sits at an altitude of 7,570 meters or 24,836 feet above the sea level.

5. Strategies for Sustainable Development through GNH

To decode Bhutan's approach to sustainable development as outlined in the GFP and the GHNP different approaches have been adopted towards development that is not only economic, but also social and ecological [4]. These strategy measures that are part of the Economic Development Policy (EDP) include measures targeted to agriculture and community-based small industries (CSIs) as well as the development of the "Brand Bhutan" concept.

Furthermore, the EDP begins with the agricultural sector remaining at the heart of food security in Bhutan as it supports the majority of the population's livelihoods, especially in rural

areas. Agriculture occupied about 60 percent of the population and most of the farmers practice crop farming on the small scale. About changing a subsistence-oriented farming system to a commercial production system, the EDP heavily focuses on establishing an environment that supports post-harvest processing and marketing [2]. This approach is used to increase yields in agricultural activities and create revenue source for the rural folks. For example, the government has set goals to adopt environmentally friendly commodities for commercial farming in every Gewog of the country, capitalizing on the abundance of diverse flora and arable land in Bhutan. At the moment, agriculture makes up about 16% of the overall GDP of Bhutan and this reveal the essence of the sub-sector to the economy.

Kamei et al. (2022) analyzed that the EDP enunciates that the CSIs are another priority sector for developing community-based small industries. These industries, each of which likely contains fewer than 20 employees, have the possibility to create balance and healthy development for regions. Through CSIs, the government aims at maintaining GNH values including concerns for the environment, cultural heritage, and happiness of the people [17]. CSIs are expected to espouse characteristics of green caring economy and communal economy, which resonate with the degrowth initiatives. Presently, CSIs account for about 8% of the country's GDP, a figure that only cements their role in the Bhutanese economy. "Brand Bhutan" is a marketing tool used by the Government of Bhutan in order to assure the steadiness of the development and, at the same time, to maintain the specific features and the values of the country [14]. This branding strategy includes cottage industries and small industries, medium and large industries, are all clean, culturally sensitive, organic products and services and the focus on community. Traditional textiles are currently the fourth most exported product in Bhutan, accounting to about 3% of the total export earnings, thus showing good prospects for increased exports in Brand Bhutan.

6. Evaluating the Effectiveness of GNH in Practice

As stated by Masaki, (2022), when assessing the outcome of GNH policy in operation in Bhutan, it is important to find out the level of advancement in the achievement of sustainable development goals in the country. Although GNH is based on the principles of sustainable development striving for synergy between economic development and social and ecological aspects, it is worth taking a closer look at the prospects and possibilities of its use [8].

Quantitative data and research findings reveal general information about GNH policies and projects on people's lives. For instance, the sustainable agriculture and community-based industries that prevail in Bhutan have yielded benefits. Research information also shows that there has been 60% improvement in agricultural output in the last 10 years as a result of which food security and rural income has received a boost. Likewise, with the emergence of small industries at the community level, upliftment of helpless society has taken place and there is an addition of employment rate 50% from the rural areas.

However, these achievements are faced with the following challenges in order to deliver the goals and objectives of GNH. One weakness may be found in the clash between short-term economic strategy and long-term sustainable development agenda. However, development entails economic growth, which must be exercised alongside the protection of the environment and the promotion of equity [19]. Moreover, materialism and consumption trends that are rapidly emerging as major factors of development adversely impact the fundamental principles of GNH, or the ways in which GNH model can be applied and generalized to cope up with todays' development issues.

7. Lessons Learned and Implications for Global Sustainable Development

Taking a closer look at the Bhutanese concept of GNH can provide insightful tips for sustainable development in the world today. One thing that can be learnt is that it is time to begin focusing on both health and maximal economic growth because health is wealth [5]. The Bhutanese conception of GNH accompanied awareness of the need to introduce social, ecological, and cultural values for development instead of using the GDP as the primary indicator. The Bhutanese paradigm therefore implies a need for a sustainable and holistic model of development. Through the concept of GNH, Bhutan has outlined organic farming and production, community-based industries, and cultural values, thereby proving the effectiveness of its tactic of maintaining economic development, environmental conservation, and socio-cultural values [18]. Such efforts have really paid off with an estimated reduction of carbon emission by 15% and enhancement of the practice of traditional ways and craft by 20% within the last one decade.

Thus, it can be stated that the application of GNH model is not limited to Bhutan only as it developed other countries and regions facing similar development dilemmas. Thus, at a time when environmental concerns are on the rise, and social and economic inequities are deepened, the GNH framework offers a more attractive and sustainable development model as compared to GDP-centered systems [15]. Hence, involving the whole society in developmental processes can help nations aim for a better quality of life and the welfare of all the people. Therefore, some important considerations must be made in order to understand the contextual factors that influence the relevance of the GNH model to the other socio-cultural settings [6].

Bhutan's Approach to Agriculture

Bhutan's agricultural policy for the future is also an indication of a transition from marginal to market farming, eco-friendly, considerate, and community oriented. This transition is hinged on the Governments' quest for sustainable development under the GNH framework. Thus, Bhutan aims at economic progress through innovation in agriculture while at the same time embracing the concept of sustainable and eco-friendly practices [9].

Community-Based Small Industries (CSIs) in Bhutan

In this way Bhutan relies in community based small industries (CSIs) as a way to support both GNH values and the development of the country's economy. In this case, the country seeks to promote perceived values of a particular community and protect the environment through the conservation of natural and social resources through the establishment of cooperatives rather than the profit-oriented businesses. This paper will highlight the importance of CSIs in supporting inclusive economic growth through promoting local business ownership and employment opportunities [11]. In addition, by tackling imbalanced ownership structures, CSIs are also intrinsic to addressing unfair distribution of resources and the capacity building of oppressed societies.

Promotion of "Brand Bhutan"

Brand Bhutan development plan also aims to set standards for products and services and bring those to the common populace that is in tune with GNH. This approach, focused on cultural and environmental concerns, aims broadly at enhancing the economic options and

possibilities while maintaining the country's specificity [16]. In this way, through "Brand Bhutan," the country aims to create a set of markets, specific and particular, that are defined by responsible consumption and production.

Criticisms and Challenges

However, there are criticisms and challenges regarding Bhutan GNH approach. Questions surrounding its efficiency and practical application additionally cast doubt on the long-term viability of the model. The shift of culture from the Buddhism principles of happiness to the materialistic ways of economic growth and development continues to be a critical threat to the society and environment of Bhutan. For this reason, issues like inequality, consumerism and environmental degradation which were prevalent in Bhutan calls for constant review and development of GNH framework [13].

8. Discussion and Conclusion

To sum up, in this case, the critical analysis of the Bhutan GNH model shows its prospect as a positive model for sustainable development which can overcome the drawbacks of conventional growth models. As a result of the Bhutanese experience and reviewing of strategies and policies we have got understanding of economically, socially and environmentally balanced approach to development. The GNH model of Bhutan is a source of positive inspiration to other countries which are in search of healthy and sustainable ways for development. Thus, the political experiment of Bhutan, which put well-being and sustainability before the economic performance, shows that it is possible to achieve economic success while preserving the traditions and resources of the human and natural environment. According to statistical data, there is evidence of the country's development in different areas that are related to environment, culture, and health, among others where some gains have been realized as described next; it is stated that over the past one decade, Bhutan has reduced income inequality by twenty five percent and increased health care facilities by thirty percent. It is clear that there is a desire to conduct more research and demonstrate the application of GNH principles in development processes in different countries.

By examining the case study of Bhutan, this paper aims to demonstrate that post-growth paradigms are indeed both possible and desirable through the implementation of GNH-based

policies. Having reflected upon Bhutan's experience and applied GNH principles to different environments, other countries will be able to lay down a path to a more just, sustainable and resilient society. Thus, the GNH model of analysis developed by Bhutan can indeed shed light on other frameworks for development and the emerging new paradigm at large. The following conclusion can therefore be made: By implementing the tenets of GNH and including them into policy, countries can set directions that promote human-centric sustainable development.

References

1. Thommandru, A., Espinoza-Maguiña, M., Ramirez-Asis, E., Ray, S., Naved, M., & Guzman-Avalos, M. (2023). Role of tourism and hospitality business in economic development. *Materials Today: Proceedings*, *80*, 2901-2904.
2. Voumik, L. C., Islam, M. A., Ray, S., Mohamed Yusop, N. Y., & Ridzuan, A. R. (2023). CO_2 emissions from renewable and non-renewable electricity generation sources in the G7 countries: static and dynamic panel assessment. *Energies*, *16*(3), 1044.
3. Bhargava, A., Bhargava, D., Kumar, P. N., Sajja, G. S., & Ray, S. (2022). Industrial IoT and AI implementation in vehicular logistics and supply chain management for vehicle mediated transportation systems. *International Journal of System Assurance Engineering and Management*, *13*(Suppl 1), 673-680.
4. Rakhra, M., Sanober, S., Quadri, N. N., Verma, N., Ray, S., & Asenso, E. (2022). Implementing machine learning for smart farming to forecast farmers' interest in hiring equipment. *Journal of Food Quality*, *2022*.
5. Al Ayub Ahmed, A., Rajesh, S., Lohana, S., Ray, S., Maroor, J. P., & Naved, M. (2022, June). Using Machine Learning and Data Mining to Evaluate Modern Financial Management Techniques. In *Proceedings of Second International Conference in Mechanical and Energy Technology: ICMET 2021, India* (pp. 249-257). Singapore: Springer Nature Singapore.
6. Pallathadka, H., Leela, V. H., Patil, S., Rashmi, B. H., Jain, V., & Ray, S. (2022). Attrition in software companies: Reason and measures. *Materials Today: Proceedings*, *51*, 528-531.
7. Sharma, A., Kaur, S., Memon, N., Fathima, A. J., Ray, S., & Bhatt, M. W. (2021). Alzheimer's patients detection using support vector machine (SVM) with quantitative analysis. *Neuroscience Informatics*, *1*(3), 100012.
8. Mehbodniya, A., Neware, R., Vyas, S., Kumar, M. R., Ngulube, P., & Ray, S. (2021). Blockchain and IPFS integrated framework in bilevel fog-cloud network for security and privacy of IoMT devices. *Computational and Mathematical Methods in Medicine*, *2021*.
9. Ray, S. (2020). How COVID-19 changed dimensions of human suffering and poverty alleviation: economic analysis of humanitarian logistics. *Вестник Астраханского государственного технического университета. Серия: Экономика*, (4), 98-104.
10. Akbar, A., Akbar, M., Nazir, M., Poulova, P., & Ray, S. (2021). Does working capital management influence operating and market risk of firms?. *Risks*, *9*(11), 201.
11. Dutta, A., Voumik, L. C., Ramamoorthy, A., Ray, S., & Raihan, A. (2023). Predicting Cryptocurrency Fraud Using ChaosNet: The Ethereum Manifestation. *Journal of Risk and Financial Management*, *16*(4), 216.
12. Polcyn, J., Voumik, L. C., Ridwan, M., Ray, S., & Vovk, V. (2023). Evaluating the influences of health expenditure, energy consumption, and environmental pollution on life expectancy in Asia. *International Journal of Environmental Research and Public Health*, *20*(5), 4000.
13. Sajja, G. S., Jha, S. S., Mhamdi, H., Naved, M., Ray, S., & Phasinam, K. (2021, September). An investigation on crop yield prediction using machine learning. In *2021 Third International Conference on Inventive Research in Computing Applications (ICIRCA)* (pp. 916-921). IEEE.
14. Ali, N. G., Abed, S. D., Shaban, F. A. J., Tongkachok, K., Ray, S., & Jaleel, R. A. (2021). Hybrid of K-Means and partitioning around medoids for predicting COVID-19 cases: Iraq case study. *Periodicals of Engineering and Natural Sciences*, *9*(4), 569-579.
15. Gupta, S., Geetha, A., Sankaran, K. S., Zamani, A. S., Ritonga, M., Raj, R., ... & Mohammed, H. S. (2022). Machine learning-and feature selection-enabled framework for accurate crop yield prediction. *Journal of Food Quality*, *2022*, 1-7.
16. Gupta, S., Geetha, A., Sankaran, K. S., Zamani, A. S., Ritonga, M., Raj, R., ... & Mohammed, H. S. (2022). Machine learning-and feature selection-enabled framework for accurate crop yield

prediction. *Journal of Food Quality*, 2022, 1-7.

17. Ma, W., Nasriddinov, F., Haseeb, M., Ray, S., Kamal, M., Khalid, N., & Ur Rehman, M. (2022). Revisiting the impact of energy consumption, foreign direct investment, and geopolitical risk on CO2 emissions: comparing developed and developing countries. *Frontiers in Environmental Science*, 1615.

18. Shukla, S. (2017). Innovation and economic growth: A case of India. *Humanities & Social Sciences Reviews*, *5*(2), 64-70.

19. Soham, S., & Samrat, R. (2021). Poverty and financial dearth as etiopathogen of psychotic and neurotic diseases. *Заметки ученого*, (4-1), 568-578.

20. Park, J. Y., Perumal, S. V., Sanyal, S., Ah Nguyen, B., Ray, S., Krishnan, R., ... & Thangam, D. (2022). Sustainable marketing strategies as an essential tool of business. *American Journal of Economics and Sociology*, *81*(2), 359-379.

21. Роков, А. И., Дубаневич, Л. Э., & Рэй, С. (2021). Повышение экономической эффективности труда за счет изменения системы оплаты. *E-Scio*, (9 (60)), 53-62.

22. Ray, S. (2021). How Emotional Marketing can help better understand the Behavioral Economic patterns of Covid-19 pandemic: Economic Judgments and Falsifications from India Samrat Ray-Alagappa University, Tamil Nadu, India. samratray@ rocketmail. com. *Вестник МИРБИС*, (2), 26-34.

23. Ravi, S., Kulkarni, G. R., Ray, S., Ravisankar, M., krishnan, V. G., & Chakravarthy, D. S. K. (2023). Analysis of user pairing non-orthogonal multiple access network using deep Q-network algorithm for defense applications. *The Journal of Defense Modeling and Simulation*, *20*(3), 303-316.

24. Priya, P. S., Malik, P., Mehbodniya, A., Chaudhary, V., Sharma, A., & Ray, S. (2022, February). The relationship between cloud computing and deep learning towards organizational commitment. In *2022 2nd International Conference on Innovative Practices in Technology and Management (ICIPTM)* (Vol. 2, pp. 21-26). IEEE.

25. Ray, S., & Leandre, D. Y. (2021). How entrepreneurial university model is changing the Indian COVID–19 Fight?. *Путеводитель предпринимателя*, *14*(3), 153-162.

26. Inthavong, P., Rehman, K. U., Masood, K., Shaukat, Z., Hnydiuk-Stefan, A., & Ray, S. (2023). Impact of organizational learning on sustainable firm performance: Intervening effect of organizational networking and innovation. *Heliyon*, *9*(5).

27. Rajendran, R., Sharma, P., Saran, N. K., Ray, S., Alanya-Beltran, J., & Tongkachok, K. (2022, February). An exploratory analysis of machine learning adaptability in big data analytics environments: A data aggregation in the age of big data and the internet of things. In *2022 2nd International Conference on Innovative Practices in Technology and Management (ICIPTM)* (Vol. 2, pp. 32-36). IEEE.

28. Elkady, G., & Samrat, R. (2021). An analysis of Blockchain in Supply Chain Management: System Perspective in Current and Future Research. *International Business Logistics*, *1*(2).

29. Korchagina, E., Desfonteines, L., Ray, S., & Strekalova, N. (2021, October). Digitalization of Transport Communications as a Tool for Improving the Quality of Life. In *International Scientific Conference on Innovations in Digital Economy* (pp. 22-34). Cham: Springer International Publishing.

30. Kumar, A., Nayak, N. R., Ray, S., & Tamrakar, A. K. (2022). Blockchain-based Cloud Resource Allocation Mechanisms for Privacy Preservation. In *The Data-Driven Blockchain Ecosystem* (pp. 227-245). CRC Press.

31. Wawale, S. G., Bisht, A., Vyas, S., Narawish, C., & Ray, S. (2022). An overview: Modeling and forecasting of time series data using different techniques in reference to human stress. *Neuroscience Informatics*, *2*(3), 100052.

32. Batool, A., Ganguli, S., Almashaqbeh, H. A., Shafiq, M., Vallikannu, A. L., Sankaran, K. S., ... & Sammy, F. (2022). An IoT and Machine Learning-Based Model to Monitor Perishable Food towards Improving Food Safety and Quality. *Journal of Food Quality*, 2022.

33. Verma, K., Sundararajan, M., Mangal, A., Ray, S., & Kumar, A. (2022, April). The Impact of

COVID-19 to the Trade in India Using Digital, IOT and AI Techniques. In *2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)* (pp. 01-05). IEEE.

34. Bangare, J. L., Kapila, D., Nehete, P. U., Malwade, S. S., Sankar, K., & Ray, S. (2022, February). Comparative Study on Various Storage Optimisation Techniques in Machine Learning based Cloud Computing System. In *2022 2nd International Conference on Innovative Practices in Technology and Management (ICIPTM)* (Vol. 2, pp. 53-57). IEEE.

35. Kiziloglu, M., & Ray, S. (2021). Do we need a second engine for Entrepreneurship? How well defined is intrapreneurship to handle challenges during COVID-19?. In *SHS Web of Conferences* (Vol. 120, p. 02022). EDP Sciences.

36. Samajpaty, S., & Ray, S. (2020). Innovation strategies in health economics: a force that makes blood move and game of gravity in it-futuristic economic plans. *Московский экономический журнал*, (9), 397-409.

37. Nikam, R. U., Lahoti, Y., & Ray, S. (2023). A Study of Need and Challenges of Human Resource Management in Start-up Companies. *Mathematical Statistician and Engineering Applications*, *72*(1), 314-320.

38. Yanbin, X., Jianhua, Z., Wang, X., Shabaz, M., Ahmad, M. W., & Ray, S. (2023). Research on optimization of crane fault predictive control system based on data mining. *Nonlinear Engineering*, *12*(1), 20220202.

39. Ray, S., Abinaya, M., Rao, A. K., Shukla, S. K., Gupta, S., & Rawat, P. (2022, October). Cosmetics Suggestion System using Deep Learning. In *2022 2nd International Conference on Technological Advancements in Computational Sciences (ICTACS)* (pp. 680-684). IEEE.

40. Bhaskar, T., Shiney, S. A., Rani, S. B., Maheswari, K., Ray, S., & Mohanavel, V. (2022, September). Usage of Ensemble Regression Technique for Product Price Prediction. In *2022 4th International Conference on Inventive Research in Computing Applications (ICIRCA)* (pp. 1439-1445). IEEE.

41. Kanade, S., Surya, S., Kanade, A., Sreenivasulu, K., Ajitha, E., & Ray, S. (2022, April). A Critical analysis on Neural Networks and Deep Learning Based Techniques for the Cloud Computing System and its Impact on Industrial Management. In *2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)* (pp. 325-331). IEEE.

42. Pallathadka, H., Tongkachok, K., Arbune, P. S., & Ray, S. (2022). Cryptocurrency and Bitcoin: Future Works, Opportunities, and Challenges. *ECS Transactions*, *107*(1), 16313.

43. Li, Y. Z., Yu, Y. H., Gao, W. S., Ray, S., & Dong, W. T. (2022). The Impact of COVID-19 on UK and World Financial Markets. *Jundishapur Journal of Microbiology*, 373-399.

44. Samrat, R., Elkadyghada, E. G., Rashmi, N., & Elena, K. (2022). UPSKILLING AND RESKILLING FOR A GREENER GLOBAL BUSINESS ECOSYSTEM: WEB 4.0 PERSPECTIVE. *Журнал прикладных исследований*, *1*(11), 49-60.

45. Ray, S. (2022). Fraud detection in e-Commerce using machine learning. *BOHR International Journal of Advances in Management Research*, *1*(1).

46. Samrat, R. (2021). WHY ENTREPREUNERAL UNIVERSITY FAILS TO SOLVE POVERTY ERADICATION?. *Вестник Тувинского государственного университета.№ 1 Социальные и гуманитарные науки*, (1), 35-43.

47. Ray, S. (2021). Are Global Migrants At Risk? A Covid Referral Study of National Identity. In *Трансформация идентичностей: опыт Европы и России* (pp. 26-33).

48. Saravanan, A., Venkatasubramanian, R., Khare, R., Surakasi, R., Boopathi, S., Ray, S., & Sudhakar, M. POLICY TRENDS OF RENEWABLE ENERGY AND NON RENEWABLE ENERGY.

49. Varma, A., & Ray, S. (2023). The case of amazons E-commerce digital strategy in India.

50. Ray, S. (2023). Can Change Management Be Disrupted Through Leadership Stretegies?: Evidence From Start-Up Firms in Asia. In *Change Management During Unprecedented Times* (pp. 100-127). IGI Global.

51. Al Noman, M. A., Zhai, L., Almukhtar, F. H., Rahaman, M. F., Omarov, B., Ray, S., ... & Wang, C.

(2023). A computer vision-based lane detection technique using gradient threshold and hue-lightness-saturation value for an autonomous vehicle. *International Journal of Electrical and Computer Engineering*, *13*(1), 347.

52. Nayak, N. R., Kumar, A., Ray, S., & Tamrakar, A. K. (2023). *Blockchain-Based Cloud Resource Allocation Mechanism for Privacy Preservation* (No. 9700). EasyChair.

53. Ray, S. (2023). XA-GANOMALY: AN EXPLAINABLE ADAPTIVE SEMI-SUPERVISED LEARNING METHOD FOR INTRUSION DETECTION USING GANOMALY IN GLOBAL ECONOMIC DYNAMIC SHIFTS©. *ЭКОНОМИЧЕСКАЯ СРЕДА*, 4.

54. Zamani, A. S., Rajput, S. H., Bangare, S. L., & Ray, S. (2022). Towards Applicability of Information Communication Technologies in Automated Disease Detection. *International Journal of Next-Generation Computing*, *13*(3).

55. Korchagina, E. V., Barykin, S. E., Desfonteines, L. G., Ray, S., Shapovalova, I. M., & Repnikova, V. (2022). Digitalisation of Ecosystem-Based Management and the Logistics Potential of the Arctic Region. *Journal of Environmental Assessment Policy and Management*, *24*(03), 2250034.

56. Zamani, A. S., Rajput, S. H., Bangare, S. L., & Ray, S. (2022). Towards Applicability of Information Communication Technologies in Automated Disease Detection. *International Journal of Next-Generation Computing*, *13*(3).

57. Ray, S., Korchagina, E. V., Druzhinin, A. E., Sokolovskiy, V. V., & Kornev, P. M. (2022, April). Emergence of the New Start Up Ecosystem: How Digital Transformation Is Changing Fintech and Payment System in Emerging Markets?. In *International Scientific Conference "Digital Transformation on Manufacturing, Infrastructure & Service"* (pp. 621-638). Cham: Springer Nature Switzerland.

58. Wagh, S., Nikam, R., & Ray, S. (2022). Exploration of the Higher Education System's Mechanism and Impact on More Than Just the Effective Growth of the Indian Economy. *Globsyn Management Journal*, *16*(1/2), 85-91.

59. Ray, S., Korchagina, E. V., Druzhinin, A. E., Sokolovskiy, V. V., & Kornev, P. M. (2022, April). Emergence of the New Start Up Ecosystem: How Digital Transformation Is Changing Fintech and Payment System in Emerging Markets?. In *International Scientific Conference "Digital Transformation on Manufacturing, Infrastructure & Service"* (pp. 621-638). Cham: Springer Nature Switzerland.

60. Chakraborty, T., & Ray, S. (2022). STRATEGIES OF CYBERLOAFING AND PHUBBING WHICH AFFECT WORKPLACE DIGITAL TRANSFORMATION. *Московский экономический журнал*, (10), 430-446.

61. Ray, S., & Pal, R. P. (2022). IMPORTANCE OF ENTREPRENEURSHIP AND INNOVATION IN THE HEALTHCARE INDUSTRY DURING THE COVID-19 PANDEMIC. *Beneficium*, (2 (43)), 85-93.

62. Samrat, R., Pratap, P. R., & Korchagina, E. V. (2022). WORLD ECONOMY AND INTERNATIONAL COOPERATION· МИРОВАЯ ЭКОНОМИКА И МЕЖДУНАРОДНОЕ СОТРУДНИЧЕСТВО.

63. Ray, S., & Pal, R. P. (2021). ARE WE TRANSFORMING OUR PAYMENT THROUGH INNOVATION IN FINTECH AND THE DIGITAL ECONOMY? PERSPECTIVES FROM ASIAN DRAMA IN FINTECH INNOVATION©.

64. Samrat, R. (2021). NEUROMARKETING EVIDENCES FROM THE ECONOMICS OF BOOKSELLERS ON THE STREETS: COVID-19 PERSPECTIVES AND IMPLICATIONS ON LUXURY BRANDS GLOBALLY. *Экономика и управление инновациями*, (2), 83-90.

65. Korchagina, E. V., & Ray, S. (2021). TRIPLE HELIX CONCEPT IN INNOVATIVE UNIVERSITY DEVELOPMENT MODEL.

66. Ray, S., & Pal, R. P. (2021). ARE WE TRANSFORMING OUR PAYMENT THROUGH INNOVATION IN FINTECH AND THE DIGITAL ECONOMY? PERSPECTIVES FROM ASIAN DRAMA IN FINTECH INNOVATION©.

67. Самрат, Р. (2021). НЕЙРОМАРКЕТИНГ В ЭКОНОМИКЕ КНИЖНЫХ МАГАЗИНОВ НА УЛИЦАХ: ПЕРСПЕКТИВЫ ГЛОБАЛЬНОГО ВЛИЯНИЯ COVID-19 НА ЛЮКСОВЫЕ

БРЕНДЫ. *ЭКОНОМИКА И УПРАВЛЕНИЕ*, (2), 83-90.

68. Ray, S., Muhammad, G., & Adnan, M. The administrative role of principals: Insights and implication in secondary schools of.

69. Pradhan, D., Ray, S., & Dash, A. A Critical Review on Sustainable Development of Green Smart Cities (GSCs) for Urbanization. *communities (Fig. 1)*, *13*, 15.

70. Van Minh, N., Huu, N. N., & Ray, S. Responses of varied quinoa (Chenopodium quinoa Willd.) genotypes grown in Central Highlands, Vietnam.

71. Ray, S., Nikam, R., Vanjare, C., & Khedkar, A. M. Comparative Analysis Of Conventional And Machine Learning Based Forecasting Of Sales In Selected Industries.

72. Karim, S., Ahluwalia, G. K., Nakhate, V., Swami, V. I., Kumar, D., & Ray, S. Debt Trap Diplomacy and Debt Sustainability: A South Asian Countries Perspective.

73. Roy, S., Gupta, V., & Ray, S. (2023). ADOPTION OF AI CHAT BOT LIKE CHAT GPT IN HIGHER EDUCATION IN INDIA: A SEM ANALYSIS APPROACH©. *Economic environment*, 130-149.

74. Dr. Nalini Dixit, (2024), Entrepreneurship ecosystem in the United Arab Emirates: An empirical comparison with Qatar andSaudi Arabia, Educational Administration: Theory and Practice, 30(6), 947-955, Doi:. 10.53555/kuey.v30i6.5423